Archaeological Studies in the Willamette Valley, Oregon
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PREFACE

The Willamette Valley occupies a position geographically, and in some ways biotically, intermediate between the Northwest Coast, Columbia Plateau, and Great Basin culture areas. It is linked by the Willamette and Columbia River systems to the Northwest Coast and Plateau, and by mountain passes eastward across the Cascades to the Great Basin. The valley is climatically mild, dryer than the coast, but much wetter than the intermontane desert east of the Cascades. Its aboriginal culture is little known. Few ethnographic accounts have come to light, and little archaeology has been done. When the area has been considered at all in the broader context of North American ethnology, its affinities—whether to the Northwest Coast, Plateau, Great Basin, or perhaps California—have not been clearly definable.

The present collection reports new archaeological surveys and excavations conducted since 1969 in the region, along with some earlier work previously described only in obscure master's theses or administrative reports. Two papers describe and illustrate in detail important collections earlier published only in part. With these new data, Willamette Valley aboriginal culture comes into clearer view. It now appears that, for the period of adequate record, Willamette Valley peoples maintained their closest contacts with the coastal region. Their stone tools are more similar to those of the coast than to those of the interior, and a few artifacts of marine shell or the bone of sea mammals indicate coastal relationships. The Kalapuyan language spoken by historic occupants of the valley is a member of the great Penutian phylum, which has many representatives along the west coast. This also suggests a common history with the coastal peoples.

Historical relationships notwithstanding, in society and economics the Willamette Valley people differed significantly from those of the Northwest Coast, showing in these respects more similarity to the smaller and simpler societies of the Great Basin and California. No large village encampments comparable to a Northwest Coast settlement are known. Sites tend rather to be small and numerous, and of several functionally different kinds. A society significantly more atomistic, and undoubtedly more egalitarian, than that of the Northwest Coast is indicated. Few salmon could pass the falls of the lower Willamette River, and with no concentrated and localized abundant resource to focus human economic activity and population, social groups remained relatively small, moving from place to place to exploit the relatively dispersed and varied resources available to them.

This distinctive culture, historically related to those of the coast, but adapted to the rather different environmental circumstances of the Willamette Valley, can be recognized with some assurance for 2000 years into the past. The record prior to that time is scanty,
though scattered evidence suggests that the region has been occupied for at least 10,000 years. A fuller record of earlier periods surely remains, and discovering it in an area characterized by repeated flooding and alluvial deposition will challenge archaeologists to attend closely to geomorphology in locating exposures of the older deposits in which it occurs.

Much is still to be learned about aboriginal Willamette Valley peoples, and this volume constitutes a beginning toward the writing of their prehistory. Until now there has been no ordered corpus of information on which archaeologists could build, and no initial synthesis at which they could take aim. This compilation, it is hoped, will serve these needs, and stimulate further study of the ancient cultures.

Landowners and informants, whose generosity has been the element without which the archaeology could not have been done at all, appropriately head the list of acknowledgements. Stuart Hurd, Jonathan Benjamin, P.G. Lynch, Ralph Lingo, E.A. Simons, Vernie Elder, Willamette Industries, Inc., and the United States Department of Interior gave permission for excavation on their lands. Morris Gant, Ron Beebe, Robert Porter, Ray Vincent, Steven Allely, Walter Wentz, and Marvin Spores gave information on site locations and artifacts, and facilitated the operations of archaeological survey crews.

The National Science Foundation gave major financial support, which made possible much of the more recent field work here reported, as well as partially supporting the publication of this volume. The University of Oregon, through its Department of Anthropology and Summer Session Office, provided facilities and support for several summer field courses in archaeology, the results of which are reported here. The University's Museum of Natural History, through its Curator of Anthropology, David L. Cole, has given information, loaned equipment, and provided permanent safekeeping for the artifacts and records generated by field research. The Northwest Archaeological Research Institute, Otto E. Henrickson, President, gave supplementary financial support.

Directors of University of Oregon archaeological field course teams were Dr. Dwight Wallace, Dr. Don E. Dumond, and myself. Drs. Laurence R. Kittleman and LeRoy Johnson contributed their expertise in geology and the obsidian hydration dating technique. Drs. Wilbur A. Davis and Richard E. Ross of Oregon State University have offered continuing interest and support. The authors of this volume are or were advanced students in the Department of Anthropology, University of Oregon, who participated in the work they report during the course of their training. Michael D. Southard, another member of this group, conducted a field survey here reported by another. Graduate and undergraduate students too numerous to name individually, from the University of Oregon and elsewhere, also contributed importantly by their labors in field and laboratory.
For their help in preparing this report for the press I thank Karla Powell and Joni Metcalf, who typed the masters; Helen Spiller, who redrafted most of the graphics; and Gary A. Smith and James Dodge, who gave editorial and production assistance.

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C. Melvin Aikens

Editor and Principal Investigator
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A SKETCH OF KALAPUYA ETHNOGRAPHY

BY

JAN PETERSON
It is usually assumed that attempts to use ethnohistorical data to reconstruct the aboriginal way of life of the Kalapuya Indians of Oregon's Willamette Valley will be unsuccessful since their numbers had been greatly reduced by European diseases long before any scientific observers arrived on the scene. The preliminary research on which this paper is based suggests that such an assumption may not be entirely warranted. In the present report, where the ethnohistorical accounts appeared contradictory or where they seemed to conflict with accepted notions about the Kalapuya, an attempt has been made to propose explanations which might resolve the disagreements. Further research is, of course, necessary.

The earliest white explorers arrived in the Willamette Valley in the early nineteenth century, and the first anthropological field work in the Willamette Valley was done by a linguist, Dr. Albert Gatschet, in 1877. Unfortunately, during the early 19th century there occurred several events which had major disruptive effects on the aboriginal way of life of the Kalapuya. First, during the early 1800's, the Willamette Valley was invaded by two different groups of people. The Klickitat came down from Washington, and the earliest Europeans began to explore and trade in the area. By the late 1830's, the lower Willamette Valley was being settled by servants of the Hudson's Bay Company, and by missionaries. Second, from about 1830 to 1833 there was a malaria epidemic which swept up the Columbia and Willamette rivers and then southward into the Sacramento Valley (Cook 1955). It is estimated that only one-quarter to one-tenth of the native population survived.

The third event (actually a series of similar events) was the signing of treaties between the various Indian groups and the governments of the United States and Oregon. This took place at Champoeg in 1851 and again in 1854 and 1855. According to these treaties, all the Indians in the Willamette Valley were to be placed on reservations. Although there was a considerable lapse of time between the signing of the treaties and the actual movement of the last group of Indians onto reserve land, it is very likely that by the middle or late 1800's the culture of the Kalapuya had undergone drastic changes, and the aboriginal form of social organization had become a thing of the past. It is reasonable to assume, therefore, that the journals of the explorers, traders, and missionaries who came to the valley before the 1830's, as well as the descriptions from Indian informants who were living in the early 1800's, present a more accurate picture of aboriginal life than later accounts.

There is some ambiguity surrounding the term "Kalapuya." Anthropologists and early explorers have used the term to refer to all the Indians in the Willamette Valley who spoke the Kalapuya language and also to refer specifically to a group of the Kalapuya who lived in the upper Willamette Valley. In a few instances this may have resulted
in genuine misunderstandings. Nonetheless, these two usages are now so well established that any attempted change would probably only add to the confusion. Herein, the term "Kalapuya" will be used to refer to all the people who spoke the Kalapuya language, and the phrase "Kalapuya tribe" will be used to refer to those people who lived on the east side of the upper valley south of the Santiam tribe.

Berreman (1937) listed nine, and possibly ten, tribes for the Willamette Valley at the time of European contact. This use of the word "tribe" is not intended to imply that these people had what Service (1962) would designate as a tribal level of sociocultural integration. Rather, it is simply used to refer to a group of people who, in the opinion of linguists, spoke the same dialect of the Kalapuya language. According to Jacobs--

...Kalapuya was spoken in three mutually unintelligible groups: one, the Tualatin-Yamhill dialects to the north; two, a larger group of dialects...all south of Tualatin-Yamhill; and three, Yonkalla, spoken in a few villages from just south of Eugene to Yonkalla (Jacobs 1945:7).

The problem of the number and boundaries of the various linguistic groups is still unsettled, but most of the data in this paper pertain to three groups, the Tualatin, Mary's River, and Santiam tribes, whose general locations are known, and none of the conclusions depend on a more precise delineation of their boundaries. Jacob's (1945) description of the tribal distributions will suffice for present purposes (see map).

SUBSISTENCE

The staple food of the Kalapuya appears to have been the roots and bulbs of numerous plants (Henry 1897:814, 817). These plants included wild carrots, wappato or wild potatoes, wild onions, and camas. The camas bulbs were baked in an earth oven dug in the ground and lined with rocks. No precise description of Kalapuya camas ovens has been found, but the reader is referred to Downing and Furniss (1968), who give a detailed account of the camas-baking procedure followed by contemporary Nez Perce Indians. Jacobs' (1945: 18-19) general descriptions of Kalapuya camas ovens indicate that the two people's methods were probably quite similar.

After baking, the bulbs were either eaten immediately or dried, ground into meal, and made into camas cakes to be eaten during the winter.
Tribal Distributions in the Willamette Valley (from Jacobs 1945. Map reproduced by permission of University of Washington Press).
...roots of various kinds which abound, constitute their principal food. These people preserve their comass (sic) much better than any others; they make it up in cakes of about 10 pounds weight, three inches thick, in which state it keeps fresh and moist (Henry 1897:814). (Kalapuya tribe)

It is ordinarily assumed that camas was gathered only in the spring (White 1974: 63), but there is ethnographic evidence which indicates that it was also harvested in late summer or early fall.

I myself know that in autumn the camas were gathered. ...They got them at the lake...(Jacobs 1945:190). (Tualatin)

Furthermore, Hartless (1923:40), an old Mary's River Indian, interpreted the native word for August to mean "camass time." This seems strange in view of the fact that in the Willamette Valley there occurs the poisonous "death camas", which looks just like the edible camas except for the flowers which are only present in the spring. But it is possible that the natives noted the location of edible camas fields in the spring and then returned later to dig the bulbs. Even more likely, they may have gathered these ubiquitous bulbs from known "safe" locations throughout the summer and into the fall.

Like many other hunters and gatherers, the Kalapuya knew how to leach acorns. These, too, were pulverized and stored for the winter.

Now then they would roast them in hot (coals in the) ground (till they cracked)...They dried the acorns' flesh...Now when they wished to eat (some) they had a small soft-long-basket, and they put some of the acorns into it. Then they placed it...in water (to soak) maybe one day and one night...(Jacobs 1945: 20). (Santiam)

In the opinion of Douglas (1905: 59), an English botanist, their understanding of plants was relatively sophisticated. He attributes the unusually large size of the wild tobacco leaves they possessed to the fact that wood ashes were used to fertilize the plants. Douglas also mentions the fact that throughout the valley the Indians burned the brush in the fall. Their reasons for this practice seem to vary.

...the natives vary in their accounts of the reason for which it is done, some saying that it is in order to compel the deer to feed in the unburnt spots, where they are easily detected and killed; others, that the object is, to enable them to find wild honey and grasshoppers, both of which serve for winter food (Douglas 1905: 78-79).
The essentially vegetarian diet was supplemented with crayfish, fish and meat. Salmon, trout, and eel were preserved for winter by drying (Jacobs 1945:188-189). Townsend (1839:182) describes a special ritual in relation to the eating of salmon. The heart was roasted and eaten first with great solemnity in order to appease the salmon spirit. Special treatment of salmon and special regard for the salmon spirit were also widespread on the Northwest Coast.

There is some disagreement over whether the numerous deer in the valley were hunted. Upon careful inspection of the sources and the dates of various statements it becomes apparent that it was only the later explorers, those who came after the 1850's, who said that the Indians did not hunt deer. The earlier explorers and the older native informants not only insisted that deer were hunted but also described the hunting techniques.

Their method of hunting deer is to wear a deer's head with horns complete, which they occasionally rub with a stick they carry. In imitation of the animal's motions, while they keep their bodies concealed (sic) ...(Henry 1897:817). [Henry visited the Willamette Valley in 1814].

Trap consisted of rope placed where deer would jump over log or hill. One end of rope tied to a bent pole which was left bent by means of another rope. As soon as deer was caught, the rope holding the pole broke, the tree shot up and tied the deer's neck fast (Hartless 1923:14-15). (Mary's River)

Perhaps the fears expressed by the Indians at the time of early contact were realized and the noise of the Europeans' guns either drove the deer away or made them more wary. If this were the case, then deer hunting may have been abandoned by the 1850's.

SETTLEMENT PATTERN

It is difficult to determine whether the Kalapuya were nomadic, seminomadic, or sedentary. That is, did individual small groups move from place to place throughout the year, did they wander part of the year and spend the remainder of the time in permanent settlements, or did they live the entire year in relatively permanent villages? The pertinent information leads to conflicting answers.

In a letter to the President of the United States, Governor John P. Gaines (1850:88) refers to "the natural tractability of the tribes" and "their habits of fixed residence." Further evidence of a relatively restricted locus of residence can be found in Hartless'
(1923: 35) description of the boundaries and bands of the various tribes. He states that the "Lakmayut" (i.e., Lakmute), "Ahantsayuk" (probably Pudding River), "Mary's ville" (i.e., Mary's River), and possibly the Yamhill were each comprised of three bands designated as "River Side, Middle, and Mountain Side." From this information it would be reasonable to infer that each local band limited its hunting and gathering activities to a relatively homogeneous and restricted area. If this were the case, then the Mountain Side band may have gotten camas and other plants that grow in marshy areas by trading either with the Middle or River Side band. Since it would not have been necessary to travel far to get food, they could have lived in fixed villages.

On the other hand, Henry (1897:814) describes the "Calipuyowes" as a "wandering race."

They are a wandering race, who have neither horses, tents, nor homes, but live in the open air in fine weather, and under the shelter of large spreading pines and cedars during foul weather. Their country is well adapted to such a roving life as they lead...(Henry 1897:814).

From this, it would appear that the Kalapuya were nomadic. In 1840, when Reverend Hines (1851:100) was crossing the Calapooya Mountains, he encountered a band of "25 Kalapuya Indians who were in the habit of crossing the mountains to go to the coast." Possibly they went to the coast for the same reason the Mary's River people were purported to have gone there, to get "Mussels, & clams & whale" (sic) (Hartless 1923: 43).

From the statements made by Mr. Kenoyer, a Tualatin Indian, it seems that the Tualatin tribe had the type of semi-nomadic pattern Beardsley, et al. (1956) would classify as 'central based wandering.' In 1877, Mr. Kenoyer enumerated more than a dozen Tualatin bands and the names of the places where each band had its "winter houses" to which they returned every winter (Jacobs 1945:186-187). At least part of the remainder of the year was spent at a considerable distance from the winter homes.

The Tualatins hunted half way in the mountains (between) pai'fan (the Tillamook country along the coast and) the Tualatin mountains, (and) at lu ku mountain (a mountain near Sauvies Island) they used to hunt (too) (Jacobs 1945: 187-188).

In a footnote, Jacobs reiterates a comment found in Gatschet's texts.

Dr. Gatschet remarks that the Tualatins sometimes caught seals in the Columbia River. Tualatins went to the oceanside, to the Tillamook speaking country, largely for the purposes of trade and intermarriage (Jacobs 1945:189 fn. 63).
To summarize, from Governor Gaines' statement it appears that the Kalapuya Indians were sedentary, whereas Henry describes them as "wandering" and "roving," and according to Kenoyer's account the Tualatin tribe at least was clearly seminomadic. The people referred to by Hines, and the Mary's River people, could have been either semi-nomadic or nomadic. Perhaps each of the tribes had a different settlement pattern, but this is not very plausible. A semi-nomadic way of life seems most likely, but more information is needed before this issue can be settled.

**RITES OF PASSAGE**

According to Collins (1941: 24), among the Tualatin, all male children were named after their father. But this conflicts with comments made by Hartless on the Mary's River people.

When first child born a feast was given. Presents given to those present. When other children came, presents were given only to family-in-law. Name bestowed during that evening by grand parents or closest relative on woman's side. Names taken from those who had died long ago (sic) (Hartless 1923: 37).

The custom described by Hartless was certainly not introduced by Europeans.

There are several possible explanations. Hartless may have been talking only about female infants, but it is unlikely he would not have mentioned this. It is also possible, but again unlikely, that in respect to the inheritance of names the Tualatin tribe was patrilineal and the Mary's River tribe matrilineal. This is especially improbable in light of the evidence which suggests that tribal exogamy was fairly common (Jacobs 1945:160 fn. 10, 189 fn. 63; Hartless 1923: 36-37). If one spouse were from a patrilineal group and the other spouse were from a matrilineal group, conflict could be expected between the wife and husband as well as between the relatives of the wife and the husband when it came time to name the baby. None of the reports mentions any such problems. On the contrary, the naming ceremony appears to have been a happy occasion accompanied by feasting and gift-giving.

A more plausible explanation may be found by reference to the original source of Collins' information.

...and (when) he died, then maybe his son become (headman) just like his father. He was a big (a wealthy and highly respected) headman. When Dsaqi lxida died, his son will become like that, his name will be like his father (Jacobs 1945:187).
Clearly, the above quotation does not say that all boys were named after their father. It may have been the case that when a headman died, one of his sons was likely to succeed him in office and inherit his name, but from this it does not follow that all the male children were named after their father.

The ethnographical accounts contain several descriptions of marriage ceremonies. Since they are essentially similar, only one will be repeated.

...they would all assemble (the relatives of both families), at the place where they were going to (ceremonially) buy the girl. Then they would take the girl, they would paint her (face), they would fix up the girl. Now one person would pack (carry on his back) the girl, and he would carry her to where the (pile of) money (and other valuables, all of which constituted the proffered marriage purchase price) lay...Then he would put down the girl (indicating acceptance of the bride price offered). Now then the people (the family) who had purchased the girl, they would take the girl. And the people who were the relatives of the girl, they would take the money (Jacobs 1945: 46). (Santiam)

According to Gatschet (1899:214), the woman's relatives also gave presents to the man's relatives, but these were only about one-fourth to one-third of the value of those received. Apparently, this exchange of gifts between affines continued long after the marriage ceremony. In a footnote Jacobs quotes Frachtenberg:

The Atfalati [i.e., the Tualatin], like the other tribes of this region, were in the habit of making additional presents, each year, to the family of their wives (Jacobs 1945:164 fn. 22).

It is also clear that the recipients of these gifts included not only the mother and father of the spouse, but other close relatives as well. Furthermore, the relatives of the wife, as well as those of the husband, continued the gift giving (Jacobs 1945:164-165).

Gatschet attempts to explain the gifts received by the woman's relatives as--

an indemnity given by the bridegroom to her relations for the daily work or other services which the bride will henceforth no longer render to her family (Gatschet 1899:214).

This may be part of the explanation, but it does not seem to explain the gifts received by the husband's relatives or the continued exchange of gifts between affines. Even if the husband died, the woman did not necessarily return to her parent's group. She might marry one of her
deceased husband's relatives (Jacobs 1945: 44-46). Thus, the gift exchange could still continue.

From the available evidence, it may be tentatively inferred that there was group exogamy and viriloclal residence (Jacobs 1945:160, 189 fn. 63; Hartless 1923:6). In any case, it appears that marriage between relatives was frowned upon.

"When you desire a woman you must purchase your wife from different (unrelated) people. You must never make your own relative your wife. To do a thing like that is very bad" (Jacobs 1945: 43).

Therefore, this gift exchange may have helped to insure a friendly and long lasting relationship with people in other areas.

**SOCIOCULTURAL INTEGRATION**

It is ordinarily assumed that there were either three or four social levels among the Kalapuya. These were slaves, commoners, shamans, and possibly headpeople--either a woman or a man could be the leader of a group. Individuals were ranked in relation to each other, but whether there were any actual social classes other than those of slave and non-slave is not clear. Slaves could be obtained by trade from "tribes north of Puget Sound, or from the Rogue River, Klamath and other southern coast tribes" (Rees 1880: 24), by "capture through war" (Gatschet 1899:214), by purchase, or as a gift. They were regarded as a form of wealth to be disposed of as the owner saw fit, e.g., to pay a gambling debt or to be given in exchange for a husband or a wife.

Except for slaves, a certain amount of social mobility was possible and rank could be changed by acquiring more wealth, or, at least in the case of a man, by marrying a woman of higher rank.

He [viz., the groom's father] paid for her [viz., the bride] with twenty slaves and ten rifles. Then and there he made his (son's) name good (even higher in class level, through that excellent marriage), his [viz., the son's]...name became that of a headman's. ...The (Chinook) salmon were piled high (to give to the Clackamas guests)...(Jacobs 1945:160).

Both women and men could attempt to raise their status by going on a quest for a spirit power. Most were eventually successful, but only those who acquired exceptionally strong powers became shamans. The others remained "mere common people" (Jacobs 1945: 61). A person with a strong power might give a party to announce that he was now qualified to begin doctoring. These parties lasted five days, and the
person who gave the party was expected to feed the guests and to give
them presents.

During ceremony of proclaiming oneself a doctor the
candidate distributed presents among the people (sic)
(Hartless 1923: 5). (Mary's River)

The function of these events is reminiscent of the function of potlatches
on the Northwest Coast, which were held to announce events of social
significance (Drucker 1965: 55).

In the Willamette Valley, as on the Northwest Coast and the
Plateau, there were winter dances at which the shamans gave gifts
to the guests.

Long ago the shamans fixed up their (own) dream-powers
during the winter-time. When some one shaman wanted to fix
up his spirit-power, he got together a lot of people,
and he (and they) stood at his dance (he danced), he
stood at his dance for five nights... Then those people
would skin it [viz., an ox]. . . they would (thus) pay them
for (assisting by) standing at their dancing. To some of
the men and women they would give out clothes, with this
they paid them for standing at their dancing (Jacobs
1945: 61-62). (Santiam)

According to Suttles (1968: 64), "From the Chinook northward there
was... the cultural definition of winter as a ceremonial season..."
Apparently, this cultural trait also extended south of the Chinook
into the Willamette Valley.

By giving a winter dance, people with an ample amount of
wealth could, in effect, exchange this wealth for status. One means
of acquiring wealth was by marrying a daughter into a wealthy family.

Long ago the people used to say that whoever had
many female children, when they became big, that
man (their father) would become a wealthy man
(Jacobs 1945: 45). (Santiam)

If the gift exchange between affines included food and if the affines
occupied areas with different subsistence resources, then among the
Kalapuya as among the Coast Salish there may have been an adaptive
relationship between "Affinal ties, subsistence, and prestige..."
(Suttles 1960). This interpretation may also help to explain the
giving of gifts to the groom's relatives and the continued exchange
of gifts between affines.

The journals of people who came to the valley after about 1855,
as well as the later ethnographic accounts, mention chiefs for each
of the tribes.
Each tribe three chiefs (sic). Two were nothing but go betweens while third stayed in village...Chiefs elected by people on strength of his honesty and acquaintance (sic) (Hartless 1923: 36). (Mary's River)

If the Kalapuya had true chiefs, then from an evolutionary point of view they would have been at the chiefdom level of sociocultural integration (Service 1962) at the time of European contact; but the accounts written before 1850 only mention headpeople for each village. There is no mention of a chief over all the villages in a tribe. In a footnote, Jacobs (1945:187 fn. 60) states that "Dr. Frachtenberg points out that before 1855 the Tualatins had no real head chief. There were only headmen within each autonomous village." A clue to the resolution of this apparent discrepancy may be found in the fact that at the signing of the Champoeg treaties in 1851, Governor Gaines instructed each tribe to select three chiefs to represent them in the negotiations and to sign the treaty. There were to be one main chief and two subordinates. Clearly, they were merely titular chiefs since they were unable to make any decisions or statements without the approval of the entire group. This may be an example of a directed social change that was adopted quite readily by the native population.

If the above interpretation is correct and if these hunters and gatherers did, in fact, live in autonomous groups, then they may have been at the band level of sociocultural integration. On the other hand, it is also possible that the Kalapuya were organized into tribes. The winter dances may have involved secret societies or sodalities whose function it was to conduct certain ceremonies. This would not be unusual since the winter dances on the Northwest Coast were associated with both these functions. If either or both of these integrating mechanisms were present, then Service's (1962:113) criterion for classification as a tribe, the presence of pan-tribal sodalities, would be satisfied.

CONCLUSION

Apparently, there is more ethnographic information on the Kalapuya than previously suspected. In addition to the more familiar journals and Jacob's well-known Kalapuya Texts, there are records kept by missionaries, documents kept by government officials, and field notes taken by early anthropologists. By a careful analysis of the original data it may be possible to arrive at a relatively comprehensive and coherent picture of Kalapuya culture at the time of European contact. This paper has only sampled some of these resources.
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A PROPOSED TYPOLOGY OF WILLAMETTE VALLEY SITES

BY

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INTRODUCTION

Willamette Valley prehistory is at present unsystematized. Before long-term progress can be made toward the reconstruction of cultural-historical-ecological relationships, the presently available data must be consolidated into a suitable framework. This paper attempts to provide such a framework for the Upper Willamette Valley by establishing a chronological outline, and a site typology based on environmental and artifactual variables.

In all, a total of 113 Upper Willamette Valley sites are considered in the present study. Ninety-six of these sites were found and surface collected by survey teams of the 1970 Willamette Valley Prehistory Project; of this number ten were tested, and one, the Hurd Site (35 La 44), near the town of Coburg, extensively excavated. In addition to this newly gathered information, data from 17 sites previously excavated to varying degrees are used. Often poorly controlled and incompletely reported, much of this latter material exists only as field notes and artifacts in museum collections. In addition to these 113 sites, three isolated finds contribute information relevant to early valley habitation.

One of the earliest professional reports dealing with Willamette Valley archaeology noted a possible association between extinct mammoth and human tools near Lebanon in the central valley (Cressman and Laughlin 1941). In the same year, Laughlin (1941) reported visits to numerous mounds in the central valley and excavated the Spurland, Miller, and Halsey Mounds. Laughlin (1943) later excavated and reported briefly on two of the most productive Valley sites, the Fuller and Fanning Mounds near McMinnville. In 1947, Cressman reported a possible association of extinct mammoth with Yuma and Sandia points at a locality approximately 15 miles from the Lebanon site described earlier by he and Laughlin.

The first attempt at synthesis was undertaken in a Master's thesis by Collins (1951), which attempted to place the Kalapuya in their proper cultural position in the Pacific Northwest. Collins re-examined and summarized the archaeological evidence then known in the valley.

After Collins' work came a 16-year hiatus in archaeological activity, which ended with a report by Cordell (1967) describing the excavations at the Lingo Site, near Junction City. A year later, Cole (1968) reported on the results of archaeological salvage work in the Fall Creek Dam area on the western flanks of the Cascades north of Lowell. He attempted to establish a relationship between artifacts recovered from one extensively excavated Fall Creek site (35 LA 33), artifacts from Cascadia Cave in the western cascades east of Sweet Home (Newman 1966), and artifacts from the Upper Umpqua River area (Marchiando 1965).

In 1970 Miller reported a comparison of the artifacts (primarily projectile points) from three sites on the Long Tom River west of Eugene.
Figure 1. The Willamette Valley
Two of these sites, Benjamin 1 and 2, were excavated by Miller and the third, the Lingo Site, had been earlier reported on by Cordell. This work includes Miller's conclusions on the general nature of Willamette Valley sites. In the same year appeared two site reports dealing with the archaeology of Little Muddy Creek north of Harrisburg (Davis 1970a), and Scoggins Creek, some distance north of McMinnville (Davis 1970b). Oman and Reagan (1971) added further information on the Little Muddy Creek area. The most recent work is a description and comparison of two of the more extensively excavated Little Muddy Creek localities, the Davidson Site and the Lynch Site (Davis, Aikens, and Henrickson 1973; Sanford, this volume).

The Willamette Valley is found within the culture area termed by Wissler (1914) the North Pacific Area by Kroeber (1963:28) the Northwest Coast, Willamette Valley Subarea. Kroeber's lack of confidence in this assignment is evidenced, however, by the stance taken later in his treatise, where he hedges on his earlier identification, suggesting that the Willamette Valley might be as well reckoned as part of the Basin-Plateau culture area (Kroeber 1963:155). This ambivalence is understandable when one considers that the Willamette Valley is environmentally unique in being not only the lone interior province of the Pacific Northwest, but also the only one lacking in continuous forestation (Habeck 1971:73-75). Assessment of the cultural position of the Willamette Valley is one of the objectives of the present study.

Linguistic and cultural evidence indicates that the Willamette Valley can be readily divided into two regions. The Lower Willamette Valley, lying between the Columbia River on the north and Willamette Falls, at the present town of Oregon City on the south, was inhabited by various Chinookan-speaking groups. According to ethnographic accounts (Jacobs 1945), these Chinookan-speaking groups were primarily salmon fishers who occupied large semi-permanent villages, and whose society was internally ranked. Drucker readily includes them in his discussion of Northwest coast groups (Drucker 1955:12) and discusses their traditional role as middlemen in the aboriginal trade between littoral and interior peoples. While little is known archaeologically of the Willamette Valley below the falls, somewhat more is known of adjacent Columbia River areas occupied by Chinookan groups (Cressman et al 1960; Strong, Schenck and Steward 1930).

Above the falls, in the Upper Willamette Valley, the inhabitants were Kalapuyan-speakers whose subsistence leaned more to hunting and gathering than to fishing. In the absence of major "harvests" of anadromous fish, villages and settlements were of a less permanent nature. Kalapuyan groups were smaller, less rigorously ranked, and by necessity more mobile than the Chinookans (Jacobs 1945).

The Upper Willamette Valley region is the primary focus of the discussion to follow. A brief outline of the plan of the work will introduce the major factors to be considered.
The chapter titled "Willamette Valley Environment" provides background data on which tentative conclusions as to specific site environment, activity, and seasonality are partially based. The chapter, "Site Variables," is the core of the study. Herein are discussed the four major site variables—environment, activity, seasonality, and age—which constitute the basis for the proposed site typology and chronology. Environmental data relating to the Upper Willamette Valley are viewed from the standpoint of specific archaeological sites and assemblages. On the basis of these four variables each archaeological site is placed in one of four broad environmental categories; each is characterized in terms of a set of activities; each is assigned a position in a seasonal cycle; and each is placed in one of five chronological periods. The chapter, "Upper Willamette Valley Sites" is a succinct description of 22 sites for which sufficient data are available to permit assessment in terms of the four site variables established for analysis. The following chapter, "Internal Relationships," offers a model of settlement distribution in relation to valley environment. A succeeding chapter on "External Relationships" attempts to determine, to the extent possible, what relationships and points of articulation existed between the Willamette Valley and adjacent regions. The final chapter is a summary of findings and inferences. Appendix I contains basic data on sites recorded by archeological survey in 1970, and Appendix II describes in detail the projectile point types referred to throughout the paper.
WILLAMETTE VALLEY ENVIRONMENT

PHYSIOGRAPHY

The Willamette Valley is in northwestern Oregon, roughly between latitude 43° 30' and 46° North, and longitude 122° 30' and 123° 30' West. This physiographic province is bounded on the north by the Columbia River, on the south by the Calapooya Mountains, on the east by the Cascades, and on the west by the Coast Range. The Coast Range separates the valley from the Pacific Ocean some 30-60 miles distant. The valley is approximately 130 miles long and 30-35 miles wide at the extreme. At the 600 foot contour there is a shift from the low relief topography of the valley floor to the steep high-relief topography of the enclosing foothills.

The valley is subdivided naturally into two smaller topographic regions by the Salem Hills - Eola Hills landforms (Balster and Parsons 1968:3). South of this divide the valley is marked by very low relief and minimally to slightly incised stream valleys. The northern valley floor, while of relatively low relief, is more dissected and deeply incised. The valley becomes gradually narrower toward the south; in the Eugene-Springfield area, the foothills of the Cascades and Coast Range pinch abruptly to within six miles of each other. South of Eugene the valley begins a steady climb, finally reaching its head approximately two miles north of the mountain gate city of Cottage Grove.

The otherwise flat valley floor is occasionally disrupted by the presence, especially along its margins, of conical hills or "buttes." These prominences are composed of columnar basalt which has been eroded into the domelike morphology now observable (Smith 1940:36).

The principal hydrographic feature of the valley is the Willamette River, which flows generally northward from its source to the vicinity of Newberg, Oregon where it turns abruptly eastward; at Canby it returns to a northward course, finally emptying into the Columbia River at Portland. It travels more than 187 miles to cover a distance of some 113 air miles, and descends from an elevation of 440 feet at the juncture of the Coast and Middle Forks south of Springfield to 20 feet at its confluence with the Columbia. The gradient ranges between a maximum of 12 feet per mile and a minimum of about .2 feet per mile, the average being 2.3 feet per mile (Balster and Parsons 1968:3). The level valley floor is due in considerable part to the inability of the river to lower its grade at Oregon City, a point some 26 miles from its mouth, where Pleistocene lava formations offer little opportunity for downcutting (Smith 1925:156).

The sill at Oregon City has caused the Upper Willamette to meander and form numerous oxbow lakes. That the river has shifted its position laterally over considerable distances in relatively recent times is
obvious. When Oregon county lines were established in the mid-1800's, the river was in many cases used as a natural boundary. A glance at any recent large-scale map will show that the lateral displacement between county line and present river course is often more than a mile. A meander scar on the eastern base of Kelley Butte in Springfield attests to the possibility that the Willamette River once flowed to the northeast of this butte rather than to the south as is now the case (Smith 1925:144).

An important aspect of Willamette Valley topography affecting the drainage pattern is the natural levee of the main river. This slight rise toward the river taken in conjunction with the general slope of the valley floor, which is not toward the river but parallel to it in a northerly direction, accounts for the inability of smaller streams to effect normal junctures with the main stream. Unlike the larger McKenzie, Santiam, or Calapooya Rivers which join at normal angles, the smaller feeder streams meander in a sub-parallel course alongside, unable to break through the natural levees of the Willamette River. The Long Tom River and Muddy Creek represent the finest examples of this meandering, Yazoo-type stream (Smith 1925:126).

The Willamette River, because of its low gradient, is relatively sluggish. During the winter and spring, when precipitation is heavy and melting snow from the surrounding mountains swells the river, it becomes overloaded. Prior to the establishment of flood control dams, great tracts of land were periodically flooded. Prevailing edaphic conditions, e.g., clayey nonporous subsoil, historically led to the creation of marshes and ponds. Smith (1925:144) reports that in the spring of 1861, the upper valley from the Coburg Hills to the Coast Range was so covered with ponded run-off that one could canoe across the valley.

A system of geomorphic surfaces described by Balster and Parsons (1968) represent various stages in landscape development. Nine major geomorphic surfaces and four minor ones were delineated; five of these surfaces are of importance in this study because it is on them that the majority of Upper Willamette Valley sites are located. The Horseshoe unit occupies the present channel of the Willamette River, and is the youngest of the geomorphic surfaces; the Ingram unit is the current flood plain, immediately above the Horseshoe unit; the Winkle unit, an extensive valley surface, is an abandoned flood plain adjacent to and higher than the Ingram unit; the Calapooya unit, particularly prominent in the southern and eastern part of the valley, is a mantle of earth eroded from adjacent uplands; and the Senecal unit is a modification of the Calapooya surface by the development of organized drainage (Balster and Parsons 1968:1-9).

The largest expanses of Ingram and Winkle surfaces are located in the area between Eugene and Albany forty-five miles to the north where they occur predominately west of the Willamette. The area to the east of the river has some Ingram and Winkle surfaces, especially in the area
where the McKenzie River joins the Willamette, but the Senecal and Calapooyia surfaces predominate elsewhere. The Ingram and Winkle units, representing the flood plains of aggrading streams and manifesting exceeding low relief, are the surfaces on which the most extensive ponding took place. The Senecal-Calapooyia surfaces, while also of low relief, are of appreciably higher elevation and of a slightly higher gradient with more organized drainage (Balster and Parsons 1968:6-8). This makes these surfaces less subject to extensive ponding, except in their lowest parts.

**CLIMATE**

Willamette Valley climate is generally considered to be "semi-humid marine." The average annual rainfall is between 35 and 40 inches, with most of the precipitation occurring between late fall and early spring. Late spring and summer months see very little rainfall (Bailey 1936:21). The fahrenheit temperatures range from a record winter low of -40° to a record summer high of 1020, the annual mean being slightly higher than 52°. Unfortunately, for most of man's tenure in the valley there were no meteorological reports. Records and logs can take us back as early as 1850, but in order to go back much earlier than this we must rely on palynological studies, which are few in the Willamette Valley area.

In 1941 Hansen made a pollen study of the only known sphagnnum bog in the lower Willamette Valley. A year later, he examined two profiles from lacustrine deposits at Labish Flats, four miles northeast of Salem, and a third profile from lacustrine sediments at Onion Flat, ten miles south of Portland (Hansen 1942:262). Pollen analyses on samples from the Lingo Site (Cordell 1967:13) and the Hurd Site (White, this volume), gave negative results. (The absence of pollen in the Hurd Site sample is attributed to destruction by mechanical weathering.) The statements about past climates summarized below are largely based on work by Hansen (1947) in the Willamette Valley and on coastal studies carried out by Heusser (1960).

The final retreat of continental ice took place in northwest North America between 10,000 and 14,000 years ago. Glacial ice did not actually intrude into Oregon but its melting did greatly affect Oregon physiography. An overloaded Columbia River created an enormous backup of glacial water in the Willamette Valley. This late glacial sound was as deep as 400 feet and would have covered most of the valley to a considerable depth; Eugene at the upper end of the valley is at approximately 450 foot elevation. Large erratics were ice-rafted into the Upper Willamette Valley (Allison 1935:619).

The period following the glacial retreat is variously referred to as the Anathermal (Cooper 1958:941), Early Postglacial (Heusser 1960: 183), or late Period II (Hansen 1947:113) in the Northwest. It took
place between 10,500 and 8,500 years ago. Climatically, the period marks a time of transition from cool and moist to warm and dry conditions. In the latter stages of the period, the climate was much the same as it is today (Heusser 1960:183; Hansen 1947:113).

The following climatic period, variously referred to as the Hypsithermal (Heusser 1960:184), Middle Postglacial (Hansen 1947:116), or Period III (Hansen 1947:113), occurred between approximately 8,500 and 3,500 years ago. The interval lengthens the farther south one goes, possibly terminating as late as 2,500 B.P. in northern California. A terminal date for the Hypsithermal in the Willamette Valley between 3,000 and 2,500 B.P. seems a reasonable estimate (Heusser 1960:184). Pollen samples indicate that during this period the climate was warm and dry. Such conditions would presumably affect the Willamette Valley by reducing the volume of lakes and rivers, and perhaps seasonally drying up smaller streams.

The final period, which marks a return to cooler and moister conditions, is referred to as the Hypothermal (Cooper 1958:943), Late Postglacial (Heusser 1960:186), or Period IV (Hansen 1947:113). It began in some parts of the northwest as early as 4,000 B.P., but in the Willamette Valley is estimated to have begun between 3,000 and 2,500 B.P. A climatic regime similar to that of the present was established at this time.

**FLORA**

The native vegetation of the Willamette Valley has been altered more extensively through human agency than that of any other province in Oregon. From 1850 on, white settlers directly or indirectly caused the destruction of most of the original forests and the replacement of native flora by alien species (Peck 1961:12).

Two principal sources exist which provide insight into pre-1850 plant communities. Hansen (1947) examines palynologically the postglacial forest succession in the Willamette Valley, and Habeck (1961) attempts to determine the original vegetation (actually vegetation at time of white contact) through a careful use of land survey records. The two studies are complementary; Hansen's contribution is of a diachronic nature, based as it is on pollen samples from sedimentary columns, while Habeck's is synchronic and describes a transect, covering 252 square miles, of the mid-Willamette Valley.

Hansen's pollen study indicates that cedar (Libocedrus) and Hemlock (Tsuga) were never abundant in the Willamette Valley; this is thought to reflect the dry summers characteristic of the post-glacial period. Lodgepole pine (Pinus contorta) was the earliest species to follow subsidence of the glacial floodwaters. It remained predominant
during early postglacial times and was eventually replaced by Douglas fir (*Pseudotsuga menziesii*). Lodgepole pine hasn't existed in the Willamette Valley since the advent of the white settler. White oak or Garry oak (*Quercus garryana*), absent in the early postglacial period, is a xerophytic species which, as the climate got warmer, expanded at the expense of the Douglas fir (Hansen 1947:84-86).

Land survey records examined by Habeck clearly indicate that at the time of the white settlement, Douglas fir forests were confined to the extreme eastern and western sides of the valley, and he suggests they more properly belong to the mountain ranges bordering the valley. In addition to the Douglas fir forests bordering the valley the survey records indicated four major types of plant communities within the valley proper: oak opening, oak forest, bottomland forest, and prairie grassland (Habeck 1971:69-74).

Oak openings are defined as grassland tracts interspersed with open-grown or thinly scattered trees. They are "oak openings" because it is this species which predominates. Occasionally Douglas fir was also found in association with these openings. The understory vegetation was apparently a mixture of grasses and shrubs identical to the main cover of the prairie type community on which they often border. Oak openings were widely distributed across the valley floor with borders most often touching on bottomlands and prairie.

Bottomland plant communities consist of those plants which occupy the major part of the Willamette River flood plain. Major tributaries such as Kalapuya Creek and the McKenzie River also possessed this type of floristic cover. According to Peck (1961:13) the larger species distributed in heavy stands along the major streams of the flood plain were extraneous deciduous species such as black cottonwood (*Populus trichocarpa*), red willow (*Salix lasiandra*), Oregon maple (*Acer macrophyllum*), and Oregon ash (*Fraxinus oregana*). Habeck's sources add cherry (*Prunus emarginata*), laurel (*Unellulária californica*), alder (*Alnus rubra*), and the ubiquitous Douglas fir. Understory vegetation includes woody shrubs known to have been of importance to the aboriginal inhabitants: Oregon grape (*Berberis aquiforium*), salmon berry (*Rubus spectabilis*), elderberry (*Sambucus glauca*), hardhack (*Spieaea douglasii*), and ninebark (*Physocarpus capitatus*) (Habeck 1961:75).

Prairie grasslands apparently covered vast areas of the Willamette Valley. The early surveyors did not distinguish between various prairie grasses beyond noting that there were two distinct habitats—one low, poorly-drained, and wet, the other upland and well-drained—and that each had its associated grasses. Camas (*Camassia quamash*) and cat-tails (*Typha latifolia*) are two important marsh resources. Shrubs mentioned for this zone are Oregon grape, ninebark, rose (*Rosa sp.*), and hazel (*Corylus californica*).

Oak forest occupies the smallest area of the valley. Garry oak prevailed in these communities, but occasional groves of red alder,
laurel, and Douglas fir were sometimes present (Habeck 1961: 73-75).

Growth ring studies on tree stumps reveal that the country was frequently burned throughout a period of 296 years, between 1647 and 1943. The same studies disclosed a steep drop in frequency of burning after 1848 (Sprague and Hansen 1946:89). This falling-off coincides with the entrance of large numbers of white settlers into the valley and the subjugation of the native population, and may serve as evidence that the earlier fires were of cultural origin, that is, were set by the aboriginal inhabitants, rather than being naturally caused. One would not expect such a dramatic dropoff if the fires were independent of human agency. Douglas related in 1826 that wide expanses of burned grass were very much in evidence (Morris 1934:316). Such firing practices may have caused forestal retrogression, or the return to a less complex plant community, and may be in part responsible for the maintenance of grasslands in the Willamette Valley.

In summary, vegetational transects of the mid-Willamette Valley constructed from surveyor's logs of the 1850's show the area to have been made up of at least five distinct types of plant communities. It is apparent that Douglas fir, although frequently occurring in isolated stands on the valley floor and in forests on the valley perimeters, did not cover the entire valley, contrary to a general belief fostered by Weaver and Clements (1938) and Barnes (1948).

FAUNA

Willamette Valley soil and limnological conditions exerted considerable influence on the distribution of animal species. The well aerated river loams and non-adhesive sandy silts of the valley invariably support sizable population of burrowers; by the same token, the freshwater marshes and ponds of the valley attract numerous mammals and various grallatorial and aquatic birds.

The soil also has an indirect affect on animal distribution. Soil fertility combines with climate and physiography to determine the character of the various plant communities. Different plant communities or associations offer haven and food resources to different animals; the huge Roosevelt elk, for example, preferred the open valley grasslands, the shyer black-tailed deer favored the dense forests and impassable thickets, and the silver gray squirrel was most at home in stands of pine or oak.

Vernon Bailey, in his classic discussion of Oregon mammals and life zones, characterizes the Willamette Valley as being within the Humid Division of the Transition Zone (Bailey 1936:20). The lists of native mammals and birds presented below are from his zoological survey, unless otherwise noted.
Mammals

The following discussion of Willamette Valley species is not intended to be exhaustive; rather the purpose is to describe species which were probably of economic importance to aboriginal valley inhabitants. The data on habitat preference will indicate what resources were available for exploitation at the various archaeological site locations to be discussed subsequently.

The largest artiodactyl of the Willamette Valley was the Roosevelt elk (Cervus canadensis roosevelti). This large herbivore originally inhabited the open country as well as the forest. The explorer Franchere, passing through the lower Willamette Valley in 1811-14, reported seeing them in great numbers, often as sizable bands, grazing on the grasses and herbaceous plants of the open valley (Franchere 1904:323). More recent accounts indicate that settlement of the valley in the late 1800's served to drive these animals into the denser timber of the low bordering slopes. The Roosevelt elk often weighs as much as 1,500 pounds.

Another large mammal (200-225 pounds), undoubtedly of economic importance to the aboriginal inhabitants, was the blacktailed deer (Odocoileus columbianus columbianus). This species, unlike the Roosevelt elk, shuns both band behavior and open country in favor of the protection of dense forests and almost impenetrable thickets. The blacktails' tendency has been to winter on the lower valley slopes below the heavy snow line and to forage its way back to the higher slopes during early summer when insect pests are at their maximum in the valley.

Somewhat smaller than the blacktail, the white-tailed deer (Odocoileus Virginianus leucurus) was formerly a very common valley species. Like the blacktail, this animal is non-gregarious and secretive. Reports going back to the 1840's indicate that white-tailed deer prefer the coppices or thickets of the narrow valleys. They on occasion leave the dense thickets of the valley for the undulating hills of the valley edge, but never range above this altitude.

The Washington snowshoe hare (Lepus americanus washingtonii) is a small, dark-colored lagomorph of the low country between the Cascade foothills and the Coast range. The usual habitat of this creature is forest or chaparral but they are known to also occupy areas of extensive dense shrubbery.

The Oregon brush rabbit (Sylvilagus bachmani ubericolor) is a small dark-colored rabbit which inhabits the brushy slopes of small tributary valleys of the main Willamette Valley. They prefer the lower levels and do not even occupy the higher altitudes of the relatively low Coast Range; they rarely enter dense timber or venture into the open valley (Dice 1926:109).
The silver gray squirrel (Sciurus griseus griseus) is at once the shyest and most numerous of the Willamette Valley squirrels. This species is commonly found in the valley where it favors stands of oak or pine.

Douglas's squirrel (Sciurus douglasii douglasii) has a more westerly range than does the silver gray, being particularly common on the heavily forested western side of the Willamette Valley, where it favors the lower edges of the Coast Range. These squirrels are normally not found in the open valley.

Townsend's chipmunk (Eutamias townsendii townsendii) is a large rodent which inhabits the forests and dense thickets of the Coast Range and Willamette Valley. Hibernation is irregular due to the mild local winters and apparently differs from place to place.

Douglas's ground squirrel (Citellus douglasii) is a large burrower found throughout the Willamette Valley area. It prefers the semi-open country of the valley and avoids heavily timbered areas and high altitudes. These animals hibernate for 4-5 months between November and February.

The Oregon Coast muskrat (Ondatra zibethicus occipitalis) is a species peculiar to the Willamette Valley and sections of the coast. It occupies the streams and marshes of the open valley and avoids streams in mountain or forest.

The Pacific Coast beaver (Castor canadensis pacificus) is the largest (48-50 pounds) rodent in the Willamette region. This creature was at home in the streams, rivers and ponds of the valley. An early journalist reported them as being in abundance along the Willamette River in 1811-17 (Cox 1832:101). The beaver was undoubtedly of prime economic value to the aboriginal valley Indians because of its flesh and fur. American fur trading led to a rapid decrease in the population.

The Pacific mountain beaver (Apolodontia rufa pacifica) is a rodent about the size of a house cat which ranged throughout the densely brush-covered slopes surrounding the Willamette Valley. The broad slopes of the foothills offered these burrowing creatures their favorite foods, salmonberry, thimbleberry, and huckleberry bushes.

The camas pocket gopher (Thomomys bulbivorous) is a burrower commonly occupying the more open parts of the valley away from the coniferous forests. Its popular name gives ample clue to its habitation area, as this animal is especially fond of the tender camas bulbs which grow in profusion in the valley flood plains.

The Oregon cougar or mountain lion (Felis concolor oregonensis) is the largest of Oregon cats. While its ultimate limits are not known, it is known to prefer the heavily forested areas of the valley edge especially in areas where deer abound.
The Oregon bobcat (Lynx rufus fasciatus) is a forest dweller that prefers dense underbrush. It prefers slope to flat country, but its particular environment is often dictated by the absence or presence of small game.

The Northwestern timber wolf (Canis lycoan gigas) is a large gray wolf historically found from the western slope of the Cascades well down into the Willamette Valley. This carnivore preferred the forests and heavily timbered areas of the valley edge and seldom ventured into open country. As the valley itself became more populated these shy animals were probably pushed higher into the Cascades.

The Oregon gray fox (Urocyon cinereoargenteus townsendii) prefers rocky country or the brushy chaparral valleys that edge the flat open country.

The Pacific marten (Martes caurina caurina) and the fisher (Martes pennanti pacifica) are primarily nocturnal forest dwellers. They range throughout dense coniferous forests in search of small game.

The western otter (Lutra canadensis pacifica) occupied most of the permanent streams of the Willamette Valley. Abundant food supply and fresh water seem to be the critical items in determining the otter's habitat preference rather than climate or altitude.

The raccoon (Procyon lotor pacifica) favors areas around foothill streams. It prefers the closeness of forested areas, especially those existing in conjunction with narrow valleys.

The largest carnivore found in the Willamette Valley was the Klamath Grizzly (Ursus klawathensis). The explorer Franchere indicates that grizzlies were numerous and ferocious in the Willamette Valley (Franchere 1904:323). Prior to settlement by whites, these large omnivores probably occupied all areas of the valley; hibernation, however, generally took place on the higher mountain slopes (Wright 1909:204).

The somewhat smaller Olympic black bear (Ursus americanus altifrontalis) favored the dense forest cover and brush of the Coast Range. These bears preferred the same kinds of berries and bulbs (camas) that the valley Indians did, probably bringing bears and Indians into regular meetings.

Economically less important mammals inhabiting the Willamette Valley are the ruddy deer mouse (Peromyscus maniculatus rubidus), dusky red-backed mouse (Clethrionomys californicus obscurus), California red-backed mouse (Clethrionomys californicus californicus), red tree mouse (Phenacomys longicaudus), white-footed phenacomys (Phenacomys albipes), gray-tailed meadow mouse (Microtus caniculus), Townsend's meadow mouse (Microtus townsendii), Oregon creeping mouse (Microtus oregoni oregoni), and the Northwest jumping mouse (Zapus trinitatus trinitatus). The first five species favor the more dense forests of
the humid valley edge, especially along the Coast Range; the meadow mice and jumping mouse prefer the low wet ground of the valley floor where they make their homes amongst the marsh grass and tules. The Oregon creeping mouse is a ubiquitous form.

**Birds**

The common loon (*Gavia immer*) breeds on deep, clear lakes and small fishless ponds. Marshy oxbow lakes are particularly attractive. These birds will not be bunched and as a result very few pairs are found even on a large lake or marsh. Superior swimmers and divers, these birds are all but helpless on land (Pough 1951:3). While they prefer to winter on the coast, summers find them occupying interior lakes and marshes (Peterson 1961:3).

The pied-billed grebe (*Podilymbus podiceps*) is a shy water dwelling bird that inhabits the perimeters of slow-moving streams and reed-grown ponds and marshes. This bird winters on interior ponds and marshes (Peterson 1961:9).

The American bittern (*Botaurus lentiginosus*) while not a true swimmer like the two previously mentioned, is in every sense a marsh bird. It prefers living secretively on marshes, bogs, and wet meadows where it nests among the thick reeds or grasses (Pough 1951:49). It remains through winter in areas with mild climate (Bent 1963:82).

Wilson's snipe (*Capella gallinago*) is a ground-nesting bird that favors clump-ridden wet meadows, grassy marshes, and areas of ponding. In Oregon, this bog wader winters in the interior valleys (Pough 1951: 222).

The Virginia rail (*Rallus virginianus*) is a marsh bird whose nest is always built in or very near a fresh water marsh or pond. The rail depends almost entirely on smaller marsh creatures for food (Bent 1963: 293).

The sora (*Porzana carolina*) is fondest of the quaking marsh where it nests in a grass and reed tower directly on the water or ooze. Like other marsh birds it relies heavily on smaller marsh fauna (Bent 1963:303).

The American coot (*Fulica americana*) is the most aquatic of the family Rallidae (rails, coots, soras and gallinules). It is more correctly termed a water bird than a wading bird. It inhabits suitable ponds, marshes, and oxbow lakes of the interior valleys where it feeds mostly on underwater plants and algae (Pough 1951:206).

In addition to these briefly described species, a list of native Willamette Valley birds would also include the wood duck (*Aix sponsa*),
Cooper's hawk (Accipiter cooperii), golden eagle (Aquila chrysaetos), sooty grouse (Dendragapus obscurus), ruffed grouse (Bonasa umbellus), California quail (Lophortyx californicus), mountain quail (Oreoryx pictus), killdeer (Charadrius vociferus), spotted sandpiper (Actitis macularia), and the robin (Turdus migratorius)

The species enumerated here were undoubtedly available to the aboriginal Willamette Valley inhabitants, but it is only an assumption that this availability was actually taken advantage of. The actual bone record from excavated archaeological sites is scanty and what faunal material has been recovered has usually not undergone careful analysis. Only deer, elk, bear, beaver, meadow mouse, and various species of birds are attested archaeologically. The scanty faunal record is undoubtedly due to poor circumstances for preservation in the valley. Soil samples from the Lingo Site, for example, measured for their pH value, were found to range between a pH of 4.5 and 5.1 (pH 7 indicates neutrality, less than 7 acidity). This relatively high acidity would foster decomposition of bone. Mechanical weathering, as would occur in sites which underwent periodic flooding and saturation, would also be a factor lessening chances of bone preservation.
SITE VARIABLES

Four major site variables - environment, seasonality, activity, and age - were considered in establishing the taxonomic framework for archaeological sites of the Upper Willamette Valley. Site size was not considered as a separate variable because size data were not available in many of the site reports (especially earlier ones) on which this study was based. However, while not considered as a separate variable, site size was recognized as important and where known was considered as a factor in determining site activity and seasonality.

ENVIRONMENT

My goal in this section is the formulation (provisional, at least) of a typology of subsistence-settlement systems based on environmental considerations. A brief review of the literature is necessary to clarify certain basic terms often used (and misused) by archaeologists.

One of the fundamental assumptions in a cultural-ecological study is that man, the animal, is part of an elaborate ecosystem. According to Odum (1959:10) "any area of nature that includes living organisms and nonliving substances interacting to produce an exchange of materials between the living and nonliving parts" is an ecological system or ecosystem. The concept of ecosystem is a broad one and the unit itself may be conceived and studied in various sizes. Geertz (1963:16) distinguishes a generalized ecosystem, in which a great variety of species exists in relatively small populations, from a specialized ecosystem, in which there are relatively few species but with relatively large populations. Man simultaneously depends on, is limited by (at least in part), and alters the ecosystem of which he is a part. Culture is the adaptive system by which man articulates with his environment; and material culture, the objectification of this system, is the primary unit of archaeological study.

A further assumption is that rational man chooses his points of articulation with care and in a nonarbitrary manner. People inhabit specific locations either because of the locational choices made first by others or because of the availability of particular resources, or because of some other offered advantage. In short, man considers alternatives and part of his adaptive strategy is the selection of a favorable habitat (Gould 1965:235).

Hardesty (1972:458) points out in a recent article that anthropologists tend to use ecological terms in an inconsistent manner, thereby causing a confusion of concepts. He is particularly concerned with the misuse of the term niche, and criticizes Coe and Flannery for their equation of niche and microenvironment. Hardesty adopts Odum's definition of niche as the functional position of the organism within its
ecosystem resulting from the organism's structural adaptations, physiological responses, and specific behavior (Odum 1959:27). Coe and Flannery (1964:651) define microenvironments (and niches) as smaller subdivisions of large ecological zones, for example as the immediate surroundings of an archaeologic site, or a nearby patch of forest. Clearly they do not have a functional definition in mind, but rather they see the microenvironment (and niche) as segments of a habitat. Hardesty argues that anthropologists should follow the lead of ecologists and use microenvironment to mean a segment of a habitat and reserve niche as a functional unit (1972:460).

Since my approach is a typological one, a nonfunctional term for the environmental correlates seems appropriate. The term environmental zone will be used to designate the broad environmental areas into which, on the basis of topography and natural resources, the Upper Willamette Valley can be divided. Based on observations that separate areas in the Upper Willamette Valley differed from one another in natural resources that they offered the prehistoric inhabitants, and in the details of the economic adaptations manifested in the archaeological remains of the various groups within each region, four such environmental zones were established. Sites located within these zones were classified as valley edge sites, narrow valley plain sites, primary flood plain sites, and riparian sites. Each of these zones is fairly broad; and each consists of more than a single microenvironment. The Hurd Site, for example (White, this volume), is of the primary flood plain type, but its situation provides easy access to three contiguous microenvironments, each with a different floral and faunal signature.

The environmental zones established for this study are not intended to stand in perpetuity. This model is being used to organize the facts as they are now known and may be expected to change when newly collected data on soil types, floral and faunal distribution, etc. allow for a more fine-grained analysis and classification. It is also true, as with many typologies, that the dividing lines are not consistently clear cut.

Valley Edge Sites

Valley edge sites are those located above the 500-600 foot contour on the slopes and tops of ridges bordering the numerous tributary valleys of the Willamette River. Commonly, these sites are located adjacent to a small spring or spring-fed stream. The survey team of the 1970 Willamette Valley Prehistory Project recorded 35 sites of this type (Appendix). Valley edge sites do not appear to have been intensively occupied as there is very little midden accumulation, and the flakes and artifacts are thinly scattered over the sites. An exception to this is site 35 LA 92.
Sites of this character would likely have been associated aboriginaly with the Douglas Fir forests which, according to Haback (1961: 74), covered sizable areas of the valley slopes and ridges at the time of contact. Stands of Garry or White oak would also have occurred. Understory vegetation in this area includes salmonberry, elderberry, hardhack, and ninebark, plants probably of economic importance to the prehistoric inhabitants.

Animals available in season at valley edge sites would have included Roosevelt elk, white-tailed deer, silver gray squirrel, Townsend's chipmunk, Pacific mountain beaver, Oregon cougar, Oregon bobcat, Northwestern timber wolf, Oregon gray fox, Pacific marten, fisher, raccoon, and, depending on the climate of any given year, the Olympic black bear. In addition, several species of phenacomys and clethrionomys are year round inhabitants. The large Klamath Grizzly could be found during the late spring and early summer; and the black-tailed deer during the winter months. Avian species occupying the valley edge environment included ruffed grouse, sooty grouse, Cooper's hawk, killdeer, mountain quail, robin, eagle, and California quail.

Occupation of these sites would offer at least four primary advantages to the aboriginal inhabitants. 1) They are located near permanent fresh water, either as spring or spring fed stream. 2) They are situated on a contour which places them out of the reach of seasonal flooding. 3) Their specific location would allow for the exploitation of the plant and animal species enumerated above. 4) Their transitional situation invites easy access to resources of both valley floor and uplands.

Narrow Valley Plain Sites

Narrow valley plain sites are located on the leading edges of low terraces in the narrow flood plains bordering the high gradient tributaries to the Willamette River. Thirty-two sites of this type were recorded by the Willamette Valley Prehistory Project, principally in the area south of Eugene. Narrow valley plain sites appear to have been more intensively occupied than valley edge sites. Although no actual mounds were observed, Southard (1970:4) noted that these sites are generally marked by an appreciable buildup of midden and a relatively dense concentration of artifacts and debitage. Narrow valley plain sites also appear larger in area than valley edge sites.

Sites of this type occupied what were probably open grassland tracts spotted with open-grown and thinly scattered trees. Garry oak probably predominated. Located along the major streams were deciduous species such as black cottonwood, red willow, Oregon ash, Oregon maple, cherry, laurel, and alder. Shrubs included Oregon grape, ninebark, rose and hazel. Camas and cat-tails would have been important floristic resources in the low, wet swales which characterize this environment.
Narrow valley plain sites would have had a wide range of faunal species available for aboriginal use. The animals natural to such localities include Roosevelt elk, white-tailed deer, Oregon brush rabbit, silver gray squirrel, Townsend's chipmunk, digger squirrel, Pacific Coast beaver, camas pocket gopher, Oregon gray fox, western otter, raccoon, Washington snowshoe rabbit (in denser thickets), jumping mouse, and various *microtus*.

Although ponding did not take place as extensively in the narrow valleys as in the main Willamette Valley, it did occur, and where it did it attracted species of birds that are at home in marshy areas of the Willamette Valley. Avian species likely to have been exploited include the common loon, pied-billed grebe, American bittern, killdeer, robin, Wilson's snipe, Virginia rail, American coot, wood duck, Cooper's hawk and golden eagle.

Sites located in the narrow valley plain would seem to have at least three advantages. 1) Site location would allow for the efficient gathering of such marsh edge staples as camas. 2) Their proximity to areas of ponding would allow for the taking of marsh birds, tules, and perhaps fish. 3) The abundance of oak trees would allow for the efficient harvesting of acorns.

*Primary Flood Plain Sites*

Primary flood plain sites are those situated on the broad flat flood plain, or strath, of the Willamette River. Sites of this type are located on now abandoned flood plains of the main river and are adjacent to ephemeral streams that characteristically meander and anastomose parallel to the main channel. Primary flood plain sites are usually connected with the Winkle and Ingram geomorphic surfaces and were subject to the periodic and calamitous flooding of the main river. They generally lack distinctive mound build-up. Eleven sites of this type were recorded by the Willamette Valley Prehistory Project and eleven others have been excavated to one degree or another, giving us more information on the sites of this environmental zone than of any other.

Primary flood plain sites are located in areas that, according to Habeck (1961), were aboriginally characterized by two major plant communities: oak openings and prairie grasslands. Prairie grasslands covered vast areas of the Willamette Valley flood plain. These open grasslands were interspersed with stands of Garry oak and such understory shrubs as Oregon grape, ninebark, rose and hazel. Since it is this area of the Willamette Valley which was subject to the most frequent and widespread flooding, large tracts of ponded water existed, and in these tracts occurred various marsh grasses and the aboriginal staples camas and wappato.
Animal resources of the primary flood plain included Roosevelt elk (although this species was driven from the valley floor after European settlement began in the middle 1800's), digger squirrel, Oregon Coast muskrat, Pacific Coast beaver, camas pocket gopher, western otter, meadow mouse, and jumping mouse.

The extensive ponding which occurred in this area created an ideal habitat for various species of birds, including the common loon, pied-billed grebe, American bittern, golden eagle, Wilson's snipe, Virginia rail, robin, killdeer, American coot, sora, spotted sandpiper, and Cooper's hawk.

Several advantages were gained by siting in this area. 1) The sites were often immediately adjacent to large marshy areas and ponds supplying such resources as tule, wading birds, and fish. 2) Camas, specifically, was in abundance near all of these sites. 3) The site locations would allow for the taking of flatland species of game and floristic resources.

Riparian Sites

Riparian sites are those located adjacent to the larger perennial streams tributary to the main Willamette River. Most frequently these sites are located immediately adjacent to the watercourse, on the high side of the stream, where they would be less likely to fall victim to degradation. Others are located on natural rises or terraces a little farther from the stream. The Senecal and Calapooya geomorphic surfaces, on which most of these sites occur, are graded steeply enough that drainage is organized and serious flooding does not occur too often; certainly not in the magnitude or with the frequency that it does in other parts of the valley floor. Riparian sites tend to manifest distinctive mound build-up, perhaps because of a combination of concentrated occupation and a lack of periodic inundation. Eighteen sites were surveyed and recorded, and four of these tested by the survey team of the 1970 Willamette Valley Prehistory project. Four other riparian sites were excavated and reported on earlier by Laughlin (1941, 1943).

The plant community found in conjunction with the major streams and rivers is referred to as bottomland forest and according to Peck (1961:13) contained such deciduous species as black cottonwood, red willow, Oregon maple, and Oregon ash. Cherry, laurel, and alder are also commonly found. Shrubs known to have economic importance to the prehistoric inhabitants, including Oregon grape, salmonberry, elderberry, hardhack, and ninebark, existed in thickets along the larger watercourses.

Faunal species natural to this zone included Roosevelt elk, white-tailed deer, Oregon gray fox, Washington snowshoe rabbit, western otter, Pacific Coast beaver, and Oregon Coast muskrat. Riparian sites have
produced the largest percentage of faunal remains and these attest directly to the aboriginal use of elk, deer, fox, and rabbit.

Avian species natural to this specific environment would include the ruffed grouse, sooty grouse, California quail, robin, killdeer, wood duck, Cooper's hawk, and golden eagle.

The rivers themselves contained several nonanadromous species of fish, as well as river mussel (Margaritifera margaritifera) and these would certainly have been utilized.

Three primary environmental advantages would accrue to inhabitants of riparian sites. 1) They were adjacent to permanent fresh water streams which would supply a valuable food source (fish and mollusca), and a transportation course (by canoe). 2) They are somewhat removed from the less disruptive seasonal floods of the main Willamette River. 3) They are in an area convenient to both thicket and open plain resources, both floral and faunal.

None of the above mentioned zones is clearly distinguished from the others in all of its characteristics. Many plant and animal resources were available in two or more areas; however, it is not the absence or presence of a single trait that makes each of these areas different, rather it is the consideration of each as a concatenation of several physiographic and biotic traits. Each of these zones presented, in season, a unique configuration of environmental traits which made it suitable for aboriginal occupation.

Sites located in each of the four environmental zones are designated for convenience of reference in tables and charts to follow as Types I, II, III, and IV for valley edge, narrow valley plain, primary flood plain, and riparian types respectively.

Figures 2 and 3 indicate in an idealized manner the particular physiographic and biotic characteristics of each of the environmental zones occupied by the upper valley inhabitants. Table 1 lists plants and animals found in each of the four zones.

**ACTIVITY**

If site areas were chosen for the advantages which they provided, it follows that an examination of the artifact record should indicate in what ways the site inhabitants specifically utilized these resources. While consideration of the prehistoric environment is necessary to determination of site utilization, it alone cannot do the job. A particular environment may suggest the range of activities likely to have been carried out at a site located within it, but two (or more) sites occupying the same environment may well have been exploiting different
Figure 2. Idealized transects of Narrow Valley Plain and Valley Edge environmental zones.
Figure 3. Idealized transects of Primary Flood Plain and Riparian environmental zones.

B
Bottomland forest (cottonwood, willow, Oregon maple, ash, laurel, etc.)
Thickets of salmonberry, elderberry, ninebark, hardhack, etc.
Abundant mammals (elk, deer, beaver, rabbit)
Abundant fish and freshwater mollusca
Organized drainage

RIPARIAN

C
Prairie grasslands
Abundant camas, wappato, cattails
Abundant marsh birds (loon, grebe, bittern sora)
Extensive ponding

PRIMARY FLOOD PLAIN
resources. The artifact inventory must be relied on to specify the particular activities emphasized. For example, the two Benjamin Sites on the Long Tom River are classed with the Hurd Site near Coburg as primary flood plain sites, and apparently like the Hurd Site were occupied during the spring-early summer. Miller (1970:81) describes the primary activity of the Benjamin Sites as being camas gathering and processing. White (this volume) describes similar activities at the Hurd Site but also notes the abundance of artifacts reflective of a major woodworking complex.

Eight principal activity complexes were delineated for Upper Willamette Valley sites. As the goal was to delineate primary activity complexes, it was held that the limited occurrence of a trait would not, in itself, be a sufficient indication of activity emphasis; rather, consideration was given to the proportion of the total returns from a site that were associated with any given activity complex. In many cases the samples from each site were too small, or the sites too inadequately reported to allow for more precise quantification than "many" or "few," and the judgements made in determining activity emphases are subjective and tentative. The eight primary extractive and maintenance activities defined are hunting (large game), hide preparation, diversified hunting (small game and birds), tool manufacturing, camas gathering and processing, fishing, woodworking, and grinding and milling.

Large Game Hunting

An archaeological site was considered to have been involved in the hunting of large game if it displayed a high percentage of large, thick projectile points, specifically Types 3a, 3b, 4a, 4b, 5a, 5b, 6, 12, 13, 14a, 14b (Appendix), and/or skeletal remains of elk, deer, bear, etc. The site environment was not considered a deciding factor in itself as some species of big game were available to all of the site locations at some time of the year (see Table 1). It is noteworthy however, that of 13 narrow valley plain and primary flood plain sites only two (15%) contained evidence of the hunting of big game. In contrast, five of the 9 (56%) valley edge and riparian sites indicated hunting of large game as an important activity.

Hide Preparation and Processing

Artifacts deemed characteristic of hide preparation activity included chopping tools, perforators, fleshers, bone awls, and a high percentage of hide scrapers and knives. Hide preparation, normally thought of as a correlative activity to hunting, proved not to be precisely so in this study. Two of the seven sites containing evidence of large game hunting did not exhibit significant evidence of hide
TABLE 1. Principal Biotic Resources Natural to the Four Environmental Zones of the Upper Willamette Valley.

<table>
<thead>
<tr>
<th>PLANTS</th>
<th>Valley Edge</th>
<th>Valley Plain</th>
<th>Narrow Valley Plain</th>
<th>Primary Flood Plain</th>
<th>Riparian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Douglas fir (Pseudotsuga menziesii)</td>
<td>X</td>
<td></td>
<td>X X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Garry oak (Quercus garryana)</td>
<td>X X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>black cottonwood (Populus trichocarpa)</td>
<td>X</td>
<td>X X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>red willow (Salix lasianara)</td>
<td>X</td>
<td>X X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oregon maple (Acer macrophyllum)</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oregon ash (Fraxinus oregana)</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cherry (Prunus emarginata)</td>
<td>X</td>
<td></td>
<td>X</td>
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<td></td>
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<tr>
<td>laurel (Unbellularia californica)</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>alder (Alnus rubra)</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Oregon grape (Berberis aquifolium)</td>
<td>X X</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>salmonberrry (Rubus spectabilis)</td>
<td>X</td>
<td></td>
<td>X</td>
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<tr>
<td>elderberry (Sambucus glauca)</td>
<td>X</td>
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<tr>
<td>hardhack (Spiraea douglasii)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ninebark (Physocarpus capitatus)</td>
<td>X X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rose (rosa sp.)</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hazel (Corylus californica)</td>
<td>X X</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>cat-tails (Typha latifolia)</td>
<td>X X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>camas (Camassii quamash)</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>wappato (Sagittaria latifolia)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| MAMMALS                                      |              |              | X X X               |                     |          |
| Roosevelt elk (Cervus canadensis roosevelti) | X X X       |              |                      |                     |          |
| black-tailed deer (Odocoileus columbianus columbianus) | X(w) | X X        |                      |                     |          |
| white-tailed deer (Odocoileus virginianus leucurus) | X         | X           |                      |                     |          |
| Washington snowshoe hare (Lepus americanus washingtonii) | X           |              | X                   |                     |          |
| Oregon brush rabbit (Sylvilagus bacamani ubericolor) | X           |              |                      |                     |          |
| silver gray squirrel (Sciurus griseus griseus)     | X           |              | X                   |                     |          |
| Douglas's squirrel (Sciurus douglasii douglasii)    | X           |              | X                   |                     |          |
| Townsend's chipmunk (Sutanas townsendii townsendii) | X           |              | X                   |                     |          |
| digger squirrel (Citellus douglasii)              | X           |              | X                   |                     |          |
| Oregon Coast muskrat (Figer zibethicus occipitalis) | X X         |              |                      |                     |          |
| Pacific Coast beaver (Castor canadensis pacificus) | X           | X           |                      |                     |          |
TABLE 1 (continued)

MAMMALS (continued)

Camas pocket gopher (*Thomomys bulbivorus*) X X
Oregon cougar (*Felis concolor oregonensis*) X
Oregon bobcat (*Lynx rufus fasciatus*) X
Northwestern timber wolf (*Canis lycean gigas*) X
Oregon gray fox (*Urocyon cinereoargenteus townsendii*) X X X
Pacific marten (*Martes caurina caurina*) X
fisher (*Martes pennanti pacifica*) X
western otter (*Lutra canadensis pacifica*) X X X
raccoon (*Procyon lotor pacifica*) X
Klamath grizzly (*Ursus kramathensis*) X
Olympic black bear (*Ursus americanus altifrontalis*) X
ruddy deer mouse (*Peromyscus maniculata rubidus*) X
dusky red-backed mouse (*Clethrionomys californicus obscurus*) X
California red-backed mouse (*Clethrionomys californicus californicus*) X
red tree mouse (*Phenacomys longicaudus*) X
white-footed phenacomys (*Phenacomys albipes*) X
gray-tailed meadow mouse (*Microtus canicausus*) X X
Townsend's meadow mouse (*Microtus oregoni oregoni*) X X
Northwest jumping mouse (*Zapus trinotatus trinotatus*) X X

BIRDS

canom loon (*Gavia immer*) X X
pied-billed grebe (*Podilymbus podiceps*) X X
American bittern (*Botaurus lentiginosus*) X X
Wilson's snipe (*Capella gallinago*) X X
Virginia rail (*Rallus virginianus*) X X
sora (*Porzana carolina*) X
American coot (*Fulica americana*) X X
wood duck (*Aix sponsa*) X X
Cooper's hawk (*Accipiter cooperii*) X X X X
golden eagle (*Aquila chrysaetos*) X X X X
sooty grouse (*Dendragapus obscurus*) X X
ruffed grouse (*Bonasa umbellus*) X X
California quail (*Lophortyx californicus*) X X
mountain quail (*Oreoryx pictus*) X
killdeer (*Charadrius vociferus*) X X X X
spotted sandpiper (*Actitis macularia*) X
robin (*Turdus migratorius*) X X X X
preparation activities. Hide preparation as a major activity was demonstrated by only one of the 13 sites of the narrow valley plain and primary flood plain. In all, hide preparation was carried out at seven (32%) of the sites.

_Diversified Hunting_

Sites demonstrating more diversified hunting, that is, the hunting of small game and birds, were characterized by large quantities of small, thin projectile points, particularly Types 1a, 1b, 1c, 7a, 7b, 8a, 8b, 9, 10, 11a, 15 and 16; small worked flakes; the remains of small animals such as beaver, fox, rabbit, etc.; and bird bones. Weight was given also to the factor of site location near marsh perimeters, where the nesting of grallatorial species would likely occur. Diversified hunting was indicated to one degree or another at eighteen (81%) of the 22 sites analyzed. Inhabitants of any given site, even though there primarily for other reasons, would not likely ignore small game when and where it was available; and small animals were available to all of the Upper Willamette Valley sites. One might conclude that diversified hunting was carried out opportunistically at sites chosen primarily for other reasons.

_Tool Manufacturing_

Tool manufacturing as an activity was represented by a high percentage of flaking debris in relation to number of finished artifacts, bone or antler flakers, hammerstones, cores, sharpening stones or abraders, shaft straighteners, and tool blanks. Nine (41%) of the 22 sites contained evidence that tool manufacturing was an important activity.

_Camas Gathering and Processing_

Sites which focused on camas gathering and processing are characterized by camas ovens, charred camas bulbs, and thermally fractured cobbles. Situation in, or near, the low marshy environment necessary for camas growth was considered a defining characteristic. This activity was the easiest to differentiate. All eight sites indicating camas processing as a primary activity contained camas ovens, six contained additional thermally fractured rock, and five contained carbonized camas bulbs. Site location appears to have been critical also, as this was the only activity confined to only one of the four environmental zones, in this case, the primary flood plain.
Fishing

Fishing activity may be recognized by the presence of sinker stones, bone gig barbs, bone harpoon collars, fish vertebrae, and fresh water molluscan remains. Fishing was evidenced at only two sites, both located immediately adjacent to permanent, free-flowing water.

Woodworking

Sites with a focus on woodworking activity were characterized by some or all of the following: flake and core spokeshaves, scraper planes, unifacial and bifacial chopper-axes, mauls, reamers, wood scrapers, stone chisels, graving tools, wedges, denticulates, and drills. Woodworking is clearly demonstrated at only four (18%) of the 22 upper valley sites. Somewhat surprising is that three of the four sites are located on the primary flood plain. One might have expected such activities to be concentrated in more densely wooded areas.

Grinding

Grinding of either floral or faunal resources is attested by a high percentage of bowl or bedrock mortars, pestles, manos, and grinding slabs. Grinding is associated with food preparation, so to some extent it probably took place at every site where meals were prepared. However, for purposes of this study, only those sites manifesting the presence of more than just a few mortar or pestle fragments were listed as emphasizing grinding activities. Sites were considered as focusing on grinding activity when the artifacts characteristic of this activity comprised at least 5-10 percent of the recovered artifact inventory. Six (27%) of the 22 sites emphasized grinding activity. Interestingly, no primary flood plain sites demonstrated an emphasis on grinding.

If an archaeological site manifested a wide range of activities, or if many burials were found, indicating a degree of centrality, then the site was considered as a base camp. Six such sites are noted in the sample.

Table 2 lists the archaeological traits which define the various activity complexes, and indicates their presence or absence at each of the 22 sites analyzed. Table 3 summarizes the data in Table 2, showing the primary activities associated with each site. Further discussion of the relationship of these complexes to settlement patterns in the Upper Willamette Valley takes place in a later chapter titled "Internal Relationships: A Model of Settlement Distribution in Relation to Valley Environment."
Table 2. Archaeological Traits Characterizing Primary Activity Complexes

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<tr>
<th>ACTIVITY/TRAIT</th>
<th>Fall Creek</th>
<th>Sccoggin Creek</th>
<th>Getting Creek</th>
<th>Derry</th>
<th>Lingo</th>
<th>Benjamin Ranch</th>
<th>Smithfield</th>
<th>Perkins'</th>
<th>Penninsula</th>
<th>Spartland</th>
<th>Miller</th>
<th>Kimrock</th>
<th>Shedd</th>
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### ACTIVITY/TRAIT

#### Base Camp Activities

|   | Range of Activities (number) |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
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| 1. | Range of Activities (number) | 3 | 2 | 2 | 3 | 1 | 3 | 5 | 3 | 2 | 3 | 2 | 2 | 4 | 2 | 3 | 3 | 2 | 5 | 1 | 4 | 6 |
| 2. | Cemetery or burial area |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

+ = Trait represents a relatively high proportion of the total site inventory.

- = Trait is present, but in relatively low proportion to the total site inventory.

? = Trait presence questionable

A blank represents the absence of information about the trait involved. It may be missing or merely unreported.
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SEASONALITY

Seasonality refers to the position in the seasonal round occupied by a specific site. The attribute of seasonality is obviously tied in directly with that of environment and one cannot discuss the pertinence of a particular environment without reference to the season of its use. Certain species of animals are more likely to occupy certain areas during certain seasons; various food plants reach certain stages of edibility at specific times; and advantageous climatic and hydrographic conditions prevail on somewhat reliable schedule. Given the environmental zone and the activities carried out by the site inhabitants, it is possible in some cases to deduce the season of use.

Of the eight primary activities carried out at Upper Willamette Valley sites, three were of such a nature as to provide clues to the season of site occupation. These three included the hunting of large game, camas gathering and processing, and the grinding of floristic resources.

The habits of the large mammalian species natural to the Willamette Valley are known to the extent that we can predict with a reasonable degree of assurance where they are apt to be during a particular season, and thereby determine the seasonality of a site situated to take advantage of them. Valley edge sites which exhibit a focus on the hunting of large game are most likely to have been occupied during the late spring and summer. The valley edge would offer animals permanent flowing water during the warm summer months, when the more ephemeral watercourses would dry up. The valley edge environment is likely to have been preferred by the Roosevelt elk and the white-tailed deer during the late spring and summer months when valley floor temperatures and humidity would have brought harassment by insect pests. The cougar prefers the valley edge year round but would be more vulnerable to exploitation in the months between April and August when its young are born. The Klamath grizzly winters on the higher slopes, but comes down to the valley edge, with its newborn cubs, in the late spring and early summer. The black-tailed deer, though, has an opposite behavior pattern. This animal winters on the valley edge and moves higher into the foothills with the advent of summer.

The hunting of large game by inhabitants of the primary flood plain and riparian zones is likely to have taken place during those fall to spring months when large mammalian species such as Roosevelt elk and white-tailed deer were common in the lowlands. The Roosevelt elk was a valley floor inhabitant between fall, its mating season, and spring, when the young were born. The white-tailed deer occupied the valley during the same months, although little is known of its breeding habits. The black-tailed deer's preference for dense forests and thickets and its shunning of the open country at all times probably made it of secondary economic importance to the primary flood plain inhabitants.
Sites at which camas gathering and processing took place would have to have been occupied in the spring. Camas gathering and processing is probably the most precise time marker of seasonality available. It took place only in sites of the primary flood plain (in which it occurred in eight of the eleven sites), all of which were adjacent to low, marshy environments. Camas bulbs reach the proper stage of harvesting and edibility in the spring, and the optimum period lasts only two or three weeks (Hitchcock, et al 1969:782).

Grinding activities, assuming the grist to be seeds of wild plants, would most likely take place when such floristic resources were at their optimum in the late spring and summer. This season of optimality would be the same for all four upper valley environmental zones.

The five remaining activities, including diversified hunting, hide preparation and processing, tool manufacturing, woodworking, and fishing do not provide sufficient clue to site seasonality, given the available data.

Hydrographic features are an important consideration in inferring site seasonality. Sites of the narrow valley plain and primary flood plain that were situated in order to afford the inhabitants the advantages of a marshy habitat would probably be occupied during spring and early summer, for it was during this time of the year that the spring rains brought about extensive ponding. Sites located adjacent to intermittent streams are more likely to have been inhabited when the streams were running, during the wet months of fall, winter and spring.

Of the 22 Upper Willamette Valley sites, 17 (77%) contained activity complexes denotive of a particular season (Fig. 4). The five sites lacking such evidence of seasonality were tentatively assigned periods of occupation the same as nearby sites with similar physical characteristics. One site, 35 LA 92, was assigned a longer seasonal occupation period than other valley edge sites because it was atypical in having a deep well-defined midden some three acres in area. Located as it was next to a series of small permanent springs, it may well have served for more than one season. Limited test excavations were inconclusive.

AGE

A tentative chronology for sites of the Upper Willamette Valley was developed through the application of five dating techniques, two of them chronometric and the other three relative. The chronometric techniques include radiocarbon dating and tree-ring dating; the relative dating techniques include pollen analysis, typological comparisons, and cross dating with historic artifacts. Five major periods of occupation were defined.
Fig. 4. Site Occupation by Season

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**Period I (8,000 - 6,000 B.C.)**

The earliest dates for aboriginal use of the Upper Willamette Valley are at the same time the most speculative. Two sites, Lebanon and Templeton, disclosed archaeological data tenuously connecting man with extinct mammoth. In the case of the Lebanon finds, the association between artifact and fossilized mammoth bones was not convincingly made. Thin section analysis of a bone artifact made to determine the nature of the soil deposited in its exposed cellular structure indicated that the tool came from the top brown bed (upper 48 centimeters) of the site, while the mammoth remains were confined to an underlying bluish clay. A stone specimen described as resembling a chisel was found in close association with the mammoth remains but the piece itself is crude and at best problematical (Cressman and Laughlin 1941). The Templeton Site conclusions are probationary for slightly different reasons. Here the artifacts, described as resembling a Sandia and a Yuma point, are real enough but their association with extinct mammoth is essentially hearsay, since they are found in 1895 by an amateur fossil hunter and reported a half-century later (Cressman 1947). Interestingly, the 13.5 centimeter long artifact described as a Sandia point is not very different in size or outline to the thick, tanged points or knives described by Miller (1970:54) for the much more recent Benjamiin sites. Hansen and Packard (1949:467) analyzed the pollen from a mammoth-bearing stratum near Silverton, Oregon (not associated with artifacts) and indicated that the sample was representative of a floral community existing in the Willamette Valley between 9,000 and 10,000 years ago. In short, the possibility exists, but is not proven, that man inhabited the Willamette Valley contemporaneously with mammoth, in terminal Pleistocene times.

**Period II (6,000 - 4,000 B.C.)**

Known sites of this period are restricted to the Cascade foothills along the eastern edge of the Willamette Valley. None are known from within the valley proper.

Cascadia Cave, in the Western Cascades east of Sweet Home, was excavated and reported by Newman (1966). The initial occupation of the site is radiocarbon-dated to 5960 ± 280 B.C. (7910 ± 280 B.P.). The upper levels of the site were badly disturbed, and detailed stratigraphic data on the occurrence of the approximately 400 artifacts recovered were not provided, but the report does indicate that the Cascade point (Type 4a bipoint) was the only type represented in the lower 90 cm of the deposits. The Cascade type gives way to a thick side-notched type (Type 3a) in upper levels. The age of the earliest side-notched points is placed at about 4000 B.C., based on their dated occurrences elsewhere in the Northwest. According to Newman, the subsistence pattern of hunting and gathering demonstrated at Cascadia Cave continued until about 1,000 B.C.
The Geertz Site, located in the foothills of the Western Cascades some 20 miles southeast of Portland, is described by Woodward (1973) as a generalized hunting and gathering locus. Several hundred artifacts were recovered, including 54 projectile points. Thirty-seven of the points were sufficiently complete to classify with confidence, and all were of the Cascade type (Type 4a). An age between 6,000 and 4,000 B.C. would seem justified for the site, based on Newman's observation that at Cascadia Cave, Cascade bipoinds are the only type used until perhaps 4,000 B.C.

Traits diagnostic of Period II include:

1. Type 4a and 4b projectile points (Cascade bipoinds).
2. Crude scrapers (of several types) made on random flakes.
3. Edge ground cobbles.
4. Short lanceolate blades (under 6 cm).

Period III (4,000 - 250 B.C.)

This period is typified by the earliest components at the Lingo, Hurd, and Benjamin I sites. The earlier components of each of these sites differ materially from the later ones. At Lingo, all the firepits found were clustered in the lowermost levels of the site, in association with an early date of 2,180 ± 110 B.C. (4130 ± 110 B.P. [Gak - 1120]). Firepits were absent higher in the midden, where burials and diverse types of artifacts are common (Cordell 1967). At nearby Benjamin I, Miller (1970) similarly noted an abundance of firepits and a paucity of artifacts in the lower levels of the site, and a direct reversal of this in the upper levels. A date of 370 ± 80 B.C. (2,320 ± B.P.) came from carbonized camas bulbs recovered from a lower level firepit. At the Hurd Site, the earliest dates of 850 ± 110 and 870 ± 230 B.C. (2,800 ± 110 B.P. [Gak - 2660]; 2820 ± 230 B.P. [Gak - 2659]) are associated with a habitation structure not attested from later periods. This earlier occupation is typified also by fewer artifacts and fewer types of artifacts than the later occupation, dated some 1700 years later (White, this volume).

Luckiamute Hearth, with its radiocarbon date of 3,300 ± 270 B.C. (5,250 ± 270 B.P. [I-472]), is the earliest C-14 dated cultural feature in the Upper Willamette Valley proper. Unfortunately excavations were very limited and no artifacts were found with the dated hearth (Reckendorf and Parsons 1966).

The Fall Creek Dam Reservoir Sites, while not radiocarbon-dated, nevertheless may represent occupations contemporaneous with or earlier than the earliest components at the Lingo, Hurd, and Benjamin I sites. Although there is some quantitative variation, the Fall Creek tool complex closely resembles those of the early components at Lingo and the
Benjamin sites. The most diagnostic artifacts from Fall Creek were rather thick, side-notched points (Type 3a), snub-nosed scrapers, and bi-pointed Type 4a (Cascade) projectile points. These look like a complex from the upper levels at Cascadia Cave guess-dated by Newman (1966) between 4,000 and 2,000 B.C. The Fall Creek complex, however, also resembles tools described by Marchiando (1965) for the Upper Umpqua region, which are supposedly of a more recent date. This latter comparison is particularly significant in light of the fact that the Fall Creek Sites are very close to the territorial border of the Yoncalla who historically occupied the Upper Umpqua area. Perhaps, as Cole (1968:27) suggests, the Cascadia, Fall Creek, and Upper Umpqua areas represent examples of a long standing cultural tradition wherein Type 4a bipoints and thick, side-notched Type 3a points began early but persisted into more recent times.

Based on the inventories of dated sites, the following attributes appear to be characteristic of Period III:

1. Point Types 3a, 12, 13, 14a, and 14b. These are generally larger and thicker than the points of later periods. Often, as at Benjamin 1 and the Fall Creek Sites, these types appear in conjunction with Type 4a and 4b bi-points (Cascade points). Newman (1966:25) characterizes such a configuration as occurring between 4,000 and 2,000 B.C. at Cascadia Cave.

2. Limited typological variation in assemblages.

3. Fewer specialized tools, i.e., fewer gravers, reamers, spokeshaves, pestles, etc.

4. Smaller camas ovens than in later periods; all appear to be less than a meter in diameter.

5. Large pit houses (one known only, in the earliest component of the Hurd Site).

6. Cache pits.

7. Flexed burials in simple pits with minimal or no grave goods. Only three of the fifteen burials recovered from the Lingo Site contained any grave goods.

When more is known of Willamette Valley archaeology, this period will undoubtedly be subdivided.
Period IV (850 B.C. - 2700 A.D.)

Period IV is the best known segment of Willamette Valley prehistory. Most of the excavated valley sites seem to have flourished during this period. The later components at the Hurd, Lingo, Fall Creek, and Benjamin Sites, as well as the pre-contact material at Fuller, Fanning, and Spurland mounds are typical of this period.

Of the 20 radiocarbon dates available from Upper Willamette Valley sites, 13 fall within this period. These include nine dates from the Hurd Site that range between 830 ± 140 A.D. (1120 ± 140 B.P. [Gak-3110]) and 1620 ± 110 A.D. (330 ± 110 B.P. [Gak-3106]); a date of 310 ± 130 A.D. (1640 ± 130 B.P.) for one of the Benjamin Sites; a date of 95 ± 120 B.C. (2045 ± 120 B.P. [Gak-1121]) for the Lingo Site; and one of 970 ± 120 A.D. (980 ± 120 B.P. [Gak-3117]) for site 35 LA 118. In addition to these 13 radiocarbon dates, a tree-ring count of 350 years for the age of a tree in the bed of a now-dry stream which furnished water to the adjacent Miller and Spurland Mounds, presumptively places the abandonment of these sites in the latter years of this period. Artifacts and traits characteristic of Period IV include:

1. Small stemmed points, specifically Types 2a, 5a, 5b, 7a, 7b, 8a, 8b, 9, 10, 11a, 11b, 15, and 16; and unstemmed point Types 1a, 1b, 1c, and 2b.

2. Deep serration of projectile points.

3. Scrapers of various types and sizes, including discoids, small oval or "thumbnail" scrapers, and concave and convex end and side scrapers.

4. Unifacial and bifacial chopping tools, usually made from basalt cobbles.

5. Scraper planes.


7. Reamers.

8. Spokeshaves, both flake and core types.

9. Large camas ovens.


In addition to these traits, which are apparently distributed throughout this period, there is a lengthy list of antler bone, and shell artifacts which appear to be diagnostic of the later part of the period. These traits include:
15. Antler fleshing tools.
17. Bone projectile points.
18. Ensiform whalebone clubs.
19. Tubular bone beads.
20. Bone poniards.
22. Whole shell beads and lopped olivellas.
23. Ear and nose plugs.
25. Dentalia.
27. Elaborate grave goods.
28. Cranial deformation.
29. "Yurok"-type obsidian blades.

In general, artifact assemblages of Period IV are more elaborate and contain more exotic traits than those of Period III and this distinction grows more obvious throughout Period IV.

Sites occupied during this period include the later components at the Hurd, Lingo and Benjamin sites; the pre-contact aspect at Fuller, Fanning, and Spurland mounds, Gettins Creek and 35 LA 118; and all occupation levels of Scoggin Creek, 35 LA 70, 35 LA 92, Dery, Virgin Ranch, Smithfield, Perkin's Peninsula, Miller Mound, Kropf, Simrock, Miller Farm, Halsey, and Shedd. This period includes most of what Davis (1970:17) calls the Kalapuya Phase, which he dates from 100 B.C. to A.D. 1851. This designation has acquired some currency, but this writer would find it more useful were it not inclusive of the full historic period. Real differences exist in sites inhabited after the penetration of Europeans and their trade goods.
Period V (1700 - 1850 A.D.)

These dates include the protohistoric and historic periods. European intervention in the Northwest was not a direct and dominant influence until after 1750 but prior to that time, sporadic contacts between non-Indian and Indian in Northern California and along the Northwest Coast seem to have given an impetus to increased trade along the Columbia River. Pre-18th century expeditions by Gabrielle (1542), Maldonado (1588), and Fonte (1640) were made to the Northwest Coast area, though the first verified contact and trade took place during the Bering-Chirikov Expedition of 1741. The Bering expedition found coastal Indians who already had a working acquaintanceship with smelted iron (Averkieva 1971:322). Historian T.A. Rickard (1939:25-50) in a study of early iron use by Indians in northwestern North America, cites documented proof that numerous trade vessels (Japanese, Spanish, and Russian) were swept to their graves along the northern coast of North America. Wreckage could have added great amounts of finished iron, and other trade items to the aboriginal inventory.

The latter occupation levels of Period IV witnessed an increase in the number of traits thought to be extra-valley in origin. Sites occupied during Period V, but prior to 1800, continue this trend, and contain even larger percentages of exotic aboriginal traits. After 1800, distinctly European goods such as copper buttons, bottle glass, trade beads, and iron appear in site inventories.

Artifacts and traits specifically diagnostic of Period V occupation include:

1. Copper ornaments and bangles.
2. Copper trombac buttons.
3. Bottle glass scrapers (one was found at 35 LA 118).
4. Trade beads.
5. Iron nose plugs.

This list includes only items actually found in archaeological sites; obviously the finding of any European artifact in situ would indicate occupation in this time period.

Period V occupations are demonstrated by the uppermost levels at Fuller, Fanning, and Spurland Mounds, and to a lesser extent at the Gettings Creek Sites and 35 LA 118. A radiocarbon date of 1850 ± 100 A.D. (modern to 200 B.P. [Gak-3116]) for 35 LA 70 falls within this
Table 4. Archaeological Traits Associated with Chronological Periods of the Upper Willamette Valley

PERIOD I
8000 (?) - 6000 B.C.
1. Early point types such as sandia and Yuma (?)
2. Crude stone tools
3. Associated extinct mammals
4. Isolated finds

PERIOD II
6000 - 4000 B.C.
1. Point types 4a and 4b are the only point types
2. Crude scrapers on random flakes
3. Edge ground cobbles
4. Short lanceolate blades

PERIOD III
4000 - 250 B.C.
1. Large, thick points; Types 3a, 12, 13, 14a, 14b, (often in conjunction with types 4a and 4b)
2. Fewer artifacts and types of artifacts, than Period IV
3. Less specialized tools
4. Small camas ovens (less than 1 meter in diameter)
5. Large pithouses
6. Cache pits
7. Absence of bone artifacts
8. Flexed burials in simple pits
9. Minimal or no grave goods

PERIOD IV
250 B.C. - 1700 A.D.
1. Small stemmed point types 2a, 5a, 7a, 7b, 8a, 8b, 9, 10, 11a, 11b, 15, 16; unstemmed types 1a, 1b, 1c, 2b
2. Deeply serrated points
3. Scrapers of many types and sizes

Period IV (cont.)
4. Unifacial and bifacial chopping tools of basalt cobbles
5. Scraper planes
6. Spherical net weights
7. Reamers and Perforators
8. Core and flake spokeshaves
9. Large camas ovens
10. Phallic pestles
11. Antler camas digging stick handles
12. Antler and bone flakers
13. Antler ear plugs
14. Antler fleshing tools
15. Bone harpoon beads
16. Bone projectile points
17. Ensiform whalebone clubs
18. Tubular bone beads
19. Bone poniards
20. Disc beads
21. Whole shell beads and lopped olivellas
22. Abalone pendants
23. Dentalia
24. Marine shell remains
25. Cranial Deformation
26. Elaborate grave goods
27. "Killed" artifacts
28. "Yurok" -type obsidian blades

PERIOD V
1700 - 1850 A.D.
1. Copper ornaments and bangles
2. Copper trombac buttons
3. Bottle glass scrapers
4. Trade beads
5. Iron nose plugs
6. Iron knives
period, but in the absence of European objects, the associated artifacts (hammerstones, small stemmed projectile points, including one Type 16, and two Type 7a) acquired through limited excavation suggest a Period IV occupation. More excavation could settle this issue.

Table 4 summarizes the principal archaeological traits associated with each of the five cultural periods. Table 5 outlines the chronology of the Upper Willamette Valley sites as determined by radiocarbon dating, supplemented and extended by tree-ring counts, typological comparisons, and cross dating with historic artifacts.
Table 5. Summary of Upper Willamette Valley Site Chronology

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>SITES</th>
<th>DATE</th>
<th>METHODS OF DETERMINATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period I</td>
<td>Lebanon Site</td>
<td>9-10,000 B.P.</td>
<td>Pollen analysis of mammoth-bearing stratum</td>
</tr>
<tr>
<td>8000-6000 B.C.</td>
<td>Templeton Site</td>
<td>9-10,000 B.P.</td>
<td></td>
</tr>
<tr>
<td>(Big Game Hunting)</td>
<td>Unrepresented in valley sites (Non-valley sites include Cascadia Cave and Geertz Site)</td>
<td>6000-4000 B.C.</td>
<td>Inferences based on dates at known non-valley sites</td>
</tr>
<tr>
<td>Period III</td>
<td>Luckiamute Hearth</td>
<td>5250 ± 270 B.P. (I-1472)</td>
<td>Radiocarbon</td>
</tr>
<tr>
<td>4000-250 B.C.</td>
<td>Early components at: Hurd Site</td>
<td>2800 ± 110 B.P. (Gak-2660) and 2820 ± 230 B.P. (Gak-2659)</td>
<td>Radiocarbon</td>
</tr>
<tr>
<td></td>
<td>Lingo Site</td>
<td>4130 ± 110 B.P. (Gak-1120)</td>
<td>Radiocarbon</td>
</tr>
<tr>
<td></td>
<td>Benjamin Sites</td>
<td>2320 ± 80 B.P.</td>
<td>Radiocarbon</td>
</tr>
<tr>
<td></td>
<td>Fall Creek Sites</td>
<td>4-6000 B.P.</td>
<td>Comparative typology</td>
</tr>
<tr>
<td>Period IV</td>
<td>Late components at: Hurd Site</td>
<td>1120 ± 140 B.P. (Gak-3110) to 330 ± 110 B.P. (Gak-3106)</td>
<td>Radiocarbon (nine dates)</td>
</tr>
<tr>
<td>250 B.C.- 1700 A.D.</td>
<td>Lingo Site</td>
<td>2045 ± 120 B.P. (Gak-1121)</td>
<td>Radiocarbon</td>
</tr>
<tr>
<td></td>
<td>Benjamin Sites</td>
<td>1640 ± 130 B.P.</td>
<td>Radiocarbon</td>
</tr>
<tr>
<td>Period V 1700-1851 A.D.</td>
<td>The uppermost levels at:</td>
<td>1700 - 1850 (?)</td>
<td>Presence of historic artifacts</td>
</tr>
<tr>
<td>-----------------------</td>
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<td>-------------------------------</td>
</tr>
<tr>
<td>Fall Creek Sites</td>
<td>Fuller Mound, Fanning Mound, Spurland Mound, Gettings Creek Sites, and 35 LA 118</td>
<td>250 B.C. - 1700 A.D.</td>
<td>Comparative typology</td>
</tr>
<tr>
<td>The Pre-contact aspects at:</td>
<td>Fuller Mound, Fanning Mound, Gettings Creek Sites, and Spurland Mound</td>
<td>250 B.C. - 1700 A.D.</td>
<td>Comparative typology</td>
</tr>
<tr>
<td>35 LA 118</td>
<td>980 ± 120 B.P. (Gak-3117)</td>
<td>Radiocarbon</td>
<td></td>
</tr>
<tr>
<td>All occupation levels at:</td>
<td>Scoggin Creek, 35 LA 70 35 LA 92, Dery, Perkin's Peninsula, Kropf, Simrock, Miller Farm, Halsey, Shedd and Smithfield Site</td>
<td>250 B.C. - 1700 A.D.</td>
<td>Comparative typology</td>
</tr>
<tr>
<td>Virgin Ranch</td>
<td>Abandoned 1700</td>
<td>Tree-ring count</td>
<td></td>
</tr>
<tr>
<td>Miller Mound</td>
<td>Abandoned 1600</td>
<td>Tree-ring count</td>
<td></td>
</tr>
</tbody>
</table>
THE UPPER WILLAMETTE VALLEY SITES

Most of the archeological sites dealt with in this paper are described only in unpublished Master's theses, special salvage reports or manuscripts of very limited circulation, or in field notes and museum records. Because of this general obscurity, basic facts about the 22 sites on which this paper is largely based (essentially all Willamette Valley sites subjected to some degree of excavation up to the time of writing) are summarized here. The descriptive format is based on the analytical variables of environment, activity, seasonality, and age that have been developed in the preceding section. The summaries reflect the quality of the available data. The projectile point type ascriptions are based in some cases on examination of collections, in others upon written descriptions and illustrations.

VALLEY EDGE SITES (TYPE I)

All the Valley Edge sites described below were occupied during Period IV. The earlier materials from the Fall Creek sites are assigned to Period III, and the historic materials from 35 LA 108 are assigned to Period V. There are no representatives of Periods I and II.

Fall Creek Dam Reservoir Sites

(35 LA 30, 31, 32, 33, 34, 35, 36, 37, 38)

Description: Nine sites were located and tested in 1964 by David L. Cole. All were located within 3 miles of each other along Fall Creek. All are above the 650 foot contour in a narrow tributary valley heavily sectioned with ridges. Most of the work was confined to 35 LA 33, from which 137 artifacts were recovered. The assemblage from 35 LA 33 appears representative of the other eight Fall Creek sites. Of the 137 artifacts, 44 (32%) were scrapers or knives (including fragments), and 16 (12%) were points. The excavator suggests that the points have greater affinity to those described for the Upper Umpqua River region by Marchiando (1965), than to those from the Lingo Site (Cordell 1967). Of the various points described from Fall Creek, none are unknown in other Willamette Valley sites; but as a group these points are generally thicker and longer than those found predominating in the flood plain sites of the main valley. Snub-nose scrapers represent the second largest specific tool category (10). These scrapers were also the most prevalent type at Cascadia Cave, where they occurred in the upper deposits in association with side-notched projectile points, and in the Umpqua collection reported by Marchiando (1965:Plate I-XI). The Lingo Site scrapers of the same type are generally much smaller than those from the Fall Creek sites. Only one milling stone fragment was recovered from all of the nine sites.
Figure 4. Upper Willamette Valley Sites Occupied During Period IV.
Activity: Evidence, geographical and archaeological, would seem to indicate multiple activities at the Fall Creek sites. Hunting of large game and preparation of hides are attested to by the points (generally larger and thicker than those from the flood plain sites) and the high percentage of scrapers, knives, and worked flakes. The rare occurrence of milling tools (one specimen) indicates a de-emphasis of activities centered on the use of floral material. Cole identifies two of the sites, 35 LA 32 and 35 LA 36, as possible manufacturing stations, on the basis of a very high percentage of waste material in the surface collection, and the presence of several cores.

Seasonality: The paucity of artifacts and the complete absence of cultural features at 35 LA 33 would seem to indicate that it was a somewhat less than permanent occupation. Occupation is likely to have been in the months from late spring through summer, when large game would be most available. Seasonality of the other sites is unknown.

Age: No absolute dates are available. When comparisons are made to similar assemblages from Cascadia Cave an early date of around 2,000 to 4,000 B.C. is arrived at. When comparisons are made with Upper Umpqua River material a somewhat later date seems likely. The Fall Creek Dam Reservoir sites appear to have been occupied during Periods III and IV.

Remarks: Examination of the projectile points and scrapers from the Fall Creek sites shows that their most obvious affinities are with the Umpqua River collection. Points from both areas are generally thicker and heavier than those of other valley sites, and there is a much higher percentage of side-notch points. The scraper collections from Fall Creek and the Umpqua River both contain a majority of snub-nose types of similar size. The geographical propinquity of Fall Creek to the area occupied by the Yoncalla, and its distance from the Willamette Valley proper, would make it an ideal situation for the diffusion of types and styles from groups occupying the Umpqua and Upper Rogue Rivers.

Basic Source: Cole (1968).

Scoggin Creek Site (35 WN 4)

Description: This is the northernmost of the sites described here. The site is located at the base of a projecting ridge of the Coast Range foothills, above the alluvial bottom of the Tualatin Valley. A permanent spring rises immediately adjacent to the site. Three test pits were dug. Average depth of midden was 60 centimeters. No archaeological features were discovered. The deposit was homogenous in nature, laden with tiny bits of charcoal, and greasy to the touch. Lithic debris was abundant throughout. Faunal remains were present, but badly deteriorated. Sixty-three artifacts and 668 flakes were recovered. Seven identifiable projectile points were found, each of a different
type (Types 3a, 7b, 5b, 8a, 1a, 1b, and 9). While workmanship appears to be cruder, the points themselves are similar to other valley sites. The type 1a and 1b points which the excavator describes as unique to Scoggin Creek are in fact quite common at the Hurd Site. Various types of scrapers represented the largest category of tools (22 specimens). A single fragment of worked bone was found. Two prismatic blades attest to employment of core-blade flaking techniques. No historic artifacts were found.

Activity: The points (particularly Types 1b, 7b, 8 and 9) indicate that diversified hunting was an important activity at the Scoggin Creek site. The high percentage of lithic debris and the presence of cores and sharpening stones is evidence also of tool manufacturing.

Seasonality: This location would probably have its optimum game resources in the late spring and summer when larger species would temporarily abandon the warm and insect-ridden valley floor.

Age: There are no absolute dates for this site. Type 1a and 1b points, where they occur at other, dated, sites, are representative of Period IV.

Basic Source: Davis (1970).

Description: Located in the uplands on the north side of narrow Camas Swale Creek valley, this site is a small rockshelter with a surface area of roughly two by three meters. Three hearths were excavated, one from the uppermost level and two from lower levels. Flaking debris occurred in abundance in all levels. Three small points were recovered, one of which, classified as Type 16, is known elsewhere as Desert side-notched. Two hammerstones were also found. Located immediately adjacent to the rock shelter were several bedrock mortars.

Activity: The bedrock mortars attest to the site's use as a food grinding area. The high percentage of flaking debris to actual diagnostic artifacts, and the fact that two of the five artifacts recovered were hammerstones, also indicate the shelter's probable use as a knapping station.

Seasonality: Late spring and summer use is indicated, at least as regards the food grinding aspect. The small area of the site indicates temporary use by a very small number of individuals, probably a work group.

Age: Charcoal taken from the uppermost hearth was dated at modern to 200 B.P. (Gak-3116). This, the presence of the Desert side-notched point and the absence of historic artifacts, support a Period IV date.
Basic Source: Appendix I.

35 LA 92

Description: This is an atypical valley edge site in that it contains a well-defined midden mound two to three acres in area. The site is located immediately adjacent to several small springs. Limited test excavations resulted in the recovery of five projectile points, three of which were Type 2b (heavily serrated, stemless points), and one of which was a Type 7a. One was unidentifiable. Several scrapers, two oval knives, and several unifacial and bifacial choppers were recovered. A relatively large number of worked flakes were also recovered.

Activity: The tool inventory indicates that diversified hunting and hide preparation and processing were carried out.

Seasonality: Midden size and artifact quantity might indicate longstanding occupation, but the season is indeterminate.

Age: Such tools as Type 2a and 2b points, oval knives, and unifacial and bifacial choppers are typical of Period IV.

Remarks: Fifteen hundred to 2,000 points have reportedly been taken from the surface of this site over the years. Type 2b points are unknown from either the Lingo, Benjamin 1 and 2, or Hurd Sites.

Basic Source: Appendix I.

Gettings Creek Sites (35 LA 100, 106, 107, 108)

Description: These four sites are located within a mile of each other along Gettings Creek, a small tributary of the Coast Fork of the Willamette River. The sites were not excavated and knowledge of their contents comes from a large surface collection donated by Mr. Ray Vincent. The collection includes 79 identifiable points. Type 7a is the best represented with 25 points (32% of the total). Type 4a (13%), Type 8a (13%), and Type 10 (19%) are also well represented. The surface collection contains 12 oval scrapers, 10 perforators, and 7 bifacial knives. A single pink trade bead was also recovered.

Activity: Hunting of both large and small game and related processing activities are evidenced by the tool inventory. The sites are large in area. Site 35 LA 108, for example, is almost one half mile long.
Seasonality: Occupation was probably during the late spring, extending through summer, a time when such animals as deer and elk left the warm pest-ridden valley floor for the higher valley edge.

Age: Type 10 points, oval scrapers, perforators, and bifacial knives are representative of Period III. The trade bead indicates that the final occupation was during Period V.

Remarks: Eleven of the points (14%) are similar to types found in high proportion in the Fall Creek Sites (Cole 1968) and Upper Umpqua area (Marchiando 1965). The geographic location of Gettings Creek makes cultural connection with these two areas likely.

Basic Source: Appendix I.

NARROW VALLEY PLAIN SITES (TYPE II)

All Narrow Valley Plain sites were occupied during Period IV. There are no representatives of Periods I, II, or III. Evidence of Period V occupation is present at 35 LA 118.

Dery Site (35 LA 63)

Description: This site is located on a terrace in the relatively narrow flood plain of the Middle Fork of the Willamette River. Cultural information comes primarily from a surface collection donated by Mr. Robert Porter. A high percentage of the total inventory consisted of artifacts associated with grinding. Sixteen shaped pestles and numerous fragments, 9 unshaped pestles and fragments, and 4 mortar fragments were recovered, comprising 51% of the total artifact inventory. Three of the 6 projectile points were Type 4a and 4b bipoints.

Activity: The large number of grinding tools indicates that processing of plant food was the single most important site activity. The large size of the unshaped pestles compared to the small size of the recovered mortars indicates the possible use of bedrock mortars, though none were observed at the site.

Seasonality: Grasses and other plant resources would be at their harvestable peak during the late spring and summer.

Age: Artifacts other than grinding tools are very similar to those recovered from the Hurd Site, dating Dery at roughly the same period as the second component at the Hurd Site, that is, Period IV.

Basic Source: Appendix I.
Description: The site is located on the flood plain of the Coast Fork of the Willamette River, several hundred yards from Bear Creek, an intermittent stream. The site covers 12 to 15 acres and is apparently very shallow. Test units determined the cultural material to be within the top 30 centimeters. While few artifacts were recovered from the test excavations, many were taken from the surface. Included among the tools were 12 projectile points, 6 pestles, 1 maul, 13 chopper-axes, and 15 scrapers of various types, including one rendered from a fragment of bottle glass, 2 chisels, 1 spoke shave, and 1 drill. With one notable exception, the projectile points are similar to those recovered from sites located in the main Willamette River flood plain (including Types 3a, 4b, 7a, 8a, 9, 11a, and 15); the one exception is a large point comparable to the type Surprise Valley split stem, which is unique in upper valley collections.

Activity: The relatively large number of small projectile points (Types 3a, 7a, 8a, 9, 11a, and 15) indicates diversified hunting as an activity of some importance. Processing of plant material is attested by the presence of a relatively large number of pestles and the location of the site on a grassy, open plain. It seems that woodworking was also an important activity; this conclusion is based on the presence of 13 chopper-axes, 2 stone "chisels," and a spoke shave, a maul, and a drill.

Seasonality: Grinding and milling activities would normally be associated with late spring and summer occupation.

Age: Charcoal taken from a firepit in the bottom of the cultural stratum at a depth of 30 centimeters was dated at 980 ± 120 B.P. (Gak-3117). This date represents the terminus post quem as it comes from the bottom of a shallow deposit, on the surface of which occurs an aboriginal scraper made from a 19th century glass bottle. The site overlaps Periods IV and V.

Basic Source: Appendix I.

PRIMARY FLOOD PLAIN SITES (TYPE III)

Periods I and II are not represented in the sample. Period III is represented by the earlier materials at the Hurd, Lingo, and Benjamin sites. All the sites listed were occupied during Period IV, and one, the Spurland Mound, exhibited some evidence of Period IV occupation.
Hurd Site (35 LA 44)

Description: This site is located at the confluence of three microenvironments: the broad marshy lowlands of the Willamette-McKenzie flood plain; the open grasslands of the immediate area; and the more heavily wooded foothills immediately to the east. It is fully reported in an accompanying paper in this volume.

Activity: Features and artifacts from the Hurd Site indicate at least five major activities: gathering and processing of camas bulbs, woodworking, tool manufacturing, hide processing, and diversified hunting (including marsh birds). The Hurd Site appears to have been a base camp rather than a task specific site.

Seasonality: Early occupation appears to have been during the winter months. More recent occupation was apparently during the spring and early summer months.

Age: A series of 13 radiocarbon determinations make this the best dated site in the Willamette Valley. The dates indicate two periods of occupation separated by a hiatus of 1,700 years. Two dates taken from different hearths located in an excavated housepit, extremely close at 2800 ± 110 B.P. (Gak-2660) and 2820 ± 230 B.P. (Gak-2659), mark the early occupation. The remaining dates range evenly from an early 1120 ± 140 B.P. (Gak-3110) to a recent 200 B.P. (Gak-3102). The early component is assigned to Period III, the late component to Period IV.

Remarks: Heavy, thick projectile points were rare. A few Type 3a, 3b, and 4a points, similar to those from the Fall Creek sites, were found.

Basic Source: White, this volume.

Lingo Site (35 LA 29)

Description: The Lingo Site is located immediately adjacent to the Long Tom river, a Yazoo-type tributary of the Willamette River. In addition to an artifact inventory consisting of projectile points, scrapers, gravers, bifaces, pestles, and two pieces of shell jewelry, 15 burials and three firepits were recovered. Interment was in a simple, often irregularly shaped pit; preservation was poor to good. Of the burials for which there exist adequate records, only three contain grave goods. One, an adult female, was found in association with a plummet-shaped pestle, a beaver mandible (Castor sp.), and a fragment of a shell pendant. The second, unsexable due to deterioration, had a "killed" pestle adjacent to its right femur. The third, an adult female, was associated with a pendant necklace of olivella and abalone shells.
Under the elbows and behind the legs, unmodified clam shells were found. Two projectile points were found, one at the base, the other at the rear of the skull. Two other burials had unmodified pebbles scattered randomly above and around them.

Three firepits were found in the yellow loam subsoil; none were cobble-lined, and all were less than 82 centimeters in diameter. Charred camas bulbs and fractured rocks were associated with the deepest of these firepits. Unstemmed projectile points predominate, with Types 1a, 1b, 2b, 4a, and 4b being the most popular, especially in the upper 40 centimeters.

Activity: The original excavator concluded that exploitation of camas was the main site activity. Diversified hunting appears also to be represented. The presence of 15 burials, consisting of both sexes and ranging in age from immature to adult, suggests that Lingo may have been a general base camp rather than a task specific site.

Seasonality: The geographic setting of the site, subjecting it to periodic (likely seasonal) inundation, and the exploitation of camas resources and small game, supports the contention that the site was occupied during the spring and early summer months.

Age: Radiocarbon analysis of charcoal from a firepit in the lowest level of the midden gave a date of 4130 ± 110 years B.P. (Gak-1120). A date of 2045 ± 120 years B.P. (Gak-1121) was established from a composite sample of charcoal taken from the top 40 centimeters of the site. Lingo is the earliest Willamette Valley habitation site so far excavated. The large time gap reflected in the carbon dates might indicate that Lingo is a two component site. Based on these dates, the early component would fall within Period III and the later component within Period IV.

Basic Source: Cordell (1967, this volume).

Benjamin 1 and 2 (35 LA 41, 42)

Description: These two sites, within a hundred meters of each other, are located adjacent to an old channel of the Long Tom River. Both were circular low mounds approximately 35 meters in diameter. The contents of both were highly similar. Fifteen firepits and six hearths were among the features recovered. The large, excavated firepits were located as a rule just above and intruding into the underlying clay subsoil. The smaller superficial hearths were located higher in the midden soil. Carbonized camas bulbs and thermally fractured rocks were found with both kinds of features. The original excavator suggests that the different vertical relations of the two kinds of fire areas may denote the presence of two distinct cultural components in the site, but it also seems possible that this apparent vertical difference is a
result of failure to detect the actual surface from which the large firepits were aboriginally excavated. They were observed archeologically only at the point where they reached the clean, sterile subsoil. No other cultural features or burials were recovered. The artifact inventory includes projectile points, scrapers, bifaces, retouched flakes, gravers, drills, and pestles. Type 8a points are most numerous, and Type 4b projectile points, known also as Cascade points, are the third most frequently found kind.

Activity: Gathering and roasting camas bulbs was undoubtedly a prime activity of the inhabitants occupying the site. The taking of small game is also suggested.

Seasonality: Camas gathering season comes in the spring-early summer, probably coincident with the recession of waters from spring flooding. Diversified hunting might have taken place at anytime when the area was not inundated.

Age: Two radiocarbon dates are available for Benjamin Site 1. The earliest date of 2320 ± 80 B.P. came from a charcoal sample taken at the bottom of a firepit between 100 and 110 centimeters below the surface. The later date of 1640 ± B.P. came from a sample of carbonized camas bulbs removed from a hearth in the top 40 centimeters. This probably does not reflect the terminal date of occupation; the presence of two Type 16 (Desert side-notched) points indicates continuance into a later period. The absence of any historic trade material suggests that the site was abandoned prior to the 1800's. These sites overlap Period III and Period IV.

Remarks: Bi-points (Types 4a and 4b) in conjunction with thick side-notched points (Type 14a and b) are found in the lowest levels of the Long Tom area sites. Newman (1966:25) characterizes such a configuration as occurring prior to 2,000 B.C. at Cascadia Cave. This date is not totally unrealistic for the earliest habitation at the Benjamin Sites and it squares with the earliest Lingo Site C-14 date.


Virgin Ranch Site (Sometimes referred to as Franklin Site)

Description: The site is located on the flood plain adjacent to the Long Tom River. The artifact yield was small and included projectile points, pestles, mortars, and retouched flakes. Type 10 points predominate, followed closely by Type 4b, but the small numbers preclude meaningful comparisons. No bone artifacts were found, but deer bones were abundant in the upper levels of the deposit. Charred camas bulbs and ash lenses were discovered in the lower levels of the site.
Activity: The similarity in inventories indicates that activities carried on at this site were similar to those of the Benjamin Sites: camas gathering and processing and diversified hunting. Hunting of other than small game is indicated, however, by the relative frequency of Type 4b points and the presence of numerous deer bones in the upper levels.

Seasonality: The presence of camas indicates a spring-early summer habitation. The white-tailed deer is likely to have abandoned the valley floor environment during the late spring and summer months, hence it was probably exploited by the site inhabitants during the fall-winter months.

Age: A possible terminus post quem date was acquired by counting the growth rings of a tree located in a dry stream bed adjacent to the site. According to ring count, the stream had been dry enough for the tree to grow since 250 years before, or since 1700. The original investigators presumed that the site was abandoned when there was no longer flowing water close by. Artifacts found are characteristic of Period IV.

Remarks: The presence of abundant nonartifactual remains suggests that the absence of bone artifacts is due to their non-utilization rather than lack of preservation.

Basic Sources: Unpublished field notes and collections, University of Oregon Museum of Natural History; Collins (1951).

Smithfield Site (Sometimes Referred to as Alvadore Site)

Description: This site is located near the Virgin Ranch Site in the Long Tom River area. The artifact assemblage contains projectile points (Type 10 predominates), pestle fragments, and worked flakes; as with the Virgin Ranch site, the artifact inventory was very small. There were many cobble-filled camas ovens located throughout the deposit. A single poorly preserved infant burial was found.

Activity: Camas gathering and processing was an activity of primary importance. Diversified hunting is also evidenced by the small projectile points, which constitute the largest artifact class.

Seasonality: Habitation was apparently in the spring and early summer when camas gathering took place.

Age: The terminal date of 1700 A.D. for the Virgin Ranch site arrived at through tree-ring counting applies as well to this site because the abandoned stream channel in which the tree was growing served both.
Basic Sources: Unpublished field notes and collections, University of Oregon Museum of Natural History; Collins (1951).

Perkin's Peninsula

Description: Located in the area of the present-day artificial Fern Ridge Reservoir, the former environment of this midden site was very similar to that of other Primary Flood Plain sites. Only 16 artifacts, including small points and worked flakes, were recovered in an excavation that lasted one day. A number of fire lenses and probable camas ovens noted in the excavation profile were said to have been distributed evenly throughout the midden deposit. Numerous small bones were found, but no bone artifacts.

Activity: The activity carried out here parallels that of the other Long Tom area sites: camas gathering and processing supplemented by diversified hunting of available fauna.

Seasonality: This was apparently a temporary camas gathering site occupied during the spring and early summer.

Age: The few small projectile points found indicate this to be a Period IV site.

Basic Source: Unpublished field notes and collections, University of Oregon Museum of Natural History; Collins (1951).

Spurland Mound

Description: The site is a mound approximately 20 by 40 meters across, located on an intermittent tributary of Little Muddy Creek. Artifacts consisted of projectile points, knives, scrapers, drills or perforators, anvil stones, mauls, pestles, fleshing tools, and worked flakes. The predominant projectile point types were Types 5a, 11a and 7a. While bird and mammal bone was recovered throughout the midden, bone artifacts were scarce, a single bone chisel and two socketed antlers being all that were found. Work carried out 10 years after the initial excavations revealed the upper 25 centimeters of the site was overlain with a mantle of thermally fractured rocks. Immediately below this mantle was a series of broad depressions, fire-hardened and burned to an orange color. Clearly, a series of camas roasting pits is represented.

Five complete human burials and part of a sixth were recovered. All were laterally flexed. One was associated with a rolled copper bead necklace, dentalium shells, and the remnants of a bearskin robe. A second burial contained a necklace composed of four kinds of marine shell, and an abalone pendant. Copper buttons are also reported.
Activity: The presence of faunal remains (including deer) throughout the midden, taken in concert with the abundance of scrapers, knives and projectile points, indicates that hunting and processing of large mammals were important activities. The reported dispersal of these materials throughout the bottom two-thirds of the mound indicates that this activity prevailed during the early occupation, but this apparently gave way to camas processing and more diversified hunting in the later phases of the site, which are dominated by camas ovens. The presence of Olivella biplicata and abalone shell demonstrates littoral contacts either via the Columbia River or directly from the coast. The range of activities and the presence of five burials indicates that Spurland Mound served as a base camp rather than a task specific site.

Seasonality: Spurland may have been occupied year round. The mound is located on slightly elevated ground, and we might assume that such a location was chosen in order to remove the inhabitants from stream overflow which, in this area, occurs most often in the winter and early spring. Camas gathering is a spring-early summer activity. Hunting of large game is likely to have taken place in primary flood plain sites in the fall to spring months.

Age: The bulk of the artifacts found are characteristic of Period IV occupation, but the presence of copper buttons indicates a Period V aspect also.

Basic Sources: Laughlin (1941); Collins (1951).

Miller Mound

Description: This site is located across a gully from Spurland Mound, and is slightly smaller in size. Unfortunately almost no records remain of the unsystematic excavations carried out here. Four laterally flexed burials were removed; one, from a depth of 1.5 meters, had a small projectile in the palm of its hand. No other grave goods were found. A few projectile points, scrapers, and worked flake were found randomly scattered throughout the deposit. Fire hearths (not camas ovens) found at various depths contained bits of unidentifiable bone and charcoal.

Activity: The lack of artifact concentration, and the paucity of artifacts in general, indicates that Miller Mound was probably a temporary campsite devoted primarily to an unknown extractive activity.

Seasonality: Not determined, but since the site is directly across the gully from Spurland Mound, it might have been an activity area of that year-round site.

Age: A boring of a large oak growing out of the center of the mound suggested the site's abandonment at least prior to 1600. This
fits the archaeological record, as no artifact that would indicate historic contact was recovered. The artifact assemblage is characteristic of Period IV.

Remarks: It seems likely that Miller Mound was abandoned prior to Spurland Mound. This abandonment might coincide with the possible change in the function of adjacent Spurland Mound from a general campsite to a camas gathering-processing site in its later phases.

**Basic Source:** Laughlin (1941)

**Kropf Site (35 LIN 22)**

**Description:** The Kropf Site is situated on a stream levee within a northward bend of the intermittent Little Muddy Creek. Most of the area within the bend was littered with artifacts and flaking debris. The site was shallow, ranging in depth between 36 and 50 centimeters, and a layer of fractured rocks and flaking debris found less than 20 centimeters below the surface was the only cultural feature. Of the 159 artifacts from the site, 124 (78%) were surface finds. The largest category of tools (22 specimens) was choppers, followed by projectile points (21 specimens) and utilized flake scrapers (21 specimens). Mortars, pestles, hammerstones, drills, knives, reamers and gravers were also recovered. The cobble choppers were identical to those found in abundance at the Hurd Site. These are invariably made by the unifacial removal of several large flakes from the end of readily available flat basaltic stream cobbles. Type 8a points prevail, along with types 7a, 7b, 11a, 11b, 2b and 1b. Very little faunal material was recovered.

**Activity:** The large quantity of heavy choppers, and the presence of reamers, wood scrapers, and graving tools indicates woodworking activity. The quantity and range of point types is evidence of diversified hunting. Toolmaking was an important activity as attested by the abundance of flaking debris, cores, and hammerstones.

**Seasonality:** Speculative, but its setting, which is similar to that of other primary flood plain sites, might similarly indicate occupation during the spring and early summer.

**Age:** Point types 2a, 2b, 7a, 7b, 11a, 11b, and 1b are indicative of Period IV occupation.

**Simrock Sites (35 LIN 21)**

**Description:** Simrock is located across from and upstream of the Kropf Site. Much of the site was destroyed by amateur collectors and a
sizable portion was destroyed by construction of a flood control channel. The site was quite shallow, varying between 10 and 25 centimeters in depth. Modern plowing has contributed to the mixing of the culture-bearing deposit. Of 32 artifacts recovered, 23 (72%) were surface finds. As with the Kropf Site, choppers represented the largest tool category, followed by small projectile points and utilized flakes. Six cores and two hammerstones were recovered. No cultural features were found.

Activity: As the inventory is quite similar to that of the Kropf Site, we can conclude that the activities carried out there were similar: woodworking, toolmaking, and diversified hunting.

Seasonality: Speculative, but its setting, which is similar to that of other primary flood plain sites, might indicate a similar seasonality, that is spring and early summer.

Age: Similarity in artifact assemblage to the Kropf Site indicates that the Simrock Site was probably also occupied during Period IV.

Remarks: The Simrock and Kropf sites have artifact assemblages somewhat similar to the Hurd Site except for the absence in the former two of spokeshaves and reamers, two items found with great frequency at the Hurd Site.

Basic Source: Davis (1970)

Miller Farm Sites 1 and 2 (35 LIN 23, 24)

Description: These adjacent sites were situated on the south bank of intermittent Little Muddy Creek. Five "used" flakes were recovered from Miller Farm Site 1, and only eight artifacts, seven of which were projectile points, were found in Miller Farm Site 2. A single blade was the only other artifact. The points include Types 10a, 11a, and 12. A single Type 16 point was also found. No archaeological features were found at Site 2 but a large camas oven was disclosed at Site 1. This oven, found 40 centimeters below the surface, contained 569 rocks and many carbonized camas bulbs.

Activity: Miller Farm Site 1 was a camas gathering-processing station. Diversified hunting may have been an important activity at Miller Farm Site 2, where seven of the eight artifacts were small points.

Seasonality: Miller Farm Site 1 was probably a late spring-early summer site as this is when the camas is ripe for harvesting. Miller Farm Site 2 may have been used at the same season.

Age: Oman and Reagan (1971:22) suggest a date for the Miller I camas oven between 370 ± 80 B.C. and 310 ± 130 A.D., based on the C-14
dating of apparently similar features at the Lingo and Benjamin Sites. The presence of a Type 16 point (Desert side-notched) would seem to support a later date, possibly even after 1500 A.D., since it was then that this type purportedly diffused into the northwest. The other point types appear to be of Period IV.

**Basic Source:** Oman and Reagan (1971).

**RIPARIAN SITES (TYPE IV)**

Periods I-III are not represented among the Riparian sites. All were occupied during Period IV, and the Fuller and Fanning mounds contained evidence of Period V occupation as well.

**Halsey Mound**

**Description:** This low mound, measuring approximately 34 by 48 meters, is situated on the bank of the Calapooia River. A trench cut through the mound revealed charcoal, flake debris, fractured rocks, long bone splinters, and fire hearths throughout the deposit. Two complete burials, an adult and a child, and portions of a third were recovered. Many bone artifacts, most of them broken, were found; among them flakers, flesher, and awls. A number of antler artifacts were also recovered including flakers, wedges, and skin dressing tools. Projectile points, scrapers (including many snubnosed types), mortars and pestles were the most common stone tools. A single sandstone arrow shaft smoother was found. Projectile points were predominantly Types 10, 11a and 15. Type 10 and 11a points are fairly common in Period IV sites, but Type 15 (short, medium to thick, diamond-shaped) points have elsewhere been described only for Fuller Mound.

**Activity:** Hunting of large mammals and hide preparation seem to have been important activities throughout the site's occupation. This is evidenced by the large percentage of tools specific to this purpose and the dispersal of bone splinters throughout the deposit. Tool manufacturing is also indicated by numerous antler flakers and the large amount of debitage. A single shaft smoother was also recovered. As the most common stone tools were mortars and pestles, grinding appears to have been an important site activity. The range of activities represented suggests that Halsey Mound served as a base camp.

**Seasonality:** As the larger fur-bearing animals, such as deer, tend to wander into the higher elevations during summer, we might conclude that this hunting site was occupied in the fall through spring, when valley climate would attract these species. Evidence of grinding and milling, which are presumably late spring and summer activities, extend the probable season of occupation through most of the year.
Age: Artifacts recovered, including projectile points, bone flakers, fleshers, awls, and antler wedges, are indicative of Period IV habitation. A former property owner stated that Indians supposedly occupied the site in 1840, when the last two occupants died, but this report cannot be substantiated archaeologically as no historic material was recorded.

**Basic Source:** Laughlin (1941).

*Shedd Mounds*

**Description:** This site is located on the west bank of the Calapooia River. Two adjacent mounds, one leveled by repeated plowing, the other cut almost entirely away by the river, constitute the site. Very little in the way of systematic archaeology has been done. A badly preserved human skull was taken from a depth of 40 centimeters, and an entire burial reportedly was removed from the mound by relic hunters. Some lithic debris was noted throughout the deposit, but very few artifacts were found. The only distinctive artifact recovered was a surface find, a dressed mortar with a geometric V-design incised along the rim. The burial removed by collectors purportedly was found in association with two mortars, pestles, and several projectile points, one of the mortars containing a well-flaked obsidian blade 25.5 centimeters long. This blade, apparently of classic "Yurok" type had been "killed"; broken in three pieces. None of the projectile points are adequately described; Collins (1951:79) casually mentions that they are similar to Fuller and Fanning types but does not say how.

**Activity:** Not enough cultural material exists to allow for an adequate appraisal of site use, but the occurrence of mortars and pestles indicates that grinding activities were important.

**Seasonality:** Grinding and milling were most likely late spring and summer activities.

**Age:** The incised mortar and "killed" obsidian blade would seem to indicate a Period IV date, since the incised mortars from Fanning Mound are considered to be late on the basis of their associations.

**Basic Source:** Laughlin (1941).

*Fuller Mound*

**Description:** The Fuller Mound is located just east of an abandoned oxbow of the Yamhill River. The site was 39 meters long, 24 meters wide, and between 100 and 150 centimeters deep. Fire hearths, charcoal, flaking debris, fractured rocks, river mussel shell, and splintered bone
were distributed throughout the deposit. Faunal remains abound; deer and elk bones predominating, followed by fox, beaver, fish and bird. A bear penis bone was also found.

A total of 41 human burials were recovered, all of them laterally flexed. One skull exhibited frontal cranial flattening, and two others had frontal and occipital flattening. Marine shells of Olivella, Littorina, Dentalium, Paphia, Acmae, and the various Pelecypoda were found in seven burials. Five burials were associated with copper artifacts. Several interesting and informative burial associations occurred. One burial, exhibiting frontal cranial flattening, was found in association with a necklace composed of tubular bone beads, shell, copper bangles, and a copper trombac button. Another burial, a male, with a shell necklace and anklet, had a decorated whalebone club lying along his back. A female was found with an incised camas digger handle behind her skull. The necklace associated with her remains consisted of shell beads, bird bone beads, one glass bead (the only trade bead found), a copper pendant, a decorated bone pendant, and feathers. An adolescent's skeleton exhibited dentalia strung as ear decorations. Two burials, one immediately above the other, each had antler earplugs. The lower of the two was found in association with a long bone poniard, and a waisted obsidian blade identical to those reported for southern Oregon by Cressman (1933:18). The remains of the upper male were in association with a whalebone club, the handle of which was incised with a geometric bird design quite similar to those described by Steward (1927:255) for the Columbia River. One individual was handsomely decorated with Olivella beads, the shells apparently having been hung about his neck, wrists, pelvis, upper legs, and ankles. A piece of iron tubing was in each nasal aperture and in his right hand lay the corroded remains of what probably had been an iron knife.

Artifacts of unknown association were common, among them antler flakers, decorated antler and bone pieces, camas digger handles, mortars, pestles, V-grooved sinker stones, scrapers, drills, and projectile points. More than 50 percent of the points were Type 11a, and these were followed in popularity by Types 8a and 7a. The projectile points were concentrated in the upper 50 centimeters of the midden deposits; the same is true of the sinker stones. Historic trade goods and camas-digger handles were found only near the surface and in intrusive burials.

Activity: The number and elaborateness of the burials, as well as their range in age and sex, seems to indicate a main base campsite rather than a specific activity locus. Mollusc gathering and fishing were undoubtedly important subsistence activities. The species represented indicate that both large game and diversified hunting were practiced; and the high percentage of debitage and large number of flaking tools points to toolmaking as an important site activity. While a score of camas digging stick handles were recovered, no camas ovens were found. Trade appears to have taken place with inhabitants of the Columbia River,
Oregon Coast, and/or the Rogue-Klamath River area, as suggested by the presence of whalebone clubs (with bird design), camas digging stick handles of antler, ocean species of mollusca, and the waisted obsidian blade.

Seasonality: Deer and elk, whose bones occur in the site, prefer to summer on the valley slopes but return to the valley floor in the fall and winter months. The bones thus suggest fall-winter occupation while the camas-digger handles indicate that occupation continued into the spring and summer.

Age: Such traits as incised camas digger handles, cranial deformation, whalebone clubs, and waisted blades, indicate that Fuller Mound was occupied during Period IV. Abandonment probably took place at about the time of White contact (1800-1850), as indicated by the trombac button which was made between 1750 and 1800 (Johnson 1948:12).

Basic Sources: Laughlin (1943); Woodward, Murdy, and Young, this volume.

Fanning Mound

Description: This low mound, 61 by 38 meters across, is situated on a terrace 100 meters from the present course of the Yamhill River and six miles upriver from the Fuller Mound. The site overlooks a lower area which is perennially flooded during the winter and early spring. Eighteen human burials were recovered, some with interesting associations. All were flexed laterally except one which was dorsally flexed. One male burial was found with a "killed" mortar at its knees; also at his knees was a small stone bowl with a shallow basin. A second burial, also a male, was associated with a finely carved head of bone. This effigy was markedly similar to late bone carvings described for the Dalles Region of the Columbia Valley (Strong, Schenk, and Steward 1930). The dorsally flexed burial, an adult female, held in its left hand a shaped phallic pestle. The flexure of this burial marks the only such deviation recorded for the Willamette Valley.

Many more artifacts were recovered from this mound than from Fuller. Five hundred projectile points were recovered; Type Ila predominates, followed by Types 7a and 8a. The proportions are quite similar to those obtaining at the Fuller Mound. In addition to a large amount of bone and shell material and flaking debris dispersed throughout the mound mass, many bone and antler artifacts were recovered. These include antler tine flakers, antler wedges, bone awls, antler camas digger handles, bone beads, bone pendants, bone harpoon collar, bone gig barb, and a possible bone projectile point. The collar is common to the Columbia River, and bone projectile points to the southwestern coast of Oregon. Many scrapers, knives, and drills were found throughout the deposit. V-grooved sinker stones were recovered, all from the
upper third of the mound. Mortar and pestle fragments were found; one of the mortars was collared by an unusual rectangular design. The beads found were, with one exception, made from molluscan species used also at Fuller Mound including Olivella, Littorina, and Dentalia. The single exception was an abalone pendant (Haliotis rufescens) found near the surface. Historic material was also found near the surface, including glass beads and copper fragments.

Activity: The large quantity and many types of projectile points, scrapers, knives, and awls indicate that large game and diversified hunting, and related economic activities such as butchering and hide processing were important pursuits at Fanning Mound. Its riverine location, the presence of fish vertebrae, and the presence of sinker stones and harpoon barbs attests to the importance of fishing. Camas digger handles were common, but there is no evidence of camas ovens. Camas gathering and roasting may have been carried out at a specific location away from the mound. The mortars and pestles demonstrate the importance of food grinding activities. The abundance of tine flakers and flaking debris is evidence that tool manufacturing was an important activity. Trade was undoubtedly important, as evidenced by the number of non-autochthonous artifacts. As with Fuller, the Fanning Mound burials of all ages and both sexes indicate that it served as a general base camp.

Seasonality: The range of activities attested indicates that habitation probably was year-round. Hunting is likely to have been a fall to spring activity and grinding and milling a late spring and summer activity.

Age: No absolute dates are available but the artifact inventory indicates that Fanning Mound was inhabited possibly as late as the early 1800's. The effigy head, antler camas digger handles, glass beads, and copper fragments in the upper level are indicative of late Period IV and Period V.

Basic Sources: Laughlin (1943); Collins (1951); Murdy and Wentz, this volume.

MISCELLANEOUS SITES

Three discoveries are listed here separately because they are isolated finds. All pertain to the earlier ranges of time.

The Lebanon Site

Description: The Lebanon Site marks the possible association of man and mammoth in the upper Willamette Valley. The occurrence is at a
spring located in a swale on the valley edge above the 800 foot contour. The top bed of the site deposit consisted of brownish soil, extending to a depth of 48 centimeters. Underlying this was a bluish clay which extended below the limits of the excavation. In the brown soil stratum several fragments of worked stone were found. A bone chisel, found eleven years earlier by W.S. Laughlin and thought to have been in association with fossilized mammoth bones, was shown through subsequent microanalysis of the soil contained in its interstices to have come from this brown upper layer. In the underlying clay stratum a large section of badly deteriorated mammoth bone was found. Close by occurred a possible flaked stone artifact.

**Age:** Based on pollen analysis of a mammoth-bearing stratum elsewhere in the Willamette Valley, Hansen (1949:467) offers an estimated date of between 9,000-10,000 years ago for proboscids in the area.

**Remarks:** While the association between stone and mammoth is apparently sound, the artifactual nature of the stone is problematical.

**Basic Source:** Cressman and Laughlin (1941).

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The Templeton Site (Sometimes referred to as Tangent Site)

**Description:** The Templeton Site is the scene of a reported association of mammoth bones, a Yuma point, and a Sandia point. The find was made in 1895 and came to the attention of L.S. Cressman some fifty years later. Mammoth bones were reportedly seen sloughing out of the clayey sidewalls some four to seven feet down in an artificially dug drainage ditch. The ditch was located in an area subject to ponding and bog-like conditions, between the Calapooia River and Muddy Creek. A lanceolate point later assigned to the Yuma type was found adjacent to the faunal remains and a possible Sandia point occurred some 75-100 feet away in the same stratum. Cressman sought the opinions of Frank Hibben and Frank H.H. Roberts Jr. as to the point type identifications. Roberts opined that they might well be authentic if slightly aberrant forms. The circumstances of finding convinced Hibben of their authenticity.

**Age:** As with the Lebanon finds of Cressman and Laughlin (1941) just 18 miles away, the age of the Templeton mammoth might be put somewhere between 9,000 and 10,000 years ago.

**Remarks:** The difficulty in accepting this find lies in the nature of the discovery rather than the artifacts themselves. They did not come to light under the most suitable conditions for scientific acceptance, having been initially made by a non-professional and reported only 50 years later on the basis of his recollections.

**Basic Source:** Cressman (1947).
**Description:** A buried hearth was exposed in the cutbank of the Luckiamute River approximately seven miles from its confluence with the Willamette River. The excavation, conducted by professional geologists and soil scientists, revealed a fire hearth 80 centimeters in diameter at a depth between 109-150 centimeters. The hearth contained 250 thermally cracked and discolored cobbles, five charred acorns, and abundant charcoal. The charcoal was identified as Douglas Fir (Pseudotsuga Menziesii) and bigleaf maple (Acer macrophyllum). No artifacts were recovered.

**Age:** Charcoal from the bottom of the hearth was dated at 5,250 + 270 B.P. (I-1472) making this the earliest dated representative of Period III.

**Basic Source:** Reckendorf & Parsons (1966).

**INTERNAL RELATIONSHIPS: SETTLEMENT DISTRIBUTION IN RELATION TO VALLEY ENVIRONMENT**

The first part of this section summarizes the seasonal and non-seasonal activities represented at the sites just described, in terms of the criteria developed in an earlier section. This forms the basis for a sketch of the postulated seasonal round of prehistoric Willamette Valley inhabitants. The sketch applies to Period IV, 250 B.C.-A.D. 1750, during which all the valley sites were occupied. Evidence of earlier and later occupation is too scant and scattered for treatment in this way.

Valley edge sites, of which five were described, contained among them evidence of five of the eight differentiated activities identified from Upper Willamette Valley sites. There was no evidence in these sites of camas gathering and processing, fishing, or woodworking. Of the five principal activities, diversified hunting (3 sites), tool manufacturing (3 sites), and hide preparation (3 sites) were the most common. Grinding and milling was in evidence at only one valley edge site. The maximum number of activities demonstrated at a single site was three; this occurred in two cases. Of the five activities represented, two, grinding and milling and the hunting of large game, were denotive of season and in both cases the seasonality was the same: late spring through summer.

Valley edge sites were occupied during the last three of the five Upper Willamette Valley periods. On the basis of a single radiocarbon date from 35 LA 70, modern to 200 B.P., (Gak-3116), and comparison of the remaining sites' artifact assemblages to sites of known date, four
of the five were dated to Period IV. Gettings Creek contained a trade bead on the surface indicating occupation during at least part of Period V. The Fall Creek Sites are assumed to have been inhabited, at least in their early stages, also during Period III, as the combination of Type 3a points with Type 4a bipoins appears to be reflective of this period.

On the basis of these findings, the following generalizations are made concerning valley edge sites:

1. Valley edge sites were task sites rather than base camps and were occupied during Periods III, IV, and V.

2. The sites were occupied primarily during the late spring and summer. These were times when certain of the larger species such as deer and elk would leave the hot and insect-ridden valley floor and would be available in the valley edge environment. Grinding and milling, represented at only one site, were also summer activities.

Narrow valley plain sites are the most poorly represented of the types in this study. Only two sites were classified in this category and both, Dery and 35 LA 118, are known only from surface collections and limited test excavations.

The two narrow valley plain sites contained evidence of three principal activities; diversified hunting, woodworking, and grinding. At Dery, grinding implements comprised 51 percent of its total artifact inventory, and it is assumed that Dery was a task specific site focusing on the processing of wild floristic resources. Acorns were probably the principal plant resource utilized, as Garry oak is a prominent species in the local plant community. Neither site showed any evidence of camas baking which is somewhat surprising as camas is abundant in the area. Neither were such activities as the hunting of large game, toolmaking, hide preparation, or fishing in evidence.

On the basis of tool types, Dery is dated to Period IV. Site 35 LA 118 had a radiocarbon date of 980 +120 B.P. (Gak-3117) from a hearth in the bottom-most stratum, and a 19th century bottle glass scraper on the surface. Occupation appears to have overlapped Period IV and Period V.

Obviously conclusions must be tentative due to the small sample of sites, but the following points are indicated:

1. Narrow valley plain sites were task sites rather than base camps and were occupied during Periods III and IV.

2. Plant resources (acorns) were emphasized over faunal ones. Of the four activities represented, three deal with plant resources.
3. Occupation of narrow valley plain sites was during the summer months. Grinding and milling are summer pursuits.

Primary flood plain sites represent the largest class of Upper Willamette Valley sites. Eleven, or 50 percent, of the 22 sites treated in this study were primary flood plain sites. Of the eight activities described for Upper Willamette Valley sites, six were carried out at one or more of the primary flood plain sites. Only fishing and grinding activities were not evidenced. The fewest activities at one site was one; this was at Miller Mound where only diversified hunting was indicated. Four sites had as few as two activities; these were Benjamin 1 and 2, Smithfield, Perkin's Peninsula, and Miller Farm. Two sites, Spurland and Hurd, had evidence of five and six activities respectively. One activity, diversified hunting, was carried out at every primary flood plain site. Camas gathering and processing was carried out at eight of the eleven sites.

With the exception of Kropf, Simrock, and Miller Mound, all of the primary flood plain sites emphasized activities reflective of specific season. Camas gathering, confined to the late spring and early summer, was used to determine the seasonality of eight of the eleven sites. Hunting of large game likely took place in the fall and winter (game would be scarcer in the summer months on the valley floor because of heat and insect pests). Two sites also having evidence of the exploitation of large game, Virgin Ranch and Spurland, may have been occupied most of the year.

A wide variety of activities and/or the presence of many burials were considered indicative of base camp rather than activity site occupations, and three primary flood plain sites, Lingo, Hurd, and Spurland, fell into the base camp category.

Three primary flood plain sites, Lingo, Benjamin and Hurd, were radiocarbon-dated, and all three contained dates which would place their earliest occupations in Period III. The earliest date for a habitation site in the Willamette Valley comes from the bottom levels at the Lingo Site, C-14 dated at 4130 ± 110 B.P. (Gak-1120). In addition to dates showing Period III occupation, each of these sites also contained dates falling within Period IV. Ten radiocarbon dates ranging between 1120 ± 140 B.P. (Gak-3110) and 330 ± 110 B.P. (Gak-3106) came from archaeological features of the Hurd Site; all fall within Period IV. The remaining primary flood plain sites were dated by comparative typology. Only Spurland Mound contained historic copper beads and buttons, indicative of a Period V occupation.

The following generalizations apply to primary flood plain sites:

1. They were generally occupied in the late spring and early summer. This is after the peak of the seasonal flooding and during the period when the camas bulb is harvestable.
2. Some (Virgin Ranch and Spurland) may have been occupied year-round.

3. Certain primary flood plain sites were base camps; others task specific sites.

4. These sites were occupied from as early as 4000 B.P. through to historic times in Periods III, IV, and V.

Four riparian sites were described. One of them, Shedd, was badly degraded and unsystematically excavated, and probably not representative of riparian sites in terms of its artifactual returns. With the exception of Shedd, which had evidence only of grinding, the riparian sites displayed a wide range of activities. Large game hunting, toolmaking, and diversified hunting were emphasized at three of the four sites, and all three are describable as base camps.

All four of the riparian sites had activities reflective of seasonality. The combined activities of hunting and grinding found at three of the sites are indicative of year-round habitation.

The artifact assemblages at Halsey and Shedd indicated Period IV habitation. The Fuller and Fanning mounds likewise were occupied in Period IV, but also contained artifacts characteristic of Period V, including copper trombac buttons and glass trade beads.

The following statements seem warranted:

1. A wide variety of activities were carried out on riparian sites. Most were probably base camps.

2. Occupation was year-round and took place during Periods IV and V.

In summary, among Upper Willamette Valley sites as a whole, diversified hunting was the most ubiquitous activity recognized, being represented at 18 (82%) sites. Evidence of this activity was found in all types of sites.

Two activities, camas gathering and fishing, were geographically limited in their occurrence. Camas gathering was confined to primary flood plain sites and fishing to riparian sites; eight (73%) of the primary flood plain sites indicated camas gathering and two (50%) of the riparian sites indicated fishing. It seems quite likely that sites in these settings were selected primarily for these reasons.

Grinding as an important activity took place in three of the four environmental zones. Both of the sites in the narrow valley plain and three of the four riparian sites emphasized it. By contrast, it was not found to have been more than a casual pursuit in any of the
Figure 5. The Period IV Upper Willamette Valley Subsistence-Settlement Pattern.
eleven primary flood plain sites. There is a simple explanation for this. Grinding is part of the processing of floristic resources where the seed is contained within a tough integument. Camas bulbs are tender when harvested and upon cooking do not need to be ground. In areas where seeds were exploited, grinding was an important activity; in areas where the camas was the principal plant resource, grinding tools were not needed.

Five of the upper valley sites (23%) indicated year round occupation; of this number, three were riparian and two primary flood plain sites. Valley edge and narrow valley plain sites appear to have been occupied in the spring and summer months.

Examination of the assemblages from the Upper Willamette Valley Sites demonstrates a certain homogeneity. It is not the presence or absence of artifact types per se that differ from site to site, but their percentages and frequency of occurrence. These percentage differences in otherwise similar assemblages allow the inference that we are dealing with a situation wherein the same or closely related people are utilizing different sites in different seasons for different reasons.

During the fall and winter months certain primary flood plain and riparian sites were occupied. Principal activities at that season were the hunting of large and small game. Hunting was still an important activity in the spring and summer but was more likely to have been carried out in the valley edge environment, an area away from the hotter and wetter valley lowlands, and in which the larger wandering species are likely to have been concentrated. Those people who stayed the spring and summer on the valley floor would continue to hunt, but hunting done at this time is likely to have been of occasional mammalian "targets of opportunity" taken when major expenditures of time and energy were directed in other directions. It is clear that the activity at primary flood plain sites during the spring and summer months was camas gathering and processing. Such ancillary activities as toolmaking and woodworking could be carried out during any season, and hide preparation would occur in conjunction with hunting activity. Fishing could take place year round in riparian sites. Figure 5 illustrates the probable seasonal subsistence-settlement pattern.

In the present sample of Upper Willamette Valley sites there are many more spring-summer sites than fall-winter ones. Presumably this reflects the character of the economic round. Spring and summer represent seasons when aboriginal communities were probably broken up into activity groups occupying small task specific sites. Camas gathering would be the major activity handled in this manner. Fall and winter, on the other hand, would be those seasons when the local communities regrouped and settled in larger aggregations. In short, there may have been more sites occupied throughout the valley during the spring and summer than during the fall and winter. Sampling error
might accentuate this numerical disparity. Since primary flood plain sites are the most numerous kind, they would tend to be over-represented in the sample in comparison to less common, hence less readily located kinds.

Figure 5 shows the spatial relationship between sites of the several types, and from the distribution it is tempting to postulate small, localized communities consisting of a site showing year-round use, surrounded by a series of spring-summer and fall-winter sites. An arrangement of this sort is conceivable, but must be asserted with caution. Some year-round sites contain traits indicative of activities associated with both the fall-winter and spring-summer seasons, yet are quite limited in terms of the total range of possible activities represented. I would be inclined to ascribe a pivotal role only to those sites characterized on the basis of their artifact assemblages as base camps; a diversified range of seasonal and non-seasonal activities, and the presence of burials, would seem more definitive criteria for centrality than seasonality per se. Probably the principal sites in the Willamette Valley settlement system (as now known) were the Spurland, Halsey, and Fanning mounds. No base camps are described for either the valley edge or the narrow valley plain, but this may be a result of inadequate sampling, and it would be unwarranted to assert that base camps were restricted to the Primary Flood Plain and Riparian zones, where the present examples appear. The possibility also remains of course that some groups may not have maintained base camps in the above sense at all, simply shifting between task-specific stations throughout the course of the year.

EXTERNAL RELATIONSHIPS

Several Upper Willamette Valley sites contain artifactual evidence of possible extra-valley connections. With the exception of the Fall Creek Dam Reservoir sites and possibly the putatively early finds at Lebanon and Templeton, all of the instances of extra-valley cultural relationships seem to occur in sites of late Period IV or Period V.

Many cultural traits found in valley sites, such as dentalia, abalone pendants, antler flakers, antler wedges, tubular bone beads, camas digging stick handles, ear spools, feather ornaments, and skull deformation, were in such common usage among neighboring non-valley groups that it is difficult to determine precisely from whence they came.

Eleven major natural corridors were available to prehistoric peoples visiting or leaving the Upper Willamette Valley; these included avenues 1) to the north by way of the Columbia River; 2) to the south over Calapuya Pass near the head of the Coast Fork of the Willamette River; 3) to the southeast by way of the Middle Fork of the Willamette
River; 4) to the east over Barlow Pass on the south of Mount Hood; 5) to the east via the McKenzie Pass over the summit of the Cascades; 6) over Hogg Butte Pass, south of Mount Jefferson; 7) to the west via the Siuslaw River; 8) to the west over Marys-Yaquina River Pass; 9) to the northwest via the Nehalem River; 10) to the northwest over Tillamook Pass; and 11) to the west through the Eugene-Florence corridor. No archaeology has been done in the area of these natural corridors to specifically determine the role played by them as avenues of culture contact between valley and non-valley groups.

A site-by-site discussion of extra-valley traits found in the Upper Willamette Valley will indicate the range and intensity of extra-valley affinities. The sites are treated in order of their south-to-north distribution, from the southern end of the Willamette Valley toward the Columbia River.

It may be that early hunters entered the Willamette Valley via the McKenzie Pass from the east. The earliest valley occupants probably possessed many of the traits seen in the early assemblage from Cascadia Cave which has affinities with sites east of the Cascades in the Fort Rock Valley and other localities.

The Fall Creek Dam Reservoir sites contain many projectile points similar in type to those described by Marchiando (1965) for the Umpqua River. The geographical location of the Fall Creek Dam Reservoir sites would make physical contact with the Rogue River and Umpqua Valleys a relatively simple matter.

The Gettings Creek sites, like those at the Fall Creek Dam Reservoir, are valley edge sites situated in the extreme Upper Willamette Valley. The projectile point inventory contains a significant percentage (14%) of the types described by Cole (1968) and Marchiando (1965) as common in the Fall Creek and Umpqua River areas. Three Type 16 (Desert side-notched) points indicate possible extra-valley affiliations in the later part of Period IV. Glass trade beads attest to Period V White contact.

At 35 LA 118, on the Coast Fork of the Willamette River, a single artifact points to possible extra-valley relationships. One projectile point, typologically unique in valley collections, resembles the Great Basin type, Surprise Valley split-stem. Historic Euramerican connections are evidenced by the use of a 19th century wine bottle as raw material for a scraper.

At 35 LA 70, C-14 dated at modern to 200 B.P. (Gak-3116), three Type 16 (Desert side-notched) projectile points were recovered. Bedrock mortars, which also occur there, are common in northeastern California (Voegelin 1942:73) where they are known for the Achomawi, Maidu, and Modoc. They are not mentioned ethnographically for the Plateau (Ray 1942:143), Northwest California (Driver 1939:324), or for
the Oregon coast (Barnett 1937:167). As the Desert side-notched point was also known among some Northeastern California groups (Voegelin 1942: 71) these traits may have entered the valley together from that direction at a relatively late date.

The Benjamin Sites contained two similar Type 16 points but nothing else reflective of possible extra-valley connections. After 1500 these points were fairly widespread in the Columbia River area.

Two of the six burials from Spurland Mound are quite clearly historic. The uppermost burial was associated with rolled copper beads, dentalia, and a bearskin blanket. The second burial, also originating in the upper level, contained copper buttons, marine shells, and an abalone pendant. Lewis and Clark (Thwaites 1905:328) observed that sheet copper was an important item of trade along the Columbia River in 1804. Dentalia was an important item to Indians along the coasts of Northern California (Driver 1939:333) and Oregon (Barnett 1937:174), as well as on the Columbia Plateau (Ray 1942:171). Abalone pendants had the same wide distribution. Salt-water marine shells obviously originate among coastal groups but their use is so universal that they could have been introduced into valley sites either directly from the coast or from the Columbia River.

The Halsey Mound contained no historic trade goods but did contain a relatively large number of bone and antler tools including flakers, wedges, fleshers, and awls. Bone artifacts are common in Columbia River sites.

The Shedd Mounds contained three pieces of archaeological evidence indicating probable extra-valley influence: a dressed mortar collared with an incised V design, a well-made obsidian blade of classic Yurok type, and the trait of "killing" of funereal artifacts. The "killing" of grave goods was common in Northwest California (Driver 1939:354), and Northeast California (Voegelin 1942:137), and less common but present among Plateau groups (Ray 1942:217) and the Oregon Coast tribes (Barnett 1937:183).

Of the sites so far reported, Fuller and Fanning Mounds represent the greatest proportion of non-valley traits. The propinquity of these sites to the Columbia River Chinookan area undoubtedly explains the richness of their extra-valley artifact inventory, for the lower Willamette Chinooks were middlemen in the ethnographic littoral-interior trade (Drucker 1955:12). Copper ornaments, feather ornaments, tubular bone beads, marine shells, camas digger handles, frontal and occipital cranial deformation, and ear spoons are known archaeologically and ethnographically for the Northwest Coast of California, the Oregon Coast, and the Columbia Plateau. Three distinctive artifacts may indicate more precise cultural connections. Of the two whalebone clubs known from the Willamette Valley, the one from Fuller Mound; incised with a geometric bird design, is quite similar to those described by
Steward for the Columbia River (1927:255-261). The waisted obsidian blade from Fuller is identical to types recovered by Cressman from Gold Hill in Southern Oregon (1933:18), and less similar to obsidian blades found elsewhere. The effigy head carved from bone was quite similar to those reported by Strong, Schenck and Steward (1930) for the Dalles region.

Petroglyphs discovered on the northern edge of Patton Valley, very near the territory of the Chinookan-speaking folk of the lower Willamette, are anthropomorphic stick drawings which Davis (1970:14) considers similar in rendition to the petroglyphic figures of the Middle Columbia River known locally as "Wishram Water Devils."

Groups occupying the area around the mouth of the Willamette River would naturally have contact with groups upriver, and exchange systems would and did develop in a north-south direction. But the Willamette Valley, unlike the Columbia Valley, does not extend from one well-defined province into another. The Willamette Valley is pinched off in its southern end by mountain ranges which separate it from Northern California and the southern Oregon coast. Hence, unlike the development along the Columbia, where exchange was more or less two-way and groups in the middle benefited by being at the "cross-roads," that which developed in the Willamette Valley tended more to a one-way flow with innovations spreading southward in decreasing intensity. The Willamette Valley may be better thought of as a cul-de-sac than as a crossroad. Passages into the southern part of the valley do exist but these are small and subtle when compared with the openness of the Willamette-Columbia confluence. These limited accesses apparently account for diffusion into the extreme Upper Willamette Valley of the relatively few traits found there that are peculiar to groups to the south.

The fact that bone artifacts in general are absent from valley sites south of Spurland Mound must be explained in a similar manner. Bone artifacts were extra-valley in origin, relatively late in arriving (all of the sites containing them appear to have late terminal dates, and the artifacts themselves are confined largely to the uppermost levels), and diffused in a general north to south direction from the Columbia region. As was stated earlier, differential preservation alone cannot explain the presence or absence of bone tools at the southern sites, because many sites containing no bone artifacts had varying quantities of unmodified faunal material, including human burials. Also, findings from the Hurd Site, the Benjamin sites, and the Lingo Site demonstrate that the former inhabitants considered camas gathering and preparation as important seasonal activities; yet antler camas digger handles are absent from all of these sites.

It is tempting to postulate that the impetus to a late and rapid spread of Columbia River traits into the Willamette Valley was given by the influx of European goods into the Lower Columbia within the last
300 years. Lewis and Clark were relatively late arrivals at the mouth of the Columbia in 1806; the Chinookan people they encountered had already had a long history of contact with Europeans, and exhibited such goods as muskets, metal knives, brass kettles, sheet metal, buttons, and beads (DeVoto 1953:307).

SUMMARY AND CONCLUSIONS

Upper Willamette Valley archeological sites have been divided into four types depending on their environmental situation. Activity complexes have been inferred from the recovered artifacts, and seasonality of occupation has been inferred from a consideration of the activities attested, in conjunction with the environmental setting.

Eight activity complexes were identified: large game hunting, tool manufacturing, hide preparation and processing, camas gathering and processing, diversified hunting, fishing, woodworking and grinding and milling. Most sites exhibited from one to three activity complexes, and were identified as task-specific locations; several contained human burials, and displayed a broader range of activities, leading to their identification as base camps.

Valley Edge Sites (Type I) are those located above the 500 foot contour on the slopes and tops of ridges bordering the numerous tributary valleys of the Willamette River. These sites, of which four are treated in this study, were occupied in the spring and summer when the hunting of large game and grinding were principal activities.

Narrow Valley Plain Sites (Type II) are located on the narrow strath bordering the tributary rivers and streams in the extreme upper valley. These sites, of which two are treated in this study, were occupied in the late spring and summer when grinding of floristic resources was the principal activity.

Primary Flood Plain Sites (Type III) are those located on the low flat flood plain of the Willamette River. These, of which 11 are reported on in this study, were generally occupied in the spring and summer when camas gathering was the principal activity. Some may have been occupied also in the fall and winter, during which time the hunting of large game was an important activity.

Riparian Sites (Type IV) are those located immediately adjacent to the larger perennial streams tributary to the main Willamette River. These sites, of which four are reported on in this study, were occupied year round; the hunting of large game, grinding, and fishing were principal subsistence activities.
It seems likely that the Willamette Valley has been continuously occupied for at least the last 6,000 years. The prehistory is divided into five tentative periods or phases.

Period I ranges between 8,000 and 6,000 B.C. and is the most speculative, represented by the possible association of typologically early point types and the bones of extinct mammoth.

Period II, between 6,000 and 4,000 B.C., represents an early, but post-big-game-hunter occupation, indicated by findings made at Cascadia Cave and the Geertz Site. The principal distinguishing feature of this period is the point inventory, which consists exclusively of lanceolate bipoins.

Period III, between 4,000 and 250 B.C., represents an occupation that is poorly known, represented by materials from the earliest levels of several predominantly Period IV sites. During this period thick, side-notched points are found in conjunction with the lanceolate bipoins.

Period IV, 250 B.C. to 1700 A.D., is the most completely known. Assemblages from sites of this period demonstrate a wide range of seasonally associated activities. It was during this period that the Upper Willamette Valley probably reached its populational peak. All excavated valley sites were occupied during this period.

Period V, or the protohistoric and historic period, dates between 1700 and approximately 1850 A.D. Sites of the full historic contain European trade goods.

Change over time was relatively slow and some tool types persist through several periods. The most radical changes appear to have taken place after mid-Period IV when exotic traits and artifacts turn up in site inventories with increasing frequency.

The distribution of upper valley sites and an analysis of their respective activity foci indicates that the prehistoric inhabitants of the Upper Willamette Valley during Period IV at least, practiced a subsistence-settlement pattern in which a broad spectrum of flora and fauna was utilized in the course of a seasonal round. From certain strategically located base camps, activity groups were deployed seasonally to specific resource areas where task specific sites were located.

A strong case can be made for contact and exchange during and after Period IV between valley groups and those occupying adjacent areas. Littoral mollusc shells and beads, whalebone clubs, antler camas digger handles, fronto-occipital cranial deformation, obsidian blades, a bone effigy head, glass beads, bottle glass, copper tubing, iron knives, and copper buttons attest to extra-valley contacts, some apparently stimulated by the European intrusion.
While in many cases it is impossible, at this stage anyway, to determine the precise point of entry of many of the extra-valley traits, the evidence indicates that at least two sections of the valley articulated with different adjacent areas. Willamette sites located adjacent to the Chinookan area below Willamette Falls display numerous artifacts undoubtedly borrowed from these Columbia River middlemen. The most elaborate and persistent extra-valley relationships assuredly occurred at this juncture. Valley edge sites located in the extreme upper valley contain tools which bear certain typological similarities to those described for groups beyond the southern perimeter of the Willamette Valley.

Kroeber (1939:30) felt that the Willamette Valley was best construed as an inland modification of a primitive riverine phase. He must certainly have been basing his judgment on the Lower Willamette Valley groups, for the Upper Willamette Valley people would have to be considered as being one step farther removed from this. Inhabitants of the Upper Willamette Valley were practitioners of a seasonal round subsistence pattern which happened to be centered in a large river valley; but they were exploiters of a broad spectrum of resources, and while the valley habitat supplied their essential needs, they were not especially "riverine" in orientation; certainly not in the sense that groups below the Willamette Falls or along the Columbia River were.

APPENDIX I
THE 1970 UPPER WILLAMETTE VALLEY ARCHEOLOGICAL SURVEY

In the summer of 1970 an extensive archaeological reconnaissance of the Upper Willamette Valley was conducted by two teams led by Michael D. Southard and John A. Woodward. This survey was commissioned with the location, mapping and discriminant testing of aboriginal sites within the Upper Willamette River drainage.

From Eugene, Oregon, as the center and base of operations, two teams of surveyors were deployed, one to the north and one to the south. The team led by Southard, working to the south, reconnoitered the lower altitudes of the McKenzie River drainage 8 to 15 miles east of Eugene, the drainage of the Middle Fork of the Willamette River between the towns of Springfield and Lowell, and the drainage of the Coast Fork of the Willamette River between Eugene and Cottage Grove. All but two of the sites mapped and tested by this team were within the larger Willamette River drainage and all are assignable to the geographic area occupied historically by Kalapuya-speaking peoples. The two exceptions were sites located near Winchester Lake at an altitude of approximately 5,000 feet and well within the Cascade Range.
The survey team led by Woodward reconnoitered the broad Willamette River flood plain between Eugene and Albany, concentrating its efforts along the Calapooia River, a right bank tributary of the Willamette. As major portions of the Upper Willamette Valley are under cultivation during the spring and summer months, it was not possible to examine some localities where the presence of sites was suspected; on the other hand, because of the widespread farming of the valley floor, it was relatively easy to find informants familiar with the landscape who knew the location of many sites.

In his end-of-season memorandum report, Southard (1970:24) separated his 67 located sites into two categories. Thirty-five sites were found along the edges of valleys at junctures between valley and uplands. These sites, commonly located near springs or on permanent streams, he terms "valley-edge sites." They are located above the 550-600 foot contour either on the gradual slopes of hills or on ridgetops. Thirty-two sites on the valley floor near tributary streams or old channels were termed "flood-plain sites."

Woodward in his memorandum report (1970:6-7) makes no explicit physiographic distinctions between the 29 sites he located, but while arguing for a geographical homogeneity, he implies a distinction between sites located along ephemeral streams and "midden-mounds on the perennial streams."

An examination of the data from all 96 sites recorded by these two teams suggested the existence of at least four types of sites, based on environmental location. These four types are those discussed at length in the body of the present paper. They represent a minimum for the Willamette Valley, and further research may well add to this number. Elevations given below are estimated from United States Geological Survey 7 1/2 and 15 minute Quadrangles. Only sites for which surface collections were obtained, or which exhibited important surficial cultural features, are described. Survey forms recording the locations of all sites, and the collections from those sites yielding artifacts, are on permanent deposit at the University of Oregon Museum of Natural History, where they may be examined by interested scholars.

**VALLEY EDGE SITES**

Valley Edge Sites offered three primary advantages to the former occupants. 1) They are located near permanent water, either a spring or spring-fed stream. 2) They are above the calamity of annual flooding. 3) Their transitional situation invites exploitation of resources (floral and faunal) of both valley floor and uplands.
Thirty-five sites of this type were recorded: 35 LA 56, 57, 59, 60, 61, 64, 67, 69, 70, 92, 94, 96, 97, 98, 99, 100, 101, 102, 103, 105, 108, 113, 114, 115, 122, 123, 124, 125, 126, 135, 136, 138, 140, 141, 142. Of this total, 18 yielded collections sufficient to warrant analysis, and 4 (35 LA 60, 35 LA 67, 35 LA 70, and 35 LA 92) were test excavated.

35 LA 60

Location: Pleasant Hill area near Seller's Butte.

Elevation: 550-600 ft.

Setting: Located on a flat at base of hill adjacent to a spring. Site covers approximately 2-3 acres in area.

Test Pits: Stratum 1 (0-30 cm.) - reddish-brown clayey loam with very little humic material. Stratum 2 (Below 30 cm.) - red clay with no organic remains.

Cultural Remains: Waste consisting of chert and obsidian flakes. Biface fragment of obsidian.

Remarks: Owner Hammond has many artifacts reportedly taken from the surface of this site. Included are points of the following Types: 1a, 2a, 3a, 3b, 4a, 5a, 6, 7a, 7b, 8a, 8b, 10, 11a, 14b, and 16. Oval and convex end scrapers are well represented, as are mortars and pestles.

35 LA 67

Location: Pleasant Hill area.

Elevation: 520 ft.

Setting: Located adjacent to a hillside spring on the east edge of the valley of the Coast Fork of the Willamette; site is approximately one acre in area.

Test Pits: Stratum 1 (0-40 cm.) - reddish-brown clayey soil with gravel and rocky bits; very little humic material. Stratum 2 (40-80 cm.) - red soil with sandy texture and less gravel than Stratum 1.

Cultural Remains: Waste flakes from all levels, including petrified wood. Thermally fractured basalt cobbles. Biface fragment; probably knife. Amorphous core of chert.
Remarks: Very little obsidian was recovered either as waste or finished artifacts.

35 LA 70

Location: In uplands on north of Camas Swale Creek Valley.

Elevation: Above 600 ft.

Setting: A small rock shelter 2 by 3 meters in area and within a few meters of an intermittent stream.

Test Pits: Strata 1 and 1a (0-30 cm.) - dark humic soil laden with decomposed organic material. Stratum 1a is a dark soil lacking the decomposed material. Stratum 2 (30-47 cm.) - a compact yellowish brown soil cemented through leaching from above. Stratum 3 (37 cm. to bedrock) - medium brown soil with much roof fall.

Cultural Remains: Two hearths from stratum 2 and one from Stratum 1a. Charcoal was collected from each. Flaking debris. Bone, unidentified as to species. Three points, types 16, 10, 8b. Two hammerstones.

Remarks: Charcoal taken from the uppermost hearth in stratum 1a returned a date of modern to 200 years B.P. (Gak-3176). Located immediately adjacent to the rock shelter were several bedrock mortars.

35 LA 92

Location: Camas Swale area.

Elevation: 550-600 ft.

Setting: An open site located around several springs at the base of a hill on the south edge of Camas Swale. Three or four acres in area.

Test Pits: Stratum 1 (0-75 cm.) - dark brown midden soil with high clay content. Stratum 2 (below 75 cm.) - reddish brown clay.

Cultural Remains: Waste flakes. Five points, 1 type 7a, 3 type 2b, and 1 unidentifiable. Scrapers included 2 convex end-scrapers, 3 irregular scraper, and 1 combination end-and-side-scaper. Other artifacts were 3 bifaces, 2 graving points, 2 oval knives, 2 unifacial choppers, 1 mortar fragment, 1 bifacial chopper, 1 pecking stone, 1 platform core nucleus.
Remarks: An estimated 1500 to 2000 points have reportedly been recovered from the surface over the years by collectors. A minimum amount of obsidian and basalt was noted.

35 LA 57

Location: Pleasant Hills area.

Elevation: 640 ft.

Setting: Open site adjacent to intermittent stream at the base of Pleasant Hill Ridge. Stoney alluvium.

Surface Finds: Waste flakes, point (Type 8a), scraper (end-and-side), spokeshave, chopper (crude uniface).

35 LA 64 (Stutz Site)

Location: Pleasant Hill area.

Elevation: 650-700 ft.

Setting: Open site located on hilltop, adjacent to steep slope.

Surface Finds: Waste flakes, 2 shaped pestles, 1 unshaped pestle, 2 mortar fragments, unifacial chopper-ax.

35 LA 96

Location: Southeast flank of Sellers Butte.

Elevation: 600-680 ft.

Setting: Open site on flank and top of butte. Prior to 1950 the site was in timber.

Surface Finds: Waste flakes, type 8a point, unifacial chopper.

Remarks: Apparently extensively collected by amateurs.
35 LA 100, 106, 107, 108 (Gettins Creek sites)

Location: Gettins Creek area, between the North Fork of Gettins Creek and Gettins Creek proper.

Elevation: 600-800 ft.

Setting: These four open sites are located within a mile of each other on the hillsides flanking the mouth of Gettins Creek, a tributary of the Coast Fork of the Willamette River.

Surface Finds: Waste flakes, oval scraper, unifacial chopper (ax). Collector Ray Vincent loaned for analysis some material which he had collected from the surface of these four sites. His collection includes: 79 identifiable points; - 2 Type 8b, 2 Type 9, 2 Type 1a, 25 Type 7a, 10 Type 8a, 15 Type 10, 5 Type 11a, 3 Type 12, 10 Type 4a, 2 Type 4b, 1 Type 5b, 4 Type 3a, 3 Type 3b, 1 Type 14a, and 1 Type 14b; 20 miscellaneous points and fragments; 12 oval scrapers; 10 drills; 7 bifaces (knives); 1 trade bead (pink, 1.2 cm. in diameter).

Remarks: 35 LA 108 is approximately 1/2 mile long, east to west.

35 LA 114

Location: South flank of Camas Swale Creek valley.

Elevation: 650-700 ft.

Setting: An open site on both sides of a small spring-fed stream.

Surface Finds: Waste flakes, biface fragment, point fragment (large, unidentifiable), unshaped pestle fragment.

Remarks: A minimum amount of obsidian and basalt was found among the waste.

35 LA 138

Location: South flank of Camp Creek.

Elevation: 550 ft.
Setting: An open, thin scatter of midden soil along the east side of Camp Creek.

Surface Finds: Waste flakes, point fragment (unidentifiable), spokeshave.

Remarks: Owner Seibert allowed the survey to look at his small collection of points found on the surface. His collection includes: Types 4a(1), 5a(1), 10(3), 11a(3), 14b(1), 15(2). A high ratio of large to small points exists.

35 LA 97

A pitted stone slab or bedrock mortar located in the Coyote Creek area at an elevation between 540 and 600 ft. No surface finds were made in the area of the slab.

35 LA 115

A petroglyph located on a hillside overlooking Spencer Creek at between 500-600 ft. elevation. It is a simple leaf-shaped pattern approximately 1.5 by 2 meters in size. No surface finds were made.

35 LA 141

A pitted boulder and scattered debris located at the head of Camp Creek at an elevation of 700 ft. Scattered lithic debris.

NARROW VALLEY PLAIN SITES

Located on low terraces on the valley floor, these sites appear to have been more intensively occupied than do the valley edge sites in the same area, as they are often marked by an appreciable build-up of midden (although no actual "mounds" were observed). The larger sites were located on the leading, or outer edges of the low terraces. Artifacts recovered from these sites demonstrate greater variety than those found on valley edge sites (Southard 1970:3-4). Site locations of this sort would seem to have the following advantages, assuming they were occupied at the right season: 1) they would allow for the gathering of staples such as camas; and 2) their proximity to ponded areas would allow the taking of marsh birds, tules, and cattails.
Thirty-two sites of this type were discovered: 35 LA 58, 62, 63, 68, 91, 93, 95, 104, 106, 107, 109, 110, 111, 112, 116, 117, 118, 119, 120, 121, 127, 128, 129, 130, 131, 132, 133, 134, 137, 139, 143, and 144. Of this total, 11 sites had collections sufficient to warrant discussion and one (35 LA 118) was test excavated.

35 LA 118

Location: Creswell area, a few yards from Bear Creek.

Elevation: 500 ft.

Setting: The midden area of this site covers most of 12 to 15 acres in a large field adjacent to Bear Creek.

Test Pits: Stratum 1 (0-30 cm.) - dark brown soil with a high clay and gravel content. The midden material was confined to this stratum. Stratum 2 (30-60 cm.) - reddish-brown clayey soil. Stratum 3 (below 60 cm.) - yellowish sandy soil.

Cultural Remains: One firepit originates between stratum 1 and 2. Twelve points, including 4 Type 8a, 2 Type 7a, and one each of Types 3a, 11a, 15, 4b, 9, and Surprise Valley Split Stem. Six unshaped pestles, 8 unifacial choppers, 5 unifacial chopper-axes, 2 stone chisels, 2 bifaces, 2 oval knives, 15 scrapers, 1 spokeshave, 1 bottle glass scraper-graver, 1 worked glass fragment, 1 maul, 1 drill.

Remarks: Charcoal taken from the firepit returned a date of 980 ± 120 years B.P. (Gak-3117). This probably represents the earliest site occupancy as the charcoal was taken from the bottom of the culture-bearing stratum. The bottle glass tool indicates occupation well into the late 1800's, as the glass fragment is from a mid-19th century wine bottle.

35 LA 58

Location: Middle Fork of the Willamette River.

Elevation: 540 ft.

Setting: An open site located on the north bank of a perennial stream tributary to the Middle Fork of the Willamette River, where the flood plain of the Middle Fork of the river widens at the Pleasant Hill area.

Surface Finds: Waste flakes, discoid, hammerstone, point (Type 8a).
35 LA 63 (Deyr Site)

Location: Pleasant Hill area. East of Mt. Pisqah, a 1000 ft. high prominence.

Elevation: 500-525 ft.

Setting: Located at the back of a terrace.

Surface Finds: None were made by the survey. R. Porter contributed a surface collection from this site to the survey. Artifacts included: Sixteen shaped pestles and fragments, 9 unshaped pestles and fragments, 4 mortar fragments, 6 unifacial choppers, 4 unifacial choppers (ax), 2 stone chisels, 2 hammerstones, 2 core scrapers, 1 core spoke shave, 1 discoid, 1 maul, 1 biface (knife), 6 points (Types 3a, 4a, 4b, 5a), 1 bone tool (flesher?), 1 edge-ground artifact of roughly laurel leaf shape 17 cm. long by 5.6 cm. wide by 2.4 cm. thick.

Remarks: Some of the unshaped pestles were unusually long. The stone chisels resemble in length and bit shape our modern cold chisels. The edge-ground artifact appears to be peculiar to this end of the Willamette Valley; others show up in private collections from this general area.

35 LA 91

Location: Camas Swale area.

Elevation: 525 ft.

Setting: A surface scatter situated on a terrace overlooking Camas Swale.

Surface Finds: Waste flakes, utilized flakes (casual), 1 point (Type 4a), 1 spoke shave.

Remarks: There is a noticeable absence of obsidian.

35 LA 93

Location: Southeast of the city of Cresswell.

Elevation: 520-540 ft.
Setting: A thin scatter of material along both sides of a former channel of the Coast Fork of the Willamette River.

Surface Finds: Waste flakes, biface fragment, scraper plane, unifacial chopper (ax).

Remarks: Collector Ray Vincent's surface finds from this site include: point Types 7a, 7b, 8a, 8b, 10 and 11a in abundance; Types 5a, 9, 14b, and 15 are represented, but less frequently.

35 LA 112

Location: Southeast of the city of Creswell. Located across the Coast Fork of the Willamette River from Site 35 LA 93.

Elevation: 520-540 ft.

Setting: Located on the back edge of the first terrace above the Coast Fork of the Willamette River and on the leading edge of the second terrace.

Surface Finds: Waste flakes, scraper (convex side), scraper (irregular), 3 unifacial choppers (ax).

35 LA 116

Location: Two miles northeast of the city of Creswell, to intermittent Bear Creek.

Elevation: 500-520 ft.

Setting: A mound, about 40 meters in diameter, situated on a low rolling ridge.

Surface Finds: Waste flakes, 3 points (Types 2b, 4a, 5b), 22 unifacial choppers, 3 unifacial choppers (ax), 1 mortar fragment, 1 stone chisel, 1 platform core.

Remarks: This site has a high percentage of silica waste (large chunks). The assemblage resembles closely that of the Hurd Site (35 LA 44); both sites contain quantities of unifacial choppers (general and ax types), perhaps indicative of woodworking activity.
35 LA 181

Location: Northeast of the city of Creswell, 1/4 mile west of the Coast Fork of the Willamette River.

Elevation: 500-520 ft.

Setting: A site consisting of debris scattered on several adjacent flood plain knolls.

Surface Finds: Waste flakes, fire-cracked rock, 2 unifacial choppers (ax), 3 unifacial choppers, 1 mortar fragment, 1 knife fragment.

Remarks: There was a noticeable absence of obsidian at the site.

35 LA 182

Location: One half mile east of the city of Creswell, near Hill Creek.

Elevation: 500-520 ft.

Setting: A surface scatter covering an extensive area.

Surface Finds: Waste flakes, utilized flakes (casual), 2 unifacial choppers (ax), 2 unifacial choppers, 1 combination hammerstone-chopper, 1 shaped pestle, scraper (straight side).

35 LA 187

Location: In the McKenzie Valley, at the extreme eastern edge of Springfield Township.

Elevation: 500-520 ft.

Setting: A site located in the McKenzie River flood plain adjacent to a now-dry spring.

Surface Finds: Waste flakes, point fragment (Type 7a or 8a), hammerstone, scraper (convex side).

In addition to the artifacts specifically mentioned above, several private collections from valley edge or narrow valley plain
sites in the extreme upper valley were examined and photographed. All of the common Willamette Valley point types are represented as are some types uncommon to the valley. Some of the larger points not commonly found in the valley may represent either influences from adjacent regions such as the Umpqua River and Western Cascades, or an earlier, poorly represented phase in Willamette Valley prehistory. Present also in these collections are several peculiar edge ground artifacts similar to the one reported at 35 LA 63, for which it is difficult to suggest a function.

**PRIMARY FLOOD PLAIN SITES**

Primary flood plain sites are those situated on the broad flat flood plain of the Willamette River north of the Eugene-Springfield area. Sites of this class are located on now abandoned flood plains of the main river and are adjacent to ephemeral streams that meander and anastomose parallel to the main channel. Woodward (1970:6) observed that sites of this class lacked the distinctive mounds common to sites found on larger perennial streams. Apparent advantages gained by situating in the broad flood plain are: 1) proximity to marsh or pond resources such as certain grasses, wading birds, and fish; (2) proximity to large concentrations of the seasonally important camas; and 3) availability of flatland species of game.

Eleven sites of this type were discovered: 35 LA 45, 71, 72, 73, 74, 75, 76, 77, 78, 79, and 80. Of this total, 5 had collections sufficient to warrant discussion, and one (35 LA 71) was tested excavated.

**35 LA 71**

Location: East bank of the Willamette River, near the conflux of the Willamette and McKenzie Rivers.

Elevation: 345 ft.

Setting: Located 120 meters from an oxbow bend of the Willamette River.

Test Pits: Stratum 1 (0-30 cm.) - buff-gray clayey loam; plow zone. Stratum 2 (30-80 cm.), - light brown sandy loam.

Cultural Remains: Waste flakes, abundant. Points included 2 of Type 8b, and one each of Types 8a, 7a, 5b, 11a. Scrapers included 2 oval specimens, 1 concave end-scraper, and 1 convex side scraper. Other artifacts include 3 unifacial choppers, 1 biface knife, 1 graving point, 1 platform core, unidentifiable bone fragments, and a possible cedar post.
Remarks: Nearness to the main river might suggest a relatively recent date. The assemblage resembles closely that of the Hurd Site (35 LA 44) in frequencies and types of artifacts.

35 LA 75

Location: Within the northwest city limits of Eugene.
Elevation: 380 ft.
Setting: Adjacent to Spring Creek.
Surface Finds: Waste flakes, shaped pestle (biconvex in cross-section), 4 unifacial choppers, 1 unifacial chopper (ax).

35 LA 76

Location: Adjacent to 35 LA 75 within northwest city limits of Eugene.
Elevation: 380 ft.
Setting: Adjacent to Spring Creek. Perhaps an extension of 35 LA 75.
Surface Finds: Waste flakes, shell (modern oyster?), unshaped pestle fragment, scraper (concave side), unifacial chopper.
Remarks: The artifacts are very similar to surface material from the Hurd Site and from 35 LA 75.

35 LA 77

Location: Approximately 3/4 miles downstream from sites 35 LA 75 and 35 LA 76.
Elevation: 370-380 ft.
Setting: An open site located on the bank of Spring Creek.
Surface Finds: Waste flakes (abundant), 2 points (1a and unidentifiable), 1 mortar fragment (rim); 5 unifacial choppers, 1 unifacial chopper (ax), 1 discoid, 1 scraper (concave side).
Remarks: The assemblage is very similar to that of the Hurd Site, 35 LA 75, and 35 LA 76.

35 LA 80

Location: Near the Long Tom River, two miles north of Fern Ridge Reservoir.

Elevation: 300-350 ft.

Setting: Midden-mound located in a formerly marshy area, 1/2 mile from the river.

Surface Finds: Waste flakes, utilized flakes, spoke shave, biface fragment, scraper (oval), scraper plane, core (platform), and bone (unidentifiable).

Remarks: This site is located less than 1/2 mile from Benjamin Sites 1 and 2 (35 LA 41 and 35 LA 42).

RIPARIAN SITES

Sites of this type are located along larger, permanent tributary watercourses, such as the Calapooia River, whose volume and discharge cause them to effect a relatively direct debouchment with the main Willamette River. Riparian sites apparently offered three primary advantages to the aboriginal occupants. 1) They are adjacent to permanent flowing streams, and hence near a food source (fish), and a transportation course (dugout canoe). 2) They are in an area convenient to open plain resources, both floral and faunal. 3) They are somewhat removed from all but the most disruptive floods in the Willamette River; that is, they are on the "high side" of the river.

The 18 sites of this type discovered are: 35 LIN 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, and 59. Of this total, 9 sites had collections sufficient to warrant discussion, and 4 (34 LIN 41, 42, 45, and 50) were test excavated.

35 LIN 41

Location: Adjacent to the Calapooia River, approximately 1 1/2 miles south of its junction with Walton Slough.
Setting: A low mound located on the west bank of the Calapooia River.

Elevation: 270 ft.

Test Pits: Stratum 1 (0-60 cm.) - dark midden soil. Stratum 2 (below 60 cm.) - brown-buff, sterile loam.

Cultural Remains: Waste flakes, abundant. Utilized flakes. Twelve points, 6 of Type 8a, 1 each of Types 6, 7a, 7c, 2 of Type 10, and 1 unidentifiable. Other artifacts include 1 straight sided scraper, 2 bifaces (knives), bone awl tip, hammerstone, and some bottle glass, possibly worked.

Location: Adjacent to Calapooia River, 300 meters upstream from 35 LIN 41.

Elevation: 270 ft.

Setting: A small mound located on the high side of the Calapooia River.

Test Pits: Stratum 1 (0-75 cm.) - light gray loam. Stratum 2 (below 75 cm.) - light brown loam (no distinct break with Stratum 1).

Cultural Remains: Waste flakes, charcoal fragments, basalt flake knife.

Location: Adjacent to the Calapooia River, 1 1/2 miles southeast of the town of Shedd.

Elevation: 260-270 ft.

Setting: A low mound, 40 by 80 meters, located adjacent to a meander loop of the Calapooia River.

Test Pits: Stratum 1)0-125 cm.) - dark brown loam midden; many roots. Stratum 2 (125-150 cm.) - light brown loam; much charcoal. Stratum 3 (150-180 cm.) - light clayey loam.

Cultural Remains: One human adult male burial. Points include 1 Type 1c, 1 Type 2b, 1 Type 5a, 1 Type 5b, 2 Type 7a, 1 Type 7b, 1
Type 7c, 9 Type 8a, 3 Type 8b, 1 Type 10, 1 Type 11a, 1 Type 13b. Other artifacts include 4 scrapers (irregular, concave side, and straight side), 4 bifaces (knives?), 2 drills, 2 bone awl fragments (tips), 1 pestle, 1 mortar fragment, 1 bifacial chopper, 1 abrading tool, 1 core scraper, 2 lithic oddments, 1 rock-lined oven, 7 square cut nails (0-20 cm.), charred camas bulbs, waste flakes, assorted bone (mostly deer), antler and skull fragment, bone of large bird, baked clay, river mussel.

Remarks: Charcoal taken from beneath the burial (depth approximately 100 cm.) returned a date of 300 ± 110 years B.P. (Gak-3114). A second date of 450 ± 80 B.P. (Gak-3113) was gotten from charcoal collected from a level below the interment.

**35 LIN 50**

Location: Adjacent to Calapooia River, approximately one mile due south of its juncture with Butte Creek.

Elevation: 250-260 ft.

Setting: Low mound on eastern bank of the Calapooia River.

Test Pits: Midden soil dark and organic to a depth of 80 cms.

Cultural Remains: One human burial; adult, sex undetermined. Points included 4 Type 7a, 3 Type 8a, 1 Type 4a, 1 Type 1b. Other artifacts include 1 convex side-scaper, 1 drill, converted from broken Type 3a point, 1 flake knife, 1 oval knife, 1 biface, 1 antler wedge, and many waste flakes.

Remarks: Charcoal removed from a depth of 60-80 cm. returned a date of 840 ± 110 years B.P. (Gak-3115).

**35 LIN 44**

Location: Adjacent to the Calapooia River, one mile due east of the town of Shedd.

Elevation: 250-260 ft.

Setting: Surface scatter (no mound) on west bank of the Calapooia River.

Surface Finds: Waste flakes, spokeshave, pestle fragment, 2 unifacial choppers, core scraper.
35 LIN 47

Location: On the Calapooia River, 1/2 mile east of its junction with Sodom Ditch.

Elevation: 280-300 ft.

Setting: Surface scatter, across the Calapooia River from relatively steep hills.

Surface Finds: Waste flakes, utilized flakes, mano (?) fragment, bifacial chopper, core scraper.

Remarks: There was a marked absence of obsidian.

35 LIN 49

Location: Adjacent to Muddy Creek, 1 1/2 miles west of the town of Halsey.

Elevation: 260 ft.

Setting: A surface scatter (no mound) on the east bank of Muddy Creek.

Surface Finds: Waste flakes, utilized flakes, 2 points (Type 8a and unidentifiable), 2 bifaces (knives), 5 scrapers (oval, convex end, convex side, irregular, straight side), 1 drill tip.

35 LIN 51

Location: Adjacent to the Calapooia River, several meters downstream from site 35 LIN 50, near juncture of river with Butte Creek.

Elevation: 250 ft.

Setting: A low mound on the east bank of a small meander loop of the Calapooia River.

Surface Finds: Waste flakes, point (Type 8a), hammerstone, unshaped pestle.
Location: Adjacent to Calapooia River, 400 meters upstream from site 35 LIN 50, near junction of river with Butte Creek.

Elevation: 250 ft.

Setting: Low mound located 200 meters back from the west bank of the Calapooia River.

Surface Finds: Waste flakes, 3 unifacial choppers, mortar fragment, core scraper (shaped), bifacial chopper (Acheulean-like).

In addition to artifacts recovered in situ, a number of private collections were examined by Woodward, and several photographs taken. No specific sites were associated with the collections. It appears that all of the Willamette Valley types are represented, with Types 1a, 1b, 1c, 7a, 8a, and 10 predominating.

**CONCLUSIONS**

It appears that there was a marked degree of cultural homogeneity among the various sites, although they contained different percentages of certain artifacts. Site 35 LA 63, for example, contained an inordinately large percentage of pestles and associated artifacts, but the pestles themselves were generally similar to those recovered at other valley sites. Projectile points, usually considered a good diagnostic trait, show some intersite variation, with larger points more frequently found in sites of the valley edge type, but in most cases the types found are common to the Willamette Valley. The extreme upper valley yielded point collections consisting of Willamette Valley types mixed with a few of those more familiar to neighboring cultures. Many of the points in private collections purportedly taken from the surface of sites in the extreme upper valley resemble closely those in use by the Yoncalla on the Upper Umpqua River (Marchiando 1965:Plates I-V). There likely was some cultural overlap in this region, as Cole (1968:27) concluded on the basis of his Fall Creek material. Desert Side-notched points (Type 16) occur with some frequency in extreme upper valley sites (at 35 LA 100, 106, 107, 108), as well as in the Benjamin Sites (35 LA 41, 42) on the Long Tom river and Fuller Site, on the Yamhill River. This point type, generally conceded to be late, may have entered from the Columbia, where it is also found, or through one of the mountain passes from the Great Basin, or both.

Perhaps the most important factor in creating inter-site dissimilarities was environmental. Assuming that sites were chosen for what they could provide the former occupants, it stands to reason
that sites of significant geographical or natural difference would reflect some parallel differences in the tool inventories contained therein.

The Valley Edge Sites have factors in common which set them apart from the sites located on the flood plain. Beside the obvious geographical differences, the artifact inventories from these sites consist largely of tools associated with hunting, butchering and hide preparation tasks. Narrow Valley Plain sites reflect a wider variety of tool classes, but the accent appears to be on operations dealing with floristic resources. Site 35 La 63 with its large number of milling tools must certainly have been a task specific site concerned with the processing of floral resources. The large number of large unifacial chopping tools found on some Primary Flood Plain sites would seem to indicate yet another operation - woodworking.

A separation of the flood plain sites into three types seems justified by the geographical and cultural evidence. Southard (1970:2-4) describes the flood plain sites of the upper valley as being areally quite extensive, although no mounds were observed. Woodward (1970:5-7) referring to flood plain sites in the area north of Eugene, describes sites generally smaller in area than those recorded by Southard, and he describes definable mounds on the perennial streams. Some Riparian sites contain river mussel shell; this is especially true of sites along the Calapooya River. Such shell remains are completely absent from sites farther south. Obsidian, both as artifacts and waste flakes, is found in relative abundance in all but one (35 LIN 47) site north of Eugene, but is conspicuous by its absence or minimality in five sites of the extreme upper valley. One possible conclusion, aside from sampling error or other skewing factors, is that, assuming the McKenzie River is the vehicle by which river-carried obsidian pebbles reach the Willamette Valley from their likely ultimate source in the North Sister area (A. Waibel, personal communication), sites located on the Willamette River some distance upstream from its juncture with the McKenzie River might be denied ready accessibility to this resource.

Five C-14 dates from four different sites were obtained. One from a typical Valley Edge site (35 LA 70) indicated modern to 200 B.P. (Gak-3116); one from a Narrow Valley Plain site (35 LA 118) indicated 980 ± 120 B.P. (Gak-3117); one from a Riparian site on the Calapooya River (35 LIN 50) indicated 840 ± 110 B.P. (Gak-3115); and two from different levels at 35 LIN 45, also a Calapooya River site were 300 ± 110 B.P. (Gak-3114) and 450 ± 80 B.P. (Gak-3113). All of the C-14 dates fall within the middle and late stages of what is described in the body of this work as Period IV, and the presence of Type 16 (Desert Side-notched) projectile points on the surface of certain extreme upper valley sites indicates a relatively recent date for their abandonment. The Gettings Creek Sites (35 LA 100, 106, 107, 108) contained trade beads, likewise indicating a late terminal date.
Laughlin's observation (1941:149) that "the larger and older mounds are on the banks of former stream beds, and the later mounds are smaller and are located on the banks of the present day streams" is conjecture at best. Some sites appear to have been purposely established next to large streams (such as the Calapooia River sites), but this does not make them late per se; if they are beyond the high-water mark they need only be later than the stream.

While it is true that sites located directly adjacent to the main river (such as 35 LA 71, 72) must be relatively late (they must be so because the frequent and wide lateral cutting of the Willamette River would totally degrade such sites within a short time), it does not necessarily follow that sites located at a greater distance from the river are older. Before site age can be determined by site location it must be learned what environmental features determined selection of the site. If, for example, one assumes that the large number of sites located on the Willamette River flood plain were primarily established in order to be near flowing water, then the hydrodynamic activities of the watercourse in question are directly relevant to the site and location will bear on site age. If, on the other hand the sites were chosen for another reason such as adjacency to marshlands, or open grasslands, then the proximity of the modern river channel to the site may be only the result of changes in the stream course.

Erratum

One Valley Edge site was accidentally omitted from the preceding listings.

35 LA 101

Location: South flank of Camas Swale Creek Valley.

Elevation: 600-650 ft.

Setting: An open site along both sides of a small stream.

Surface Finds: Nothing recovered by survey.

Remarks: Owner Napper allowed the surveyors to examine his surface collection of the past 50 years. The collection included: shaped pestles, unshaped pestles, a small mortar, and large bifaces. Point types represented include Types 3a, 3b, 4a, 4b, 5a, 5b, 6, 7a, 7b, 8a, 8b, 10, 1a, 11a, 14a, 14b. A high percentage of these types are large.
APPENDIX II
WILLAMETTE VALLEY POINT TYPES

The purpose of this essay is to establish a workable point typology for the greater Willamette Valley area. Ideally, such a typology should be inclusive enough to adequately describe the range of variation and at the same time be of manageable size. Too much "lumping" may blur meaningful variation, while too much "splitting" may create differences of little usefulness. The two considerations must be taken together, lest, as so often happens, the resultant classification contain so many types that it is imponderable. Cordell (1967) described 30 common and eleven unique types for the Lingo Site. Miller (1970) reanalyzed the points from Lingo with those from the two Benjamin sites and came up with 32 types and several subtypes.

In constructing a comprehensive point typology for the Willamette Valley, I was guided by these considerations and by the requirement that the typology must be inclusive of data already gathered and yet flexible enough to incorporate new finds. An attempt was made to combine the virtues of both "lumping" and "splitting" by structuring the framework in terms of types, subtypes, and varieties. The types were determined on the basis of size, outline, and hafting configuration. Significant differences in one aspect led to the creation of a subtype. Minor differences were considered as defining varieties of a type and given no special designation.

The typology is primarily based on the examination of points recovered from the Hurd (35 LA 44), Benjamin (35 LA 41, 42), and Lingo (35 LA 29) sites. Published data from the Simrock (35 LIN 21), Kropf (35 LIN 22), Scoggin Creek (35 WN 4), Fall Creek (35 LA 31, 33, 34, 36), Fuller, Fanning, Spurland, Halsey, Tangent, Shedd, Perkin's Peninsula, Franklin, and Alvdalore sites were also taken into account. Points from these sites were originally classified in many different ways; incorporation of the various typologies into the comprehensive one offered here is an attempt to create a much needed uniformity. Figures 6 and 7 illustrate typical specimens.

Table 6, following the type descriptions, is included as an aid in correlating them with several previously constructed typologies. While in most cases previous types could be absorbed directly into the new system, in some cases it was necessary to split a previous type into two or more and on other occasions to merge several types into one.

Figure 6 - Willamette Valley Point Types. a-b, Type 1a, Convex Base; c-d, Type 1b, Straight Base; e, Type 1c, Concave Base; f, Type 2a, Straight Stem; g, Type 2b, Stemless; h, Type 2a, Broad; i, Type 3b, Narrow; j, Type 4a, True Bipoint; k, Type 4b, Rounded Base; l, Type 5a, Broad; m, Type 5b, Narrow; n, Type 6; o-p, Type 7a, Triangular.
TYPE 1

Description: Small, thin, unstemmed points. Triangular to subtriangular in outline. The sides range from straight to slightly convex (Fig. 6 a-e).

Subtypes: a, convex; b, straight; and c, concave bases.

Varieties: Two varieties appear to be present; one is very small, the other appreciably larger (although still relatively small).

Length: R = .90-2.30 cm. X = 1.48 cm.

Width: R = .60-1.50 cm. X = .91 cm.

Thickness: R = .10 - .50 cm. X = .22 cm.

Occurrence: Located generally in the upper levels at the Lingo and Benjamin sites. At the Hurd Site, 70 percent occur in the top half of the deposit.

Remarks: Here, as in all other types (except Type 2), serration was not considered as a taxonomic criterion as it was occasionally present in all types and was apparently independent of form.

Previous types absorbed: Types I, II, III a, b (Miller 1970: 53-54); Type 13 (Woodward, Murdy and Young, this volume); Types 14, 20, 21 (Murdy and Wentz, this volume); Form Class 13y, 13z (Davis 1970: 20); Type NBb (Collins 1951:Fig. 1).

TYPE 2

Description: Medium to small points, the sides of which are deeply serrated or notched (Fig. 6 f-g).

Subtypes: a, straight-stemmed; b, stemless.

Length: R = 1.30 - 2.30 cm. X = 1.65 cm.

Width: R = .80 - 1.65 cm. X = 1.02 cm.

Thickness: R = .20 - .30 cm. X = .24 cm.

Figure 7 - Willamette Valley Point Types. a, Type 7b, Spade-shaped; b, Type 8a, Normal Stem Length; c, Type 8b, Long Stem; d, Type 9; e-f, Type 10; g, Type 11, Short and Broad; h, Type 11, Long and Narrow; i-j, Type 12; k, Type 13; l, Type 14, Short and Broad; m, Type 14, Long and Narrow; n, Type 15; o, Type 16.
Occurrence: Type 2a is found in the upper third of the deposits at the Benjamin and Lingo sites. At the Hurd Site, 74 percent of Type 2a specimens are found in the top half of the deposit. Type 2b is not found at these sites, but occurs with some frequency on the surface of certain Pleasant Hills area sites.

Remarks: The serration of these points is inordinately deep. Previous types absorbed: Type IIIc (Miller 1970:54); Form class 12 w, 12 x (Davis 1970:20).

TYPE 3

Description: Medium to thick points with straight to slightly convex sides, straight shoulders and wide expanding stems (Fig. 6 h-i).

Subtypes: a, broad; b, narrow.

Length: Subtype a; R = 2.50 - 3.40 cm. X = 3.02 cm. Subtype b; R = 2.30 - 3.10 cm. X = 2.83 cm.

Width: Subtype a; R = 1.90 - 2.30 cm. X = 2.14 cm. Subtype b; R = 1.10 - 1.70 cm. X = 1.40 cm.

Thickness: R = .46 - .80 cm. X = .56 cm.

Occurrence: Found uniformly distributed throughout the deposit at the Benjamin, Lingo, and Hurd sites.

Remarks: These points appear to be more common in Valley Edge and Narrow Valley Plain sites than in Primary Flood Plain and Riparian sites.

Previous types absorbed: Types XVII, XXII, XXVII (Miller 1970: 57-58); Type 2 (Murdy and Wentz, this volume); Form Class 3g, 3h (Davis 1970:15-16).

TYPE 4

Description: Medium-thick to thick, leaf-shaped bipoints (Fig. 6 j-k).

Subtypes: a, true bipoint; b, more rounded base.

Length: R = 2.10 - 5.30 cm. X = 3.16 cm.

Width: R = 1.00 - 1.70 cm. X = 1.36 cm.
Thickness: \( R = 0.50 - 0.75 \text{ cm}, \ X = 0.63 \text{ cm} \).

Occurrence: Type 4a is found in the top third of the deposits at the Lingo, Benjamin, and Hurd sites. All four specimens from Hurd came from the top half of the deposit. Ninety percent of Type 4b points are found in the bottom half of the deposit at these sites.

Remarks: This type is referred to elsewhere as the Cascade type (Newman 1966:11-14).

Previous types absorbed: Types V, VI, VII, VIII (Miller 1970: 54-55); perforator type 2 (Woodward, Murdy, and Young, this volume); Form Class 1a, 1b (Davis 1970:14-15); Types NAb, NAb₂ (Collins 1951: Fig. 1).

**TYPE 5**

Description: Medium to thick points with convex sides, rounded shoulders, and a relatively broad contracting stem (Fig. 6 1-m).

Subtypes: a, broad; b, narrow.

Length: \( R = 2.10 - 3.70 \text{ cm}, \ X = 3.01 \text{ cm} \).

Width: Subtype a; \( R = 1.25 - 1.75 \text{ cm}, \ X = 1.45 \text{ cm} \). Subtype b; \( R = 1.10 \text{ cm} - 1.30 \text{ cm}, \ X = 1.17 \text{ cm} \).

Thickness: \( R = 0.28 - 0.90 \text{ cm}, \ X = 0.46 \text{ cm} \).

Occurrence: Relatively uniform vertical distribution from top to bottom of the Lingo, Benjamin, and Hurd sites. A low frequency point type in Primary Flood Plain sites and Riparian sites and much more common in Narrow Valley Plain and Valley Edge sites.

Previous types absorbed: Types XXIV, XXVIII, XXIX (Miller 1970: 59-60); Type 11b (Woodward, Murdy, and Young, this volume); Form Class 1c, 1d (Davis 1970:15-19).

**TYPE 6**

Description: Medium-thick to thick leaf-shaped points with wide convex base (Fig. 6 n).

Subtypes: None at present.

Length: \( R = 2.10 - 4.25 \text{ cm}, \ X = 3.59 \text{ cm} \).
Width:  \( R = 1.65 - 2.30 \) \( \text{cm.} \) \( X = 1.99 \) \( \text{cm.} \)

Thickness:  \( R = .50 - 1.10 \) \( \text{cm.} \) \( X = .72 \) \( \text{cm.} \)

Occurrence: Uniform vertical distribution from top to bottom at Lingo and Benjamin sites. The three specimens from the Hurd Site were all in the top fourth of the deposit. Type 6 appears to be rare in Willamette Valley sites; only eleven have been reported to date.

Previous types absorbed: Type IV (Miller 1970:54).

\textit{TYPE 7}

Description: Medium length, thin to medium-thick points, slightly concave to convex sides, with corner notching and expanding stem (Fig. 6 o-p; Fig. 7 a).

Subtypes: a, triangular; b, spade-shaped.

Varieties: Type 7a points range from short and broad to long and narrow.

Length: Subtype a; \( R = 1.10 - 3.00 \) \( \text{cm.} \) \( X = 2.06 \) \( \text{cm.} \) Subtype b; \( R = 1.40 - 1.79 \) \( \text{cm.} \) \( X = 1.63 \) \( \text{cm.} \)

Width: Subtype a; \( R = .80 - 2.00 \) \( \text{cm.} \) \( X = 1.45 \) \( \text{cm.} \) Subtype b; \( R = 1.00 - 1.70 \) \( \text{cm.} \) \( X = 1.37 \) \( \text{cm.} \)

Thickness: \( R = .20 - .50 \) \( \text{cm.} \) \( X = .31 \) \( \text{cm.} \)

Occurrence: Located in the top third of the deposit at the Lingo and Benjamin sites. At the Hurd Site it has a uniform vertical distribution from 0 to 60 cm. Type 7a constitutes the predominant point type at the Hurd Site.

Previous types absorbed: Type XIV (Miller 1970:57); Types 1a, 1b, and 2 (Woodward, Murdy, and Young, this volume); Types 1a, 1b, and 9 (Murdy and Wentz, this volume); Form Class 6k, 6l, 6m, and 7 n (Davis 1970:17-18); Type SCb\(_3\) (Collins 1951:Fig. 1).

\textit{TYPE 8}

Description: Thin triangular points, slightly concave to convex sides, corner-notched with a contracting stem (Fig. 7 b-c).

Subtypes: a, normal stem length; b, stems of exceptional length.
Length: \( R = 1.20 - 3.40 \) cm. \( X = 1.99 \) cm.

Width: \( R = .95 - 1.95 \) cm. \( X = 1.41 \) cm.

Thickness: \( R = .16 - 1.53 \) cm. \( X = .31 \) cm.

Occurrence: This type constitutes the dominant type at the Benjamin sites where it occurs most frequently in the upper third of the deposits. It constitutes the second most plentiful type after Type 7a at the Hurd Site, where 75 percent of the specimens occur in the top half of the deposit.

Previous types absorbed: Types XIII, XX (Miller 1970:57-58); Types 8, 9 (Woodward, Murdy and Young, this volume); Types 5a, 5b, 11, 12, 13a (Murdy and Wentz, this volume); Form Class 10 q-u (Davis 1970: 18-19); Type SAb (Collins 1951: Fig. 1).

**TYPE 9**

Description: Thin to medium-thick spade-shaped points, relatively short and broad, with basal-notching and short contracting stem (Fig. 7 d).

Subtypes: None at present.

Varieties: Point tip ranges from relatively sharp to rounded.

Length: \( R = 1.20 - 2.10 \) cm. \( X = 1.79 \) cm.

Width: \( R = .80 - 1.80 \) cm. \( X = 1.55 \) cm.

Thickness: \( R = .14 - .42 \) cm. \( X = .32 \) cm.

Occurrence: Associated with upper third of the deposit at the Lingo and Benjamin sites. Six of the eight specimens from the Hurd Site in the top half of the deposit.

Previous types absorbed: Type XVI (Miller 1970:57); Type 14 (Murdy and Wentz, this volume); Form Class 9 p (Davis 1970:18).

**TYPE 10**

Description: Thin to medium-thick triangular points, with straight to slightly convex sides, basal-notching and straight stem (Fig. 7 e-f).
Subtypes: None at present.

Length: \( R = 1.20 - 3.00 \) cm. \( X = 1.89 \) cm.

Width: \( R = 1.20 - 1.90 \) cm. \( X = 1.43 \) cm.

Thickness: \( R = .20 - .50 \) cm. \( X = .31 \) cm.

Occurrence: Found in the upper third of the deposit at the Lingo and Benjamin sites. At the Hurd Site, 68 percent were in the upper half of the deposit. Specimens of this type from Fanning Mound tend to be larger than those from other valley sites (average length - 2.51 cm.).

Previous types absorbed: Types XI, XV, XVIII (Miller 1970:56-58); Type 6 (Murdy and Wentz, this volume); Form Class 8 o (Davis 1970:18); Type SBB (Collins 1951:Fig. 1).

**TYPE 11**

Description: Thin triangular points with straight sides, corner-removed, with straight or contracting stem (Fig. 7 g-h).

Subtypes: a, short and broad; b, long and narrow.

Length: Subtype a; \( R = 1.20 - 2.00 \) cm. \( X = 1.63 \) cm. Subtype b; \( R = 1.70 - 2.90 \) cm. \( X = 2.03 \) cm.

Width: Subtype a; \( R = 1.00 - 1.40 \) cm. \( X = 1.20 \) cm. Subtype b; \( R = .70 - 1.20 \) cm. \( X = .91 \) cm.

Thickness: \( R = .16 - .44 \) cm. \( X = .28 \) cm.

Occurrence: Not found at the Lingo Site. Type 11a is located in the uppermost part of the deposit at Benjamin Site no. 1. A uniform vertical distribution of type 11a and 11b points occurs at the Hurd Site.

Previous types absorbed: Types XXI, XXX, XXXII (Miller 1970:58-60); Types 3, 4, 5, 10 and 11a (Woodward, Young, and Murdy, this volume); Types 3, 4, 10, 11b (Murdy and Wentz, this volume); Form Class 5j, 11v (Davis 1970:17-19); Type SAa (Collins 1951:Fig. 1).
TYPE 12

Description: Large, thick points, straight to slightly convex sides, straight shoulders and straight or rectangular stem (Fig. 7 i-j).

Subtypes: None at present.

Length: \( R = 3.20 - 5.20 \) cm. \( X = 4.13 \) cm.

Width: \( R = 1.60 - 2.50 \) cm. \( X = 1.84 \) cm.

Thickness: \( R = .50 - .76 \) cm. \( X = .62 \) cm.

Occurrence: A rare point type; none at the Lingo or Hurd sites, one at each of the two Benjamin sites, where they occur in the bottom half of the deposits.

Remarks: In some cases the shoulders may be slightly rounded.

Previous types absorbed: Types XII, XIX (Miller 1970:56-58); Types 7, 8, (Murdy and Wentz, this volume); Form Class 4 i (Davis 1970: 16).

TYPE 13

Description: Large, thick points with straight to slightly convex sides, side-notched with broad, thick, expanding stem (Fig. 7 k).

Subtypes: None at present.

Length: \( R = 3.20 - 5.40 \) cm. \( X = 4.47 \) cm.

Width: \( R = 1.70 - 2.40 \) cm. \( X = 2.08 \) cm.

Thickness: \( R = .70 - .90 \) cm. \( X = .78 \) cm.

Occurrence: A rare point type in valley plain sites. The single specimen from the Hurd Site was a surface find. This type occurs in surface finds in upper valley sites.

Remarks: One specimen from one of the Benjamin sites (35 LA 41) measures 7.30 cm. in length and may represent an aberrant form.

Previous types absorbed: Type XXIII (Miller 1970:58); Type 17 (Murdy and Wentz, this volume).
**TYPE 14**

Description: Thick side-notched points with convex sides and convex base (Fig. 7 1-m).

Subtypes: a, short and broad; b, long and narrow.

Length: Subtype a; R = 1.80 - 3.40 cm. X = 2.81 cm. Subtype b; R = 2.95 - 4.20 cm. X = 3.39 cm.

Width: Subtype a; R = 1.00 - 1.80 cm. X = 1.49 cm. Subtype b; R = .90 - 1.45 cm. X = 1.15 cm.

Thickness: R = .20 - .80 cm. X = .53 cm.

Occurrence: Rare at the Hurd Site; one specimen (Type 14a) was found in a firepit which originated in the top half of the deposit at a depth of 43 cm. Several were found on the surface of upper valley sites.

Previous types absorbed: Types XXV, XXVI (Miller 1970:59); Type 12 (Woodward, Murdy, and Young, this volume); Types 15, 16 (Murdy and Wentz, this volume); Form Class 2e, 2f (Davis 1970:15-16).

**TYPE 15**

Description: Medium to thick, short, broad, straight-sided, diamond-shaped point with broad contracting stem (Fig. 7 n).

Subtypes: None at present.

Length: R = 2.00 - 2.50 cm. X = 2.29 cm.

Width: R = 1.30 - 1.70 cm. X = 1.49 cm.

Thickness: R = .30 - .70 cm. X = .51 cm.

Occurrence: Not found at the Lingo, Benjamin, or Hurd sites. Rare at other sites in valley. Seven found at Fuller Mound.

Previous types absorbed: Type 6 (Woodward, Murdy and Young, this volume); Type SAa (Collins 1951:Fig. 1).
TYPE 16

Description: Small, thin, side-notched triangular point with concave base (Fig. 7 o).

Subtypes: None at present.

Length: $R = 1.30 - 2.20$ cm. $X = 1.70$ cm.

Width: $R = 1.10 - 1.60$ cm. $X = 1.24$ cm.

Thickness: $R = 0.20 - 0.40$ cm. $X = 0.25$ cm.

Occurrence: Found in the upper levels of valley sites where it occurs only rarely. Not found at the Lingo or Hurd sites. Several specimens observed from surface collections taken in the extreme upper valley.


Previous types absorbed: Type XXXI (Miller 1970:60); Type 12 (Woodward, Murdy, and Young, this volume).
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THE HURD SITE

BY

JOHN R. WHITE
Map of Willamette Valley Showing location of Hurd Site.
INTRODUCTION

The Hurd Site (35 La 44) is situated on the eastern edge of the Upper Willamette Valley at the base of the Coburg Hills, outliers of the western Cascades. The site is approximately 2-1/2 miles east of the junction of the McKenzie and Willamette rivers, and about 1/2 mile southeast of the town of Coburg. It occupies the leading edge of a slightly elevated former flood plain designated the Winkle terrace, which radiocarbon dates indicate ceased to be the regular flood plain of the Willamette between 5250 and 3300 years ago. The site overlooks the extensive Ingram terrace, the current high-level floodplain, lying directly to the west and south. The abandonment of the Ingram surface as an annual floodplain probably occurred about 550 years ago (Balster and Parsons 1968:9). Along the boundary between the Winkle and Ingram surfaces along the south west edge of the Hurd Site, there runs an irrigation ditch which partially follows the bed of a natural stream originating in the Coburg Hills less than 3/4 mile east of the site.

The Hurd site is classified as being of the Primary Flood Plain type (White, this volume), but it occupies the conflux of three microenvironmental zones: the broad marshy lowlands of the adjacent Ingram terrace, the open grasslands of the Winkle surface, and the heavily wooded foothills immediately to the east.

The site occupies much of a field between two and three acres in area. Surficial evidence of occupation was concentrated in areas from midfield to the bordering irrigation ditch, with remains progressively sparser toward the east. A few artifacts and flakes were found on the Ingram surface immediately west of the ditch.

The site presently has a varied floristic covering. The principal flora is dictated by the farming schedule but such small plants as lamb's quarter (Chenopodium album), thistle (Cirsium sp.), equisetum (Equisetum sp.), and redroot (Lachnanthes tinctoria) occur regularly as weeds when the field lies fallow. Bordering the site are understory plants such as poison oak (Rhus diversiloba), blackberry (Rubus sp.), fern (Polypodium sp.), Queen Anne's Lace (Daucus carota), and amaranth (Amaranthus retroflexus). Larger species include alder (Alnus sp.), Garry oak (Quercus Garryana), the Oregon grape (Mahonia aquifolium), filbert (Corylus avellana), apple (Malus pumila), and cottonwood (Populus deltoides). A lone Douglas fir (Pseudotsuga menziesii) stands just northwest of the site. The organically dark loam on the western perimeter of the site may attest to concentration of vegetation along the former stream.

The adjacent stream bed, having as it does a gravel bottom, may have supplied lithic raw material for aboriginal toolmakers. Basalt, the most commonly used stone at the Hurd Site, was identified in the
stream gravel, as were chalcedony, chert, jasper, and diorite. In addition, the nearby McKenzie River would have certainly been an abundant source for obsidian cobbles. The obsidian raw material found at the site was in the form of stream-rolled stones.

DEPOSIT DESCRIPTION

The typical Winkle unit soils on which the Hurd Site is located are Pachic Ultic Argixerolls, which in their upper limits are seen as very dark brown (10 YR 2/2) silty loams and which in depth grow lighter and more clayey, finally ending in an underlying gravel bar many feet thick (Balster and Parsons, 1968:28). The Hurd Site soils are basically water-deposited from the mountainous areas flanking the valley.

There are two differentiable strata at the site. The upper stratum consists of a dark brown river loam, somewhat sandy in texture, friable, and well aerated with small rootlet chambers. At varying depths within the upper stratum, the dark organic material (Zone A) merges into a lighter yellowish (10 YR 6/6) loam similar in texture but with less aeration (Zone B). Both these zones bear cultural material and it appears that the color differences are due to organic decomposition and leaching rather than depositional discontinuity. The presence of cultural features and artifacts at various levels in this upper stratum suggests that what is here designated as a single stratum is in fact an accumulation over a considerable period of time. However, the profile does not reveal any layering and with no discernible depositional stratigraphy we are left to discuss the upper stratum as a single unit.

The second recognizable stratum consists of the undulating gravel bar which underlies the entire site. This contains water-worn stones ranging from small pebbles of aspirin size to cobbles twelve inches in diameter. While none of the site's cultural features originated from this stratum, some did penetrate it from above. The gravel bar is exposed on the surface along the eastern edge of the site where it makes up the bed and banks of an earlier (and now abandoned) stream channel. It undulates in an east-to-west direction across the site, gradually becoming more deeply buried toward the west.

Plow disturbance was indicated over most of the site to an average depth of approximately 20 centimeters.

EXCAVATION PROCEDURES

Extensive excavations were carried out in 1969 and 1970 with an approach dictated by the following objectives:
1.) To obtain an inventory of materials for use in determining activities taking place specifically at the Hurd site.

2.) To recover a body or archaeological data that would contribute to the broader task of reconstructing Upper Willamette Valley culture history.

The choice of areas for excavation was guided by the surface conformation and the occurrence of surficial cultural material. Controlled surface pick-up was carried out in six meter square grid units. All lithic material was collected and examined in the field. A count was kept by unit of all discardants, and artifactual material was returned to the laboratory for further processing. The surface survey indicated some parts of the site to be potentially more productive than others and test pits were excavated in these areas.

The excavation work was done on a standard grid system using one by two or two by two meter units for horizontal control. The unstratified deposit was excavated in arbitrary 10 and 20 centimeter levels, and passed through 1/4 inch mesh screen. Occasionally it was possible to control excavation by reference to natural or cultural stratigraphy in localized situations. Items found in association with burials or other features were recorded by reference to these less arbitrary associations. A total of 70 two by two meter units and 30 one by two meter units were excavated and plotted on a site map. In all, 194 lots based on ten centimeter levels, and 64 lots based on twenty centimeter levels were examined. This is equivalent to 1,288 cubic meters of earth.

Work was one over two seasons, and was concentrated in three main areas. The major work of the 1969 season was in Excavation Area One, a 63 square-meter block along the southeastern edge of the site. The initial work of 1970 was concerned with exposing a series of rock clusters discovered at the northwestern tip of the site. This exposure covered 32 square meters and is referred to as Excavation Area Two. Also in 1970 Excavation Area Three, a 66 square meter exposure between Excavation Areas One and Two was cleared.

In addition to the above units excavated by shovel, seven backhoe trenches were dug midway through the 1970 season. Totaling approximately 158 meters in length, those two foot wide trenches (trench width was dictated by the backhoe's bucket width) were placed in various sections of the site and in various directions. All were dug to the top of the gravel bar which underlies the entire site between 40 and 125 cm, in depth. These trenches revealed the overall depth of the site and were responsible for the location of several cultural features. (Fig. 1).
THE CULTURAL STRATIGRAPHY

Refined depositional stratigraphy at the Hurd Site is not discernible, but the sandy loam deposits and the knowledge that the site occupies a former flood plain would seem to indicate that earth build-up during the period of its inhabitation was by a series of inundations. Cultural features were found throughout the sandy loam, and for purposes of this report I will speak of cultural strata, by which I mean inferred stratigraphic levels at which various cultural phenomena such as firepits, rock clusters, and ash lenses, conjoin to represent what appear to be temporally related phenomena. The features are grouped together on the basis of their proximity to one another at the same level in the deposit, and while one constituent of a specific cultural stratum may not be quite contemporaneous with another in the same stratum, nevertheless we can state with assurance based on actual superposition of some features, that constituents of one cultural stratum are earlier or later than those of another stratum in the same excavation area. For example, while the temporal order of the features within Cultural Stratum I (CSI) may not be specifically known, we do know that all of the features are roughly contemporaneous and that they are all earlier than those constituting Cultural Stratum II (CSII).

The cultural strata are derived from the association of some cultural features relative to others in the same area. Each of the three excavation areas has its own separate sequence and the cultural strata of one area are not necessarily contemporaneous with similarly labelled strata in the other areas. Intra-site correlations are discussed in a later section.

EXCAVATION AREA ONE

In Excavation Area One there were three levels (CSI, CSII, CSIII) with CSI being the earliest.

Cultural Stratum I

Cultural Stratum I contains the earliest cultural features present in the south end of the site. Immediately beneath them is sterile loam, and deeper (the depth varies between 100 and 110 cm.) is the undulant gravel bar.

At a depth of between 57 and 70 cm. an extremely hard and compacted surface was encountered (Fig. 2, Features 2, 14). This surface, which occupied an entire two-meter square unit, was heavily cracked in the manner of a mud surface which has been exposed to
drying. It consisted of the yellow, sandy loam which underlies the organically darker top layers of the deposit. At some time in the past this hardened area was an exposed surface, and for a long enough time to allow for compression, saturation, and drying. The presence of artifacts and bisque (minute fragments of charcoal and burnt daub) above this surface indicates that it was in all likelihood an occupation floor. Additional excavation revealed the compacted area to be part of a basin-shaped depression, the exact limits and shape of which were not determined. The disclosed portion of the depression, which in its greatest extension in a northwest-southeast direction was approximately 4.3 meters long, suggests that we are dealing with a cultural phenomenon that falls well within the size limits of a pithouse. Beyond these speculations nothing more can be said, as the incompleteness of our work left us with no interior features or postholes around which to form a more convincing argument.

_Cultural Stratum II_

Cultural Stratum II is above and separated from CSI by some 17 cm. of yellow loam.

The dominant archaeological feature of CSII was a large shallow semieliptical pit outline assessed as the rim of a semisubterranean structure (Fig. 2, Feature 13). The initial discovery of this rim came with the exposure, at a depth of 35 cm., of a dark soft area whose fill contrasted markedly with the lighter, yellowish, harder soil adjacent to it. In the incipient stages of its exposure, this rim represented no more than a demarcation between hard and soft soils.

Unfortunately, we were unable to recover a complete ellipsoid. On the western side the pit rim was interrupted by an intruding pit dug in aboriginal times (Fig. 2, Features 12, 15). To the southeast, the rim was apparently destroyed by later aboriginal digging, as indicated by the presence of some rock features higher in the deposits there (Fig. 2, Features 6, 16, 24). Excavation of contiguous units disclosed only one other small rim segment, located 7.5 meters directly south of the point of initial discovery. There were distinct depth differences in the two segments. The northern rim was seen to have been aboriginally dug from a level 35 cm. above the yellow loam subsoil while the smaller south rim was barely detectable as a slight rise in the yellow subsoil. This difference in rim lip-to-floor depth may be accounted for by the contour of the land; in this section of the site the ground surface slopes away to the south. Purposeful deep cutting on the north side would serve to create a level living floor.

The longer of the two rim arcs measures 8.2 meters, the shorter 2.2 meters (Fig. 2, Feature 13). Unfortunately, we have no eastern
Fig. 2. Plan View and Composite Profile Excavation Area 1. (Profile not to scale).
or western rim remains but the curvature of the two known rim sections is similar and their placement indicates that the complete structure would have been elliptical in shape with a probable maximum north-south diameter of 7.5 meters and a maximum east-west diameter of 5.4 meters. The depression encountered within this area contained a dark charcoal and bisque-flecked fill, throughout which artifacts and flakes were found.

Occurring very near the center of the structural depression was a tight concentration of cobbles seated in a shallow saucer-shaped pit (Fig. 2, Feature 7). The cobbles themselves formed a circle with a diameter ranging between 65 and 69 cm. The center of this cluster was 1.1 meters from the center point of the larger depression on the floor of which it lay. The concentration consisted of 68 rocks, most of which were whole, but some of which were fractured, probably thermally. The matrix surrounding the rocks was a dark, organically stained loam similar to the fill occurring in the upper levels of the site. A large amount of charcoal as well as several fragments of burnt daub were recovered but no recognizable carbonized vegetation was found. The basin containing the rocks was 22 cm. deep, and its edge was heavily burnt to a bright orange color; the feature was very clearly a firehearth. Charcoal selected from it for radiocarbon processing produced a date of 2800 B.P. ± 110 years (Gak-2660).

Located just outside the southeast edge of the projected structure outline, and originating on the same horizontal plane as its floor, was a circular bowl-shaped pit varying in diameter between 45 and 48 cm. (Fig. 2, Feature 10). This pit, 23 cm. deep, was dug into hard yellow loam and its fill, easily differentiated, consisted of a black friable soil with an oleaginous texture. Recovered from the pit were two flat circular stone discs naturally formed, but evidently carefully selected and several unworked stream cobbles and numerous flakes of basalt and obsidian. Two very small (8 cm. in diameter) pits (post-holes?) were located 15 and 23 cm. to the northwest and west of this bowlshaped pit. These shallow pits were 36 cm. apart center to center.

Located on the western edge of the excavation and originating at or slightly above the architectural rim is an amorphous pit which interrupts the continuation of the western section of the structure's rim (Fig. 2, Feature 15). The pit dimensions were 1.5 by 1 meter and the fill consisted of dark loam flacked with minute charcoal and daub fragments. Inside, near the western edge of this pit, there occurred a loose cluster of fractured cobbles (Fig. 2, Feature 12) and among these scattered rocks was a considerable amount of charcoal. A sample taken for radiocarbon testing returned a date of 2820 ± 230 years B.P. (Gak-2659). This is effectively identical to the 2800 ± 110 years B.P. (Gak-2660) attributed to the rock cluster established as the central hearth in the architectural depression, and helps to establish clearly the point in time at which the structure was occupied.
and abandoned.

A total of 18 small holes ranging in depth from 7 to 23 cm., were found relating to CSII phenomena. Cross-sectioning demonstrated that 11 of them were directly connected with rodent tunnels or burrows making them suspect as post-holes (these are not shown in Fig. 2). The remaining seven were not associated with rodent disturbance and their placement was in keeping with an architectural function. Four of the post-holes probably relate to an internal roof support system. Three lie in a straight line east to west across the middle of the northern half of the structural depression and the fourth is located adjacent to the western edge of the central fire hearth. Three exterior post-holes are spaced fairly evenly around the northern rim section.

In summary, CSII is represented by a large pithouse depression containing a central fire hearth. Assuming that an entire pithouse outline did at one time exist, then our inability to locate the east and west edges must be considered as important, especially in light of the special care given to this task. However, some explanations for the failure have already been suggested. On the western side the well-defined rim ends where a large pit intrudes from above. Immediately south of this interruption is the area of our initial test pit and due care was perhaps not taken at this point in our excavation. Post-CSII aboriginal digging would seem the most suitable explanation for our inability to locate the remaining segment as there was a good deal of CSIII activity in this area.

Cultural Stratum III

Cultural Stratum III consisted of a darkly stained occupation or activity area approximately 5.5 by 5 meters across, containing three rock clusters. One rock cluster and a small bowl-shaped cache pit were outside, but immediately adjacent to, the organically-stained area. Artifacts were found throughout the dark fill, including three ground stone tools found in close association with one another. Whereas the features of CSII related horizontally to one another to form an architectural unit, those labelled as CSIII bear no such clear association among themselves. They all appear to originate, however, within the upper 40 cm. of the excavated deposit, above the features of CSII (Fig. 2).

In the northwestern section of the darkly stained area was a rock cluster measuring 60 by 39 cm., across (Fig. 2, Feature 11). This cluster consisted of 43 cobbles approximately one-third of which were thermally fractured. The fill around them consisted of dark humus flecked with minute fragments of charcoal and bisque. The basal rocks lay on the yellow subsoil, but additional rocks were piled above
it some 10 cm., suggesting that they reposed in a shallow pit dug from within the organically dark upper soil. The inferred pit outline was not observed directly, however.

Approximately 1.3 meters to the east was a second rock cluster (Fig. 2, Feature 9). Measuring 110 by 70 cm., this concentration also occurred within the bounds of the extensive soft dark area of organically stained soil. The rocks extend from the dark upper zone down to the yellow subsoil indicating that this group of cobbles also had been placed loosely in a shallow pit.

The final rock cluster located in the dark soft zone of CSIII lies 115 cm. further east (Fig. 2, Feature 8). This single-layer cluster consisted of 10 cracked rocks in a concentration 40 by 50 cm. across. Occurring 30 cm. from the surface, this cluster was entirely surrounded by black, humic fill.

At the southeastern edge of the area of dark soft fill a group of three ground stone artifacts was found (Fig. 2, Feature 6). Two of these were pestles of cylindrical shape and the third was a large, flat, tear-shaped basalt cobbles, the distal edges of which are worn as if by being used in a rocking motion. They were all found within 30 cm. of each other.

Outside the limits of the darker area, at a depth of 34 cm., a small cluster of rocks was found (Fig. 2, Feature 16). This cluster, the dimensions of which were 35 by 40 cm., consisted of whole and broken rocks interspersed with black charcoal-flecked loam. As noted earlier, the position of this feature might explain our inability to locate the eastern perimeter of the CSII pithouse. The rock cluster is situated in a direct line with the structural rim, and, the point at which we could no longer detect the rim was precisely that at which this concentration of cobbles occurred.

Directly south of the Feature 16 rock cluster, at a distance of 4.2 meters, lies an area of extremely heavy rodent disturbance. A well-defined bowl-shaped pit was found in the midst of this disturbed area (Fig. 2, Feature 24). The pit, measuring 58 by 61 cm., was filled with dark, greasy loam flecked with charcoal and was easily differentiated from the lighter soil surrounding it. The top levels of the pit contained three large artifacts - two choppers and a large fragment of worked basalt; only flakes were found deeper in the pit. A charcoal sample from this pit returned a date of modern ± 200 years (Gak-3102). This is consistent with the vertical placement of this feature in CSIII, but the rodent disturbance would seem to cast some doubt on its accuracy.

In summary, CSIII contains six cultural features. The area of dark, soft, humic fill in which four of the six features are located
directly overlies an earlier semisubterranean structure. The depths of the rock features from surface vary between 30 and 45 cm., but this variation need not necessarily be considered a function of non-contemporaneity as the ground does slope away to the southeast and the three most shallowly buried features do occur in this direction.

**EXCAVATION AREA TWO**

Excavation Area Two consists of eight contiguous 2 by 2 meter units located at the extreme northwestern edge of the site.

While there was no observable depositional stratigraphy in Excavation Area Two, two soil zones were distinguishable. The upper zone is dark, humic-stained and well aerated. This extends to a depth of 43 cm. on the eastern edge of the area and to approximately 50 cm. on the western. Below this darker zone is found a lighter yellow loam containing flecks of charcoal. Beyond this there was no visible differentiation.

**Cultural Stratum I**

Excavation Area Two yielded a single cultural stratum. Designated CSI, it consists of eight cobble clusters encircling a larger centrally located cluster. Five of the eight Area Two excavation units were dug 20 cm. deeper than the level of origin of these clusters, and, subsequent deep excavation substantiated with the fact that the underlying soil was culturally sterile.

The large central cluster, measuring 204 by 209 cm., was located 40 cm. below the surface at the juncture of the dark humic soil zone and the lighter yellow zone (Fig. 3, Feature 18). On the western perimeter of this cluster was an area 80 cm. in diameter consisting of red-orange fire-hardened loam. Oxidized soil representing open burning was not found elsewhere in this excavation area except in the form of tiny flecks. The rocks of this feature were seated in a shallow saucer-shaped pit, the depth of which was 23 cm. below its level of origin. A total of 437 rocks, 415 of which were thermally fractured, were removed from this feature. The total weight of all cobbles (whole and fractured) was 498 pounds.

From the fill surrounding the cobbles a single carbonized camas bulb and many sizable charcoal fragments were removed. Radiocarbon dating of the charcoal returned a date of 330 ± 110 years B.P. (Gak-3106).
Fig. 3. Plan View and Composite Profile Excavation Area 2.
Located 80 cm. southeast of the central cluster was a concentration of rocks measuring 59 by 50 cm., across, and 18 cm., in thickness (Fig. 3, Feature 21). A total of 37 rocks, 26 of them fractured, were present. While many of the cobbles touched upon one another, some did not and were separated from one another by several centimeters of fill. The fill itself was similar to that of other clusters in this complex; dark humic loam, well aerated, and specked with minute charcoal fragments.

Located 157 cm. east of the large central cluster was a group of 45 cobbles, 41 of which were fractured, confined within an area of 101 by 170 cm. (Fig. 3, Feature 22). This concentration was the largest of the satellite clusters. Its measurements and general morphology were similar to those of the one just described.

Located 168 cm. northeast of the central cluster was one which measured 114 by 144 cm. in area (Fig. 3, Feature 25). Forty-one cobbles, only seven of which were whole, were contained in this feature. This cluster, the most loosely arranged of the lot, displayed clear evidence of rodent disturbance.

Located 72 cm. north of the large central cluster was the smallest satellite cluster of the lot, containing only 19 cobbles spread loosely over an area 117 by 67 cm. (Fig. 3, Feature 30).

Located 82 cm. northwest of the central cluster was one which measured 60 by 56 cm. and consisted of 21 cobbles, 11 of which were fractured (Fig. 3, Feature 19). While the rocks in this group were situated similar to those of the other satellite clusters, they were piled higher than in any of the other cases. The cluster was also unique in that the rocks contained in it were noticeably smaller than those in any of the other satellite clusters.

Located 120 cm. southwest of the central feature was a cluster not recovered in its entirety as it extended into the sidewall of an unexcavated unit (Fig. 3, Feature 34). Fifteen rocks were contained in the excavated portion of this cluster; seven were whole, eight were fractured. The portion measured 62 by 75 cm.

The most distant of the clusters surrounding the large central feature was located to the southwest at a distance of 300 cm. (Fig. 3, Feature 28). Consisting of 22 cobbles, only 2 of which were unfractured, this cluster, like the preceding one, was not fully exposed. Its exposed area measured 38 by 96 cm.

Located 180 cm. south of the central cluster was a small group containing only 22 cobbles (Fig. 3, Feature 27). It occupied an area 57 by 85 cm.

As the preceding shows, in Excavation Area Two there were two
basic types of rock clusters. One, the central cluster, contained almost ten times as many cobbles as the largest of the surrounding clusters. The large central cluster was densely concentrated and lay in a saucer-shaped depression. The outlying clusters were not seated in depressions, lacked the density of the central feature, and appeared to be placed with no apparent premeditation. While the fill overlying each of the clusters in this area is essentially the same, only from among the rocks of the central cluster were we able to extract sizable samples of charcoal.

The contents and arrangement of these nine rock clusters are fully consistent with ethnographic descriptions of camas bake-ovens (Jacobs 1945:18). The large central cluster represents the oven itself. The shape and size of the saucer-shaped depression, the abundance of thermally fractured cobbles, the burnt discolored loam, the large amount of charcoal, and the carbonized camas bulb certainly are consonant with this conclusion.

The eight satellite clusters are not specifically described in the ethnographic literature but are consonant with what one might expect as the physical aftermath of camas preparation. They apparently represent the top layer of rocks used to seal in the heat during camas preparation. Their casual arrangement (some touching, some not), the higher percentage of whole to fractured rocks, the fact that they contain only minute fragments of charcoal, and the fact that they encircle the large bake-oven all suggest this.

While camas ovens are referred to in other archaeological works dealing with the Willamette Valley (Miller 1970; Cordell 1967; Collins 1951) and other areas of the Northwest (Collier, Hudson and Ford 1942) no one describes these associated clusters. Either they did not exist, were disregarded as debris, (so often the case with fire-cracked rock), or were described as something else, perhaps as small hearths. In a personal communication Miller informed this author of many loosely arranged rock clusters found in the area of the camas pits at the Benjamin Sites (reported as small firehearths found at higher elevations than the bake-ovens observed [Miller 1970]), but he was unwilling to suggest the presence of the pattern seen at the Hurd Site. Perhaps the best clue as to the function of these clusters was given by a Kalapuya informant to Melville Jacobs (1945:18):

.....they always put (in) large quantities of (wide) maple and ash leaves, they put them in first (on top of the hot rocks). Now then they put (in) the camas. And then they placed leaves on top of the camas. Now then they covered it with earth. Now they built a fire on top of rocks (placed over the oven), hot rocks were under it.....

Assuming that each of the outlying clusters represents the opening of the oven after a roast, we can postulate a minimum of eight
times that the oven was used. Expansion of the excavated area would perhaps have revealed additional evidence.

In summary, Excavation Area Two seems to represent an area devoted to camas roasting. All of the archeological features appear to represent a single cultural unit. Results of a radiocarbon assay on the charcoal from the central oven indicate a date of $330 \pm 110$ B.P. (Gak-3106).

**EXCAVATION AREA THREE**

Excavation Area Three comprises 15 adjacent two by two meter units located between areas One and Two. Closer to Area One, it occupied the section of field from which the surface returns were most numerous.

As was the case in other areas of the Hurd Site, no depositional stratigraphy was recognizable beyond the obvious gravel-loam separation. The transition between the dark, humic upper soil zone and the lower yellowish loam occurred at varying depths in this area. At its shallowest, it occurred at 25 to 30 cm. in the southwest corner; at its deepest it occurred at 45 to 50 cm. in the southeast corner.

**Cultural Stratum I**

Cultural Stratum I constitutes the stratigraphically earliest level in Excavation Area Three. A loosely arranged cobble cluster measuring 50 by 80 is the only feature clearly identifiable as originating at this level (Fig. 4, Feature 26). This cluster was deeper than several nearby features assigned to CSII, at 54 cm. below the surface just inside the yellow loam zone. The rocks themselves did not occupy any kind of pit but were apparently piled on a flat surface. The cluster contained both whole and cracked rocks in an apparently unplanned placement. A large fragment of elk (?) bone was found among the cobbles. One characteristic which set the unit apart from all other Hurd Site rock clusters was the high proportion of small stream pebbles in its makeup. A date of $940 \pm 90$ years B.P. (Gak-3103) was derived from charcoal removed from among the rocks of this cluster.

**Cultural Stratum II**

Cultural features assigned to CSII are vertically separated from the CSI rock cluster by some 12 cm. of deposit. Cultural Stratum
Fig. 4. Plan View and Composite Profile Excavation Area 3.
II commences at the vague zone of demarcation between the darker and lighter soil horizons at a depth of approximately 40 cm. Culturally, CSII contained, in addition to artifacts, two rock clusters, a firepit, a burial, and an enigmatic area of stream gravel intermixed with charcoal, tools, and lithic waste.

One rock cluster was located some 72 cm. east of the CSI cluster just described (Fig. 4, Feature 29). Measuring 90 by 72 cm. in area, it contained 41 cobbles, 30 of which were thermally fractured. The cluster was seated in a shallow saucer-shaped depression, 10 cm. deep. Unlike the forementioned cluster, this one reflected a purposive placement, having as it did a more circular shape and a tighter concentration of constituent cobbles. Some minute fragments of charcoal were found but far fewer than one would expect if the feature's primary use had been as a fire hearth.

Located 125 cm. further east was a cluster measuring 94 by 73 cm. across and containing 35 rocks, 32 of which were thermally fractured (Fig. 4, Feature 33). The rocks constituting the cluster were seated in a shallow depression approximately 10 cm. deep. The depression apparently originated at a depth of 41 cm.; the fill surrounding the rocks was a dark humic loam specked with minute particles of charcoal. Similarities in shape, size, and composition between this feature and the one previously described were readily apparent.

While there are similarities between these two clusters and those encircling the camas oven in Excavation Area Two, they differ in one major respect; whereas the Excavation Area Two clusters were apparently dropped and piled up without previous modification of the surface on which they were to lie, those described here were placed in shallow depressions. It is difficult to postulate a function for these two CSII clusters. The abundance of cracked rock argues for their use as small ovens or hearths but the relative paucity of charcoal would seem to lessen the strength of this argument.

A well-defined firepit was located three and a half meters to the south (Fig. 4, Feature 31). Originating 43 cm. below the surface, this pit began a few cm. above the base of the dark upper soil zone, passed through 37 cm. of lighter yellow loam, and penetrated some 15 cm. into the underlying gravel bar. Its total depth was 57 cm. The pit was nearly circular in shape, measuring 80 by 91 cm. and its walls were burnt to a bright orange color. The burned earth varied from barely a centimeter to 20 cm. in thickness and had the friability of the surrounding unburnt loam. The pit contained a dark and greasy fill from which a large amount of charcoal was extracted, along with numerous artifacts, and an abundance of obsidian and basaltic detritus. A radiocarbon assay on charcoal taken from this firepit indicated a date of 460 ± 90 B.P. (Gak-3104).
The soil in an area approximately four meters west of the fire pit was decidedly softer within an area approximately 2.5 meters square. This concentration of dark soil, which we must conclude was an irregularly shaped pit originating at about 40 cm., contained an abundance of charcoal and worked basalt. At a depth of 85 cm., a human burial was encountered. The pit in which the burial was located measured 140 by 160 cm., with the skeleton itself occupying an area within this of 45 by 40 cm. (Fig. 4, Features 41, 43). The remains were in a very poor state of preservation with the vertebrae, ribs, femora, radii and ulnae missing entirely. What bones did remain were completely decalcified and were destroyed by even the slightest disturbance. In situ examination of the sutural apertures and dentition indicated that the skeleton was that of a young adult. Sex could not be established due to incompleteness of the remains. Apparently disturbed subsequent to interment (the mandible was located near the parietal region of the skull), it was evident that the body had been laid on its right side with the head pointing west. Hardening agents were used to no avail, and exhumation caused many of the bone fragments to disintegrate under their own weight.

The pit in which the burial was located contained many finished lithic artifacts and much waste. Seven large basalt choppers were found in direct association with the burial. Although a large amount of charcoal was found within the burial pit, the bones themselves did not bear signs of being burned.

Charcoal removed from the area immediately adjacent to the burial gave a date of 510 ± 90 B.P. (Gak-3109), which squares nicely with the date indicated for the nearby firepit (460 ± 90 B.P.) and serves to establish an equivalent age for the features within this stratum.

CSII contained one rather enigmatic phenomenon. In a unit dug immediately west of the grave pit, beginning at a depth of 30 cm., a large number of unfractured cobbles and small stream-worn pebbles were encountered. The blanket of stones was about 10 cm. thick and looked natural (like a flood effect), but the matrix consisted of the dark loam common to the rest of this level, and interspersed with the gravel were artifacts, charcoal, and debitage. A test pit dug approximately one meter to the south of the unit containing the problematical gravel stratum had no such unusual contents, but an adjacent unit to the northwest did. Characteristics of this unit were identical to those of its neighbor. As the site map indicates, there is an elevation change right at this point and the present canal passes south to north approximately 20 meters to the west. In the same direction, only 12 meters away, the gravel bar which normally underlies the loam stratum throughout the site comes to the surface in an area that gently slopes toward the present canal. This area of banked gravel may mark a point at which the original stream channel widened or cut easterly into the site.
Cultural Stratum III

Unlike the features described for CSII, neither of the two rock clusters that constitute CSIII originates on or near the light yellow loam which in this section of the excavation begins at a depth of 40 cm. Their shallowness in the fill sets them apart. One rather loose rock cluster measuring 80 by 80 cm., was uncovered at a depth of 30 cm. (Fig. 4, Feature 32). A radiocarbon date for this feature of 850 ± 90 B.P. (Gak-3105) is anomalous for CSIII, it may be that aboriginal excavation carried out during the CSIII occupation brought to the surface gravel from the underlying bar and also fragments of charcoal from the CSI occupation, but no such aboriginal excavation was actually identified. Of course, the feature may possibly belong to CSI, despite its relatively high level in the site deposits.

Located 100 cm. south of this cluster was another (Fig. 4, Feature 39). Originating at a depth of 30 cm., well up in the dark humic zone, this pile of cobbles extends upward to within 10 cm. of the present surface. It was initially recorded as having an east-west dimension of 135 cm. and a north-south extension of 72 cm., but as digging continued and the uppermost stones were removed, it became consolidated into an area 50 by 60 cm. The loose east-west distribution might well be the result of recent disturbances as it occurs within six inches of the present surface, well within the reach of both plow and cultivator. This cluster consisted of 90 cobbles, 78 of which were broken. Three of the cobbles were fashioned into chopper tools. Minute fragments of charcoal were observed in the fill immediately surrounding the cluster.

In summary, Excavation Area Three contained three cultural strata. The artifactual returns indicate heavy aboriginal activity. From the standpoint of quantity and variety of artifacts it was the most productive area of the Hurd Site. Cultural features include several rock clusters probably used as small ovens or hearths, a well-defined firepit, and a young adult burial. While no architectural remains were observed, the rock hearths might be seen as secondary evidence of some sort of temporary dwelling units. The C-14 determinations, taken together, indicate occupation between approximately 500 and 1000 B.P.

In addition to the three main areas of excavation discussed, a series of backhoe trenches was dug during the 1970 season. Three of these trenches yielded significant cultural remains.

Backhoe Trench C

Backhoe Trench C was 28 meters long and ran in a northeast to southwest direction approximately midway between Excavation Area One
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<tr>
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and Excavation Area Three (Fig. 1). At the northeastern end of Trench C were found a large stone oven on a sloping fire-reddened floor, and a smaller cluster of rocks seated in a bowl-shaped depression. The small cluster of rocks, some of which showed signs of being worked, were seated in a shallow depression 40 by 50 cm. across and approximately 16 cm. deep. Located well within the yellow loam zone 80 cm. below the modern surface, the cluster contained a fill, likewise yellowish, but mixed with small particles of burnt clay and charcoal. Assayed charcoal indicated a date of 1050 ± 180 B.P. (Gak-3108).

The small rock cluster was overlain by a broad saucer-shaped surface of burnt loam upon which occurred a large cluster of stones interpreted as a rock oven. The cluster, very compact, was waisted, giving the whole feature a figure eight shape oriented east to west. Half the rocks were seated in a shallow pit and half were stacked next to it. The eastern segment measured 80 by 80 cm., and the western segment (the stacked rocks) measured 70 by 100 cm. The soil between the rocks consisted of soft, friable brownish-black loam flecked with charcoal. A single carbonized camas bulb was found in the fill adjoining the western segment. Charcoal from the eastern segment gave a radiocarbon date of 1050 ± 110 B.P. (Gak-3111).

The thin compacted layer of burnt loam on which the oven lay extended over most of three contiguous 2 by 2 meter units excavated to trace its extent (Fig. 1, Trench B4-C intersection). It slanted upward and disappeared approximately 3.25 meters from the westernmost edge of the oven. To the east it could be traced a short distance in the profile of Trench B4, but the exact dimensions of this burned occupation surface are unknown.

Approximately 10 meters to the west of the rock oven, on the south side of backhoe Trench C, a large rock cluster resembling the large camas roasting pit described in Excavation Area Two was exposed. The cobbles were seated in a saucer-shaped depression 19 cm. deep, the upper limits of which were observed within 8 cm. of the surface. The depression measured 144 cm. east-west and 140 cm. north-south and was lined with loam burnt to a dull orange color. The entire feature was located in the dark humic zone and contained a fill of dark loam specked with charcoal and particles of burnt clay. Several artifacts, including projectile points, scrapers and a pestle fragment were found within the cluster. A total of 603 rocks were removed, 445 of which were fire-cracked or broken. The only significant difference between this large cluster and the previously described camas roasting pit from Excavation Area Two was in the smaller size of the constituent cobbles. A C-14 date of 1120 ± 140 B.P. (Gak-3110) for this oven would put it in the same temporal range as the one located ten meters to the east.

Time did not allow for outward expansion of the excavation in order to determine the presence or absence of satellite clusters as
were found encircling the camas oven in Excavation Area Two. Without these we can only suggest the possibility that the two camas ovens may have served in similar contexts.

**Backhoe Trench E**

Backhoe Trench E, 6 meters long in a north-south directions, was located approximately midway between Excavation Areas Two and Three where previous excavation of three test pits had revealed an area of extensive burning. Three distinct intrusive pits were revealed by the cut. These pits were observed only in the trench profile and cannot be completely described.

The northernmost pit, 65 cm. in diameter, extended to a depth of 108 cm., some 18 cm. into the underlying bedrock gravel. The depth at which it originated is unknown. A large amount of charcoal was taken from it, some pieces being more than one inch thick. Assayed charcoal indicated a date of 670 ± 90 B.P. (Gak-3112). One meter south was a pit which reached to a depth of 84 cm. and had a maximum diameter of 60 cm. Some small badly preserved fragments of bone were noted. A third pit, immediately south of the second, was 80 cm. deep and 50 cm. across.

At some time in the past large scale burning took place in this area of the site. Subsequently, a series of pits were dug deep into the yellow subsoil passing through the earlier level at which the burning took place. The use to which these pits were put is unknown. Widespread rodent disturbance occurred at all levels in this area.

**Backhoe Trench F**

Backhoe Trench F, 13 meters in length, was located about 18 meters south of Excavation Area Two. It extended in an easterly direction from the edge of the irrigation canal toward the center of the field, and in so doing passed through a line along which random test units had been dug earlier in the season. (Fig 1).

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Fig. 5 (opposite page). Hurd Site Cultural Features. Upper left, looking southeast across the Hurd Site; upper right, housepit rim and central hearth, Excavation Area One; middle left, camas oven and outlying rock clusters, Excavation Area Two; middle right, large camas oven, central feature of Excavation Area Two; lower left, well-defined firepit, Excavation Area Three; lower right, rock oven and borrow pile at juncture of backhoe Trenches B and C.
The sidewall of Trench F revealed an area where heavy burning had taken place. The layer of burnt loam varied in thickness from less than 1 cm. to 36 cm., but even in places where it existed in concentrations many centimeters thick it was not appreciably harder than the fill surrounding it, although it had a more granular consistency. Its depth varied considerably; from a maximum depth of 52 cm. at the east end of the trench it sloped upward to the west, eventually reaching to within 23 cm. of the surface. The organically-stained dark loam overlaying the oxidized layer yielded an abundance of artifacts as well as some large pieces of charcoal. Beneath the layer were several deep and irregular pits which appeared to be a combination of rodent burrows and root systems. Several large sections of partially burned and rotted wood were recovered. There was a noticeable paucity of cultural material below the orange floor. A radiocarbon date of 150 ± 90 B.P. (Gak-3107) on a sample from this floor indicates that this burning took place at a relatively recent time. As to whether the original cause was cultural or natural, we cannot say. Conflagrations in wooded areas and open grasslands still occur as a result of lightning, and there are ethnographic reports of deliberate aboriginal burning as well (Peterson, this volume).

Backhoe trenches A, B1, B2, B3, B4, and D (Fig. 1), yielded only scattered cultural remains. The trench B series and two test pits dug to the east of it establish the boundary of the site as lying at, or slightly to the west of, this trench line.

**CHRONOLOGY**

A total of thirteen C-14 determinations makes the Hurd Site the best dated one yet excavated in the Willamette Valley. Three dates from Excavation Area One indicate two occupations widely spaced in time. Dates of 2800 ± B.P. (Gak-2660) and 2820 ± 230 B.P. (Gak-2659) are associated with the central hearth of a housepit and with a rock-lined hearth which intrudes into the housepit, both identified as belonging to Cultural Stratum II. The third date, modern to 200 B.P. (Gak-3102) comes from a charcoal-laden pit approximately 42 centimeters above the housepit floor (25 centimeters below the surface) and identified as belonging to Cultural Stratum III. No datable material was available from the very scantily represented Cultural Stratum I.

Charcoal taken from the large central camas oven of Excavation Area Two returned a date of 330 ± 110 B.P. (Gak-3106). All of the cultural material from this excavation area comes from a single cultural stratum, which on the basis of the radiocarbon determination seems to be roughly contemporaneous with Cultural Stratum III of Excavation Area One.

Charcoal samples from four cultural features in Excavation Area Three were dated. A sample from a rock cluster near the northwest edge
of the excavation, assigned to Cultural Stratum I, was dated to 940 ± 90 B.P. (Gak-3103). Cultural Stratum I, on the evidence of this date, represents a period intermediate between Cultural Strata II and III of Excavation Area One. Charcoal samples dating 460 ± 90 B.P. (Gak-3104) and 510 ± 90 B.P. (Gak-3109) were associated with a firepit and a human burial belonging to Cultural Stratum II; this stratum seems to correlate roughly in time with the single Cultural Stratum present in Excavation Area Two. The fourth C-14 determination is anomalous. Charcoal from a rock cluster near the center of the area, and assigned to Cultural Stratum III, returned a date of 850 ± 90 B.P. (Gak-3105). This is earlier than the dates for Cultural Stratum Two, and overlaps that for Cultural Stratum One. It is possible that aboriginal excavations may have brought up older materials from the underlying deposits, or it may be simply that the dated rock cluster is erroneously assigned to Cultural Stratum III and properly belongs to Cultural Stratum I.

Five C-14 samples were associated with features uncovered in units apart from the three main excavation areas. Two of these dates came from charcoal collected from areas of extensive burning. The more recent date of 150 ± 90 B.P. (Gak-3107) was associated with burnt loam occurring at a depth of 25-50 cm. near Excavation Area Two. The second date, 670 ± 90 B.P. (Gak-3112) comes from a depth of 50 cm., in a trench intermediate between Excavation Areas Two and Three.

The three remaining radiocarbon dates were associated with rock clusters. A date of 1120 ± 140 B.P. (Gak-3110) was obtained on charcoal taken from a large canvas oven 20 cm. below the surface and 10 meters southeast of Excavation Area Three. A date of 1050 ± 110 B.P. (Gak-3111) was obtained from a small rock-lined hearth nearby, and a smaller and less well-defined cluster of rocks stratigraphically lower and some 130 cm. away was dated at 1050 ± 180 B.P. (Gak-3108).

The above Radiocarbon dates indicate two occupation periods for the Hurd Site as a whole; an earlier, represented by dates of 2800 and 2820 B.P., and a later, represented by a series of 11 dates ranging from 1120 B.P. to modern (Fig. 6). Both of the early dates came from the semisubterranean house in Excavation Area One, and a hiatus of some 1700 years separates this house from the later occupation in the same area. Cultural Strata I and II of Excavation Area One thus represent the early period at the Hurd Site. The late period is represented by Cultural Stratum III in Excavation Area One, and by all other remains from the site.
Fig. 6. Hurd Site Radiocarbon Dates.
FEATURE AND ARTIFACT DISTRIBUTION

The Hurd Site topography and the relationship of C-14 dates to vertical depth indicates that the deposit did not accumulate at an even rate. The natural undulation of the gravel terrace on which the site is located created rises and swales which led, through time, to a deposit of uneven depth, which explains, at least in part, how a camas oven located at the bottom of the plow zone 20 centimeters deep can carry a date of 1120 B.P. and a camas oven in another area of the site at a depth of 40 centimeters can bear a date of 330 B.P. It is necessary, in light of the foregoing, to use caution in making inferences based on the vertical distribution of artifacts. Also for this reason, distributions in each individual excavation area must be considered separately.

The artifact type designations used in this discussion are described in the next section on lithic industries. Tables 2, 3, and 4 contain information on the distribution of the complete Hurd Site artifact inventory. The provenience information is broken down by excavation area, cultural stratum, and absolute depth. All classes of tools occur with greater frequency in the upper levels of the site.

In Excavation Area One two cultural features and only one artifact, a Type 8a point, were associated with the earliest cultural stratum, CSI. Cultural Stratum II, in addition to the association of features (pit rim, post-holes, central hearth, and cache pit) making up the pithouse, contained twenty-two core and ground stone tools, and forty-four flake tools, of which seventeen were various scraper types and sixteen were projectile points. One specimen of point types 3a, 4a, and 5a occur exclusively in CSII.

In CSIII, the total number of artifacts increases dramatically; 188 artifacts are associated with the use area surrounding the four rock clusters of this stratum. This number represents 76% of the artifact sample from Excavation Area One. Fifty-four scrapers makes this the largest tool class, with convex side scrapers representing 28% of this class. Projectile points comprise the second largest class with 33 specimens. Types 9, 10, and 11a occur exclusively in CSIII, while Types 1a, 1b, 2a, 7a, and 8a are present in both CSII and CSIII. An increase in spokeshaves, gravers, reamers, and scraper planes as well as the first appearance of unifacial chopping tools identified as axes, drills, and denticulates suggests orientation toward a woodworking industry.

Excavation Area Two presents one cultural stratum of relatively recent date, consisting of a large rock-lined camas oven surrounded by eight smaller amorphous rock clusters identified as camas oven "lids". A total of 123 artifacts were recovered from the fill between and over
these camas oven features. This is the smallest sample from any of the
evacuation areas, as might be expected in an area of such specialized use.
Scrapers (36 specimens), with convex side scrapers comprising 31% of the
sample, and projectile points (35 specimens), with Type 7a points
comprising 43% of the point sample, represent the two largest artifact
classes from this excavation area.

The major percentage of the artifacts taken from the Hurd Site
came from Excavation Area Three, suggesting that this area was one of
very heavy activity, and was probably the nucleus of the aboriginal
settlement. Cultural Stratum I consisted of a single feature, an amorphous
cluster of cobbles interspersed with charcoal and large fragments of bone.
Twenty-nine artifacts were removed from the fill of this level, only
two of which were projectile points.

Cultural Stratum II contained two rock clusters, a well-defined
firepit, a human burial, and 208 artifacts. The artifacts were found
throughout the fill assigned to this cultural stratum, and excepting
those found with the interment, none were in direct association with
cultural features. Within the burial pit, and adjacent to the burial
itself, were found four generalized unifacial chopping tools, three
unifacial chopping tools identified as axes, three scraper planes, one
core scraper, one discoid, one flake knife, and numerous large fragments
of basalt waste. These artifacts are thought to signify a woodworking
industry and the urge is therefore great to identify the burial remains
as those of a young adult male. In the ethnographic period, Kalapuya
men usually handled woodworking duties (Jacobs 1945:21).

Sixty-four projectile points were recovered from this cultural
stratum, with Type 7a by far predominant, comprising 52% of the point
sample from CSII. In the southwest corner of this excavation area, also in
CSII, a blanket of small stream pebbles interspersed with cultural material
and dark humic soil covered the floor of two contiguous two by two meter
units and extended into the sidewalls of the excavation on three sides.
This intermingling of gravel and cultural material is probably due to a
minor flooding during the period of occupation.

Cultural Stratum III contained a single rock cluster similar to
those of CSII and a mass of cobbles and small gravel thought perhaps
to have been brought to this level from below by post-CSII activity.
A total of 287 lithic artifacts were recovered from this cultural stratum,
making it the most productive at the Hurd Site. Projectile points
represent the largest tool class, with 102 specimens making up 36% of
the tool inventory for this level. Type 7a points predominate. Sixty-four
scrapers of various types constitute the second largest tool class and
comprise 22% of the tool inventory.

Tables 2, 3, and 4 contain information on the distribution of the
complete Hurd Site artifact inventory. The provenience information is
broken down by excavation area, cultural stratum, and absolute depth. All
classes of tools occur with greater frequency in the upper levels of the
site.
LITHIC INDUSTRIES

With the exception of thermally cracked rocks and cobbles, the chipped stone assemblage represents the largest category of cultural material from the Hurd Site; 2586 stone artifacts were recovered. In addition to the artifacts themselves, 9,634 waste flakes were taken from the site.

Most lithic material was collected by arbitrary ten or twenty centimeter levels, due to the lack of observable depositional stratigraphy. When lithic artifacts were found in conjunction with cultural features, the feature to which the material related served as the provenience marker. Only obviously non-cultural material was discarded in the field, and when this was done, note was made of the kind and number of items discarded. After washing, a second culling of nonartifactual material was made, with everything remaining after this point given over to labelling.

All of the lithic material collected at the Hurd Site falls into three fundamental raw material classes: obsidian, silica, and basalt.

The material designated as obsidian includes also dacite, which, except for color and opacity, resembles obsidian proper. The obsidian recovered is of two primary kinds; an unblemished vitreous variety and a phenocrystic variety. With few exceptions, most notably the light gray dacite, the material is black. The obsidian utilized at the Hurd Site came to the inhabitants in the form of small riverworn pebbles. The largest of these pebbles measured only 6.7 by 5.7 cm, and weighed 221 grams. The average size was approximately 3.5 by 3 cm, with an average weight of 32 grams. Obsidian pebbles of the nature described are available from the nearby McKenzie River which passes approximately 1-1/2 miles south of the site. Neutron activation analysis of obsidian from the Hurd Site demonstrated it to have gamma-ray activity patterns identical to those of obsidian units adjacent to the North Sister, a major peak in the upper McKenzie River drainage (Al Naibel, personal communication).

The silica group is the most inclusive raw material category and consists of various grades of chalcedony, chert, quartzite, and agate. All of the material included in this category consists of fine-grained cryptocrystalline minerals yielding some degree of conchoidal fracture. Silica outcroppings in the nearby Coburg Hills may have been tapped occasionally for raw material. Waterworn cobbles were the other source for the silicas, such cobbles presumably being found in some of the small streams in the area as well as in the McKenzie River.

Basalt was the most widely used raw material, it consisted for the most part of a high quality black fine-grained stone. As in the case of the obsidian, the basalt used on the Hurd Site is float
Table 2

PROJECTILE POINT DISTRIBUTION

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*Depth numbers indicate 10 centimeter increments.
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PROJECTILE POINT DISTRIBUTION (Cont.)

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FLAKE TOOL DISTRIBUTION

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Scrapers by type

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*Depth numbers indicate 10 centimeter increments.
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FLAKE TOOL DISTRIBUTION (Cont.)

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| 3 2 1 | 5 2 2 1 | 24 |
| 1 1 1 | 1 | 6 |
| 1 5 2 4 | 2 1 1 | 29 |
| 2 1 | 3 2 | 12 |
| 4 6 1 4 1 | 4 2 1 1 1 | 40 |
| 1 | | 2 |
| 1 1 1 | 1 | 12 |
| 1 | 1 | 5 |
| 27 36 7 20 2 | 40 12 1 9 6 9 3 | 285 |</p>
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CORE TOOL DISTRIBUTION (Cont.)

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material. Judging from the number and size of the cobbles observed in nearby stream beds, material of the quality found at the Hurd Site was abundant and easily accessible. Apparently there was no need to exploit a huge outcropping of columnar basalt located 1-1/2 miles south of the site.

DEBITAGE

All waste flakes were segregated into three classes: primary or decortication flakes, secondary or irregular flakes, and tertiary or flat flakes. Each of the three categories was further divided into one of three subcategories on the basis of raw material.

Primary or decortication flakes have one face covered in whole or major part by the original cortex of the pebble from which they were struck. Binford and Quimby (1963:287), Brose (1970:97) and McPherron (1967:134). As a general rule, the flakes in this category were larger than those in the other categories. White (1963:5) separates decortication flakes into primary, when the cortex covers the entire external surface, and secondary, when the cortex covers only a part of the surface. Both kinds are considered primary flakes here. Her suggestion that primary decortication flakes were usually discarded does not hold for the Hurd Site, where several artifacts are modified decortication flakes of the type she would call primary. Several flake knives are virtually unmodified decortication flakes on which the cortical surface serves as a natural "backing" opposite the cutting edge. It is true, however, that flakes wherein the cortex covers only a small surface are found in far greater abundance among the artifacts than are those with large areas of cortex.

Secondary or irregular flakes normally result from the process of shaping cores or the percussion trimming of a large decortication flake. These flakes may or may not have well-developed percussion bulbs. Invariably they are relatively large and blockish; in cross-section they are often rectangular or quadrilateral in shape. In other assemblages they are known variously as "tabular" (White 1963:13), "ridged" (Binford and Papworth 1963:83) and "Category B" (Wobst 1968:201) flakes.

Tertiary or flat flakes are flat or wedge-shaped in cross-section and usually bear the characteristic marks associated with finishing or retouch: a well-defined striking platform, a more or less prominent bulb of percussion, ripple marks or dunes, and radiating force lines. According to Witthoft (1957: 17-18), the range between wedge-shaped and flat flake form is accounted for by the angle at which percussive force is applied. As the force vector moves from an acute angle toward a position parallel with the core face the resulting flake becomes flatter and thinner.
Flat flakes are often subdivided into categories based on their shape, as determined by considering the ratio of width to length with the proximal end as the reference. Authors describe "expanding" flakes (White 1963:8; Binford and Papworth 1963:8) where the lateral edges widen toward the distal end; "contracting" flakes (Binford and Papworth 1963:86; Fitting 1966:21) or "converging" flakes (White 1963:8) where, in plan view, the widest point is at the proximal end and the convergence of the edges is away from the point of impact; and "parallel-sided" (Fitting, Devischer, and Wahlin 1966:21; White 1963:14) or "lamellar" (Binford and Papworth 1963:86) flakes whose lateral edges remain parallel throughout their length. As a large percentage of material from the Hurd Site was broken or otherwise lacking diagnostic features, separation of the flat flakes into these narrower subcategories was impractical.

The raw material was broken down separately into flake types when it was observed that each flake type tended to be used in the manufacture of essentially different tools (with, of course, some overlap).

Decortication flakes are by far the predominant type in each raw material category (Table 5). The percentages by weight and count are almost identical for decortication flakes of obsidian and basalt. The high frequency in each of these categories may be due to two related reasons. In the first place, probably all obsidian and basalt used on the Hurd Site was struck from stream-worn cobbles; if either of the materials had been quarried their ratios would be different, for whereas the stream cobble is initially entirely surrounded by cortex which must be dealt with by the knapper, quarried material has at least one extensive face the area of which is free of cortical material. In the second place, the manufacture of flake tools from cobbles of limited diameter necessitates the constant removal of cortical material. In the case of obsidian, where the median nodule diameter was 3 cm., it would have been extremely difficult to remove flakes free of the exterior cortex (only 7% of the obsidian debitage was secondary flakes). With basalt the problem is still one of limited purchase. While the basalt cobbles were of initially greater dimension than the obsidian pebbles, they were employed to make proportionately larger tools.

Reverse percentages in the proportion of secondary to tertiary flakes in the materials of obsidian and basalt seems also to be a function of cobble size and desired artifact. Since 88% of the projectile points collected from the site are made from obsidian, and approximately 91% of these are on tertiary flakes and since Hurd Site obsidian artifacts must, by necessity, be relatively small (the pebbles are small) one can reasonably expect to find relatively few secondary flakes appearing as artifacts or waste. The manageable size and workability of the obsidian pebbles would allow for direct pressure or soft hammer removal of flat tertiary flakes ready to use (either
with or without the cortex). The prehistoric knappers had, on the other hand, very little use for tertiary flakes of basalt (there was only one projectile point of basalt). There are numerous large flat flake tools but often these are backed with cortical material. Secondary flakes are more likely to result from percussion flaking of the large basalt cobbles than from the percussion flaking of small obsidian pebbles, especially where such large irregular flakes can be utilized in themselves either casually or as finished artifacts. While the obsidian artifacts are usually shaped and retouched, those of basalt are generally finished simply by the removal of a few flakes. The large flat decorticating flakes were apparently used with minimal retouch. Such a distinction would also contribute to the unequal percentages of tertiary flakes as, of course, retouch flakes are tertiary flakes.

Though decorticating flakes still predominate among silicadebitage, the percentage is measurably less (Table 5). Interesting too, the remainder of silica group flakes are divided equally between secondary and tertiary types. The reason may lie, at least in part, with the natural occurrence of the silicates being used. Unlike the case with obsidian and basalt, most of the silicas did not come to the aboriginal knapper as stream worn cobbles. Raw material extracted from an outcropping would have at least one extensive face free of cortical material at the commencement of knapping, and therefore potentially fewer decorticating flakes available for removal.

Careful macroscopic analysis of waste flakes would seem to be warranted. It is possible that two assemblages might differ in the selection of flakes for use (and hence for discard), and such differences might be informative. Microwear studies would also be of importance. While such analysis was not done on the Hurd Sitedebitage, waste material was separated by material and flake type, and each of the resultant nine types was separately bagged and labelled in preparation for possible future analysis.

**CASUAL FLAKE TOOLS**

The term casual flake tools was applied to any flake showing wear (polishing, nibbling, crushing, or striation) as a result of aboriginal utilization. This category does not include any tools exhibiting purposeful retouch, primary or secondary flaking. The assumption is that these flakes were used in a more or less casual manner as they were picked up. Edge wear was visible to the naked eye, and examination under a low power 30X microscope added nothing to the initial observations. This category theoretically includes all flakes no matter how slight their use, but in the absence of detailed and systematic microanalysis, the casual flake tools discussed below.
are those bearing at least macrowear indications. As with debitage, the casual flake tools were divided into categories by raw material and subdivided further by flake type (Table 5).

A frequently observed wear pattern may be described as crushing; this is where the resistance of the material being worked on by the flake caused what appears as very minute flaking. Striae were not noted except on a few larger pieces of obsidian where the glassy texture set off such scratches.

A total of 1180 casual flake tools were recovered from the Hurd Site; of this number, 368 were of obsidian, 529 of silica, and 283 of basalt. In the cases of both obsidian and basalt, the percentage of all utilized flakes of total flakes is almost identical. In the breakdown, however, there are differences. In the case of obsidian the highest percentage of utilization comes with secondary flakes and the lowest with decortication flakes; with basalt, preference was for tertiary flakes with the least interest shown in secondary flakes. Certain of these relationships can be explained by the characteristics of the flakes themselves. Less preference would be given to decortication flakes of obsidian because of the small size of the flake and the high ratio of cortex area. Most obsidian pebbles were under three centimeters in diameter, and such small decortication flakes, devoid as they normally are of usable edges, would have been of limited utility. Secondary flakes of obsidian are relatively rare, but those found would have served well in various capacities. Although usually angular and blocky in shape, the edges are often cleanly broken and sharp and would have served well as steep-sided scrapers. The percentage of utilized tertiary flakes may be lower than expected because of the very small size of most of these flakes.

A preference for tertiary flakes of basalt would be expected. When available, their size and shape - they tend to be relatively large and have at least one extensive thin edge - would make them ideal for many purposes. The small number of secondary flakes which were utilized is probably due to the awkward shape and size of the flake; such flakes would not find regular use when superior flakes were available.

The interesting statistic in the silica group is that a total of 17% of the silica flakes, of all types, saw use as casual flake tools. This is twice the percentage of either obsidian (8.6%) or basalt (8.4%) and would seem to indicate a definite preference. An examination of the utilized flakes of silica suggests that they may have been selected for casual use because they are characterized by the best features of both obsidian and basalt, that is, they tended to be large like the basalt ones while maintaining the tractability and clean edges common to obsidian.
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<th>Debitage</th>
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<td>% Utilized by flake type</td>
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<tr>
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<td>73.5</td>
</tr>
<tr>
<td>Sec.</td>
<td>12.1</td>
<td>16.9</td>
</tr>
<tr>
<td>Tert.</td>
<td>10.7</td>
<td>9.6</td>
</tr>
<tr>
<td>Total</td>
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</tr>
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</table>

| Silicates: |
|------------|--------------------|---------|
|            | % Utilized by flake type | % by wt. 2 | % by ct. 3 | wt. | Counts | % by wt. | % by ct. | wt. | Counts |
| Dec.       | 19.0               | 66.4    | 52.4     | 1868 | 277    | 63.8     | 45.3     | 6272 | 1182   |
| Sec.       | 14.5               | 24.8    | 23.1     | 697  | 122    | 28.1     | 27.5     | 2764 | 717    |
| Tert.      | 15.5               | 8.9     | 24.6     | 250  | 130    | 8.1      | 27.2     | 795  | 711    |
| Total      | 16.9               | 2315    | 529      | 9831 | 2610   |

| Basalt:    |
|------------|--------------------|---------|
|            | % Utilized by flake type | % by wt. 2 | % by ct. 3 | wt. | Counts | % by wt. | % by ct. | wt. | Counts |
| Dec.       | 8.7                | 87.4    | 77.0     | 9965 | 218    | 85.4     | 73.7     | 68699| 2279   |
| Sec.       | 5.8                | 8.6     | 11.5     | 981  | 33     | 12.5     | 17.3     | 10024| 535    |
| Tert.      | 10.4               | 4.0     | 11.2     | 451  | 32     | 2.1      | 9.0      | 1678 | 277    |
| Total      | 8.4                | 11397   | 283      | 80401| 3091   |

1Includes dacite  2Weight to nearest gram  3Percentages to nearest tenth
FLAKE TOOLS

The most abundant non-casual artifacts from the Hurd Site were flake tools. A total of 992 flake tools and tool fragments were recovered, representing 38% of the total artifact inventory. Hurd Site flake tools include projectile points, scrapers, graving points, spokeshaves, drills, burinlike tips, flake knives, reamers, multi-purpose tools, bifaces, and adzes.

Projectile Points

A total of 434 points and point fragments was recovered from the Hurd Site; this figure comprises 44% of the total flake tool category and makes this the largest artifact class. Of the total points, 363 (88%) were of obsidian, 50 (12%) were of silica group minerals, and only one was of basalt. Of the 434 points, 363 were classified into thirteen types and several subtypes; the remainder consisted of unique specimens, blanks, and unclassifiable fragments.

Classification is in terms of the Willamette Valley point typology presented by White (this volume). The Hurd Site collection formed the basic framework around which the Willamette Valley point typology was constructed; to forego unnecessary repetition, point descriptions are omitted below except where elucidation is needed.

Type 1a

A total of 30 Type 1a projectile points were recovered, comprising 7% of the projectile point sample (Fig. 7 a-d). Four of a larger variety are represented; the remainder are small. None of the specimens is serrated. Twenty-five of the Type 1a points are of obsidian, 5 are of silica material. Length ranges between .9 cm. and 2.2 cm., the mean is 1.5 cm. Width ranges between .6 cm. and 1.5 cm., the mean is .9 cm. Thickness ranges between .15 cm. and .5 cm., the mean is .2 cm.

Type 1b

A total of 26 Type 1b projectile points were recovered. This represents 6% of the projectile point sample (Fig. 7 e-g). Three of a larger variety are represented; the rest are small. Six of the specimens are lightly serrated. Twenty-four Type 1b points are of obsidian material, 2 are of silica material. Length ranges between
.9 cm. and 2.2 cm., the mean is 1.5 cm. Width ranges between .6 cm. and 1.5 cm., the mean is .9 cm. Thickness ranges between .1 cm. and .3 cm., the mean is .2 cm.

Type 1c

Two Type 1c points were recovered (Fig. 7 h-i). One specimen appears to have small asymmetrical ears. One is obsidian, the other is silica group material. One specimen is 1.5 cm. long, 1 cm. wide and .2 cm. thick, the other is 1.4 cm. by .9 cm. by .2 cm.

Type 2a

Nineteen Type 2a points, comprising 4.4% of the total point sample, were recovered from the Hurd Site (Fig. 7 j-k). All are obsidian and all are deeply serrated. Many of the points are broken, due probably to structural weaknesses inherent in such exaggerated serration or notching. Length varies between 1.3 cm. and 2.3 cm., the mean is 1.7 cm. Width varies between .8 cm. and 1.7 cm., the mean is 1 cm. Thickness varies between .2 cm. and .3 cm., the mean is .24 cm.

Type 3a

Five Type 3a points, representing 1% of the total point sample, were recovered (Fig. 7 l). Four of the specimens are obsidian, one is of silica group material. There is some range in the symmetricality of points in this group. Flaking is largely confined to the edges of the point, large areas of the flat surface are untouched. None of the specimens are serrated. Length ranges between 2.6 cm. and 3.2 cm., the mean is 3.0 cm. Width ranges between 2 cm. and 2.2 cm., the mean is 2.1 cm. Thickness ranges between .49 cm. and .51 cm., the mean is .50 cm.

Fig. 7 (opposite page). Projectile Points. a-d, Type 1a; e-g, Type 1b; h-i, Type 1c; j-k, Type 2a; l, Type 3a; m, Type 3b; n-o, Type 4a; p, Type 4b, q-r, Type 5a; s-t, Type 5b; u, Type 6; v-ee, Type 7a; ff-gg, Type 7b; hh-kk, Type 8a, 11-nn, Type 8b.
Type 3b

Three Type 3b points were recovered (Fig. 7 m). All three specimens are of obsidian. One specimen is lightly serrated. Length ranges between 2.5 cm. and 3.1 cm., the mean is 2.8 cm. Width ranges between 1.1 cm. and 1.6 cm., the mean is 1.3 cm. Thickness ranges between .46 cm. and .50 cm., the mean is .49 cm.

Type 4a

Four Type 4a points, representing 1% of the total projectile point inventory, were recovered (Fig. 7 n-o). All specimens are of obsidian. One specimen is lightly serrated. Length ranges between 2.7 cm. and 3.2 cm., the mean is 2.9 cm. Width ranges between 1.3 cm. and 1.5 cm., the mean is 1.4 cm. Thickness ranges between .50 cm. and .75 cm., the mean is .63 cm.

Type 4b

Two Type 4b points were recovered (Fig. 7 p). Both specimens are of silica material. Neither is serrated. One specimen is 3.5 cm. long, 1.5 cm. wide, and .7 cm. thick; the other is 2.6 cm. long, 1.3 cm. wide, and .7 cm. thick.

Type 5a

Four Type 5a points, comprising 1% of the total point inventory were recovered (Fig. 7 q-r). Three of the specimens are obsidian, one is of silica. None are serrated. Length ranges between 3.4 cm. and 3.6 cm., the mean is 3.5 cm. Width varies between 1.3 cm. and 1.7 cm., the mean is 1.4 cm. Thickness varies between .55 cm. and .65 cm., the mean is .60 cm.

Type 5b

Five Type 5b points, comprising 1% of the total projectile

Fig. 8 (opposite page). Projectile Points, Scrapers, Etc. a-b, Type 9; c-f, Type 10; g-i, Type 11a; j-k, Type 11b; l, Type 13; m, Type 14a; n-p, Miscellaneous crude points; q-u, Blanks; v-w, Lithic oddments; x, Straight side scraper.
point sample, were recovered (Fig. 7 s-t). All specimens are obsidian. One specimen is lightly serrated. Length varies between 2 cm. and 2.7 cm.; the mean is 2.2 cm. Width ranges between 1.1 cm. and 1.3 cm., the mean is 1.2 cm. Thickness ranges between .25 cm. and .4 cm., the mean being .3 cm.

Type 6

Three Type 6 points were recovered (Fig. 7 u). All three specimens are silica group material. None are serrated. Length varies between 3.8 cm. and 4.1 cm., the mean being 3.9 cm. Width varies between 1.7 cm. and 1.9 cm., the mean being 1.8 cm. Thickness ranges between .6 cm. and .8 cm., the mean being .7 cm.

Type 7a

A total of 134 Type 7a projectile points were recovered. Representing 31% of the total point inventory, this constitutes the predominant point type at the site (Fig. 7 v-ee). Nineteen of the specimens are silica material; the remainder are obsidian. Forty have light to medium serration. There is some variation in outline as shape ranges from short and broad to long and narrow. A full spectrum of knapping proficiency is displayed, with points ranging from crudely to finely made. Length varies between 1.1 cm. and 3.0 cm., the mean being 2.1 cm. Width varies between 1.0 cm. and 1.7 cm., the mean being 1.4 cm. Thickness varies between .2 cm. and .3 cm., the mean being .26 cm.

Type 7b

Seventeen Type 7b points, comprising 4% of the total projectile point sample, were recovered (Fig. 7 ff-gg). Fifteen of the specimens are obsidian, two are of silica group material. Nine are lightly serrated. Length varies between 1.4 cm. and 1.8 cm., the mean being 1.6 cm. Width varies between 1.0 cm. and 1.7 cm., the mean being 1.4 cm. Thickness varies between .2 cm. and .3 cm., the mean being .26 cm.

Type 8a

Fifty Type 8a points were recovered. This constitutes the second most abundant type and represents 12% of the total point sample.
(Fig. 7 hh-kk). Five of the specimens are silica material, the remainder are obsidian. Twenty-six points are lightly serrated. Length varies between 1.2 cm. and 2.8 cm., the mean being 2.0 cm. Width varies between 1.0 cm. and 1.9 cm., the mean being 1.4 cm. Thickness ranges between .2 cm. and .5 cm., the mean being .3 cm.

**Type 8b**

Ten Type 8b points, comprising 2% of the total point inventory, were recovered (Fig. 7 ll-nn). Nine specimens are obsidian, one is silica group material. Seven are lightly serrated. Length varies between 1.5 cm. and 2.5 cm., the mean being 1.7 cm. Width varies between 1.0 cm. and 2.5 cm., the mean being 1.2 cm. Thickness varies between .2 cm. and .3 cm., the mean being .23 cm.

**Type 9**

Eight Type 9 points, comprising 2% of the projectile point sample, were recovered, (Fig. 8 a-b). Six of the specimens are obsidian, two are silica material. One specimen is lightly serrated. Length varies between 1.2 cm. and 2.1 cm., the mean being 1.8 cm. Width varies from .8 cm. to 1.8 cm., the mean being 1.6 cm. Thickness ranges from .2 cm. to .4 cm., the mean being .34 cm.

**Type 10**

Twenty-five Type 10 points were recovered. This constitutes 6% of the total point sample (Fig. 8 c-f). Twenty-two of the specimens are obsidian; the remaining three are silica group material. Light to medium serration is present on 17 specimens. Length varies between 1.4 cm. and 2.5 cm., the mean being 1.9 cm. Width varies between 1.2 cm. and 1.6 cm., the mean being 1.4 cm. Thickness varies between .2 cm. and .5 cm., the mean being .3 cm.

**Type 11a**

Seven Type 11a points, comprising 2% of the total point sample, were recovered (Fig. 8 g-i). Six specimens are obsidian, one is basalt. Four are lightly serrated. No fine workmanship is demonstrated by points of this type; all are relatively crude. Length varies between 1.5 cm. and 1.7 cm., the mean being 1.68 cm. Width varies between 1.0 cm. and 1.4 cm., the mean being 1.2 cm.
Thickness varies from .2 cm. to .4 cm., the mean being .27 cm.

Type 11b

Seven Type 11b projectile points, representing 2% of the total point inventory, were recovered (Fig. 8 j-k). Six of the specimens are serrated. Workmanship is generally crude. Length varies between 1.8 cm. and 2.3 cm., the mean being 2.0 cm. Width varies between .7 cm. and 1.2 cm., the mean being .9 cm. Thickness ranges from .2 cm. to .3 cm., the mean being .26 cm.

Type 13

A single Type 13 point was recovered from the Hurd Site (Fig. 8 i). The specimen is obsidian, unserrated, and represents a high degree of workmanship. It measures 4.8 cm. in length, 2.0 cm. in width, and .9 cm. in thickness.

Type 14a

A single Type 14a point was recovered (Fig. 8 m). The specimen is obsidian and unserrated, 3.0 cm. long, 1.6 cm. wide, and .6 cm. thick.

Miscellaneous

Three crudely made projectile points are fashioned from decortication flakes of obsidian. One entire surface of the point consists of unmodified cortical material (Fig. 8 n-p). The points defy typing because of their crude, unfinished appearance. All are stemmed. Length ranges from 1.3 cm. to 2.2 cm., the mean being 1.8 cm. Width ranges between .9 cm. and 1.9 cm., the mean being 1.3 cm. Thickness ranges between .2 cm. and .5 cm., the mean being .36 cm.

Blanks

Eleven artifacts classified as point blanks were recovered from the Hurd Site. This number constitutes 3% of the point sample (Fig. 8 q-u). All eleven specimens are obsidian. All are ovate in outline. Length varies from 2.2 cm. to 3.0 cm., the mean being 2.5 cm. Width
varies from 1.6 cm. to 2.1 cm., the mean being 1.8 cm. Thickness ranges between .3 cm. and .6 cm., the mean being .5 cm.

Unclassifiable Fragments

Fifty-seven unclassifiable fragments were recovered. This number constitutes 13% of the total point inventory.

Scrapers

Few site reports describe more than two fundamental scraper types, side scrapers and end scrapers. There are some notable exceptions (Gradwohl 1969: 97-98; King 1968) but most authors give short shrift to this tool class. Such treatment is not warranted as this tool's frequency and range of types attests to its importance in the aboriginal tool kit. At the Hurd Site, scrapers of all types represent the second largest artifact class, after projectile points. Three hundred and twenty-five scrapers and scraper fragments were recovered from the site, representing 33% of the flake tool category.

The scraper typology for the Hurd Site materials was designed with two primary aims in mind. First, to describe in relatively simple terms the variant scraper forms present; second, to the degree possible, to devise a straightforward typology that would be capable of being universally applied. Both aims were satisfied by a typology based solely on the position and plan view shape of the working edge. The typology itself is not necessarily a reflection of function; such was not intended. Sophisticated analyses of retouch methods and manufacture such as are exemplified by Shafer (1970:480) are welcome but they serve different purposes than those intended by this typology.

Straight Side Scrapers

This group includes those scrapers, the working edges of which are located on the longitudinal edge of the flake, and whose edges throughout the length of the retouched area maintain a straight line in plan view (Fig. 8 x). A total of 55 straight side scrapers and fragments comprise 17% of the scraper sample. Thirty-two are of basalt, 19 of silica material, and 4 of obsidian. Of the basalt scrapers, 26 (81%) are made on decortication flakes, 4 (13%) on secondary and only 2 (6%) on tertiary flakes. Of the silica scrapers, 10 (53%) are on decortication flakes, 4 (21%) on secondary flakes, and 5 (26%) on tertiary flakes. Of the obsidian specimens, 2 are on decortication flakes and one each on secondary and tertiary flakes.
All but two of the scrapers are unifacially retouched on the working edge. Most are crude in fabrication. The angle of steepness (as determined with a protractor), ranges between 14° and 80° with the mean being approximately 40°. Length of working edge on complete specimens ranges between 2.2 and 8.1 cm., with a mean of 4.6 cm.

Convex Side Scrapers

This category includes those scrapers the worked surfaces of which are located on the longitudinal edge of the flake and whose edges throughout the length of the retouched area maintain a convex curve (Fig. 9 a-c). Eighty-two classifiable convex side scrapers and fragments were recovered, representing 25% of the sample. Forty-three scrapers are of basalt, 26 of silica, and 13 of obsidian. Of the basalt scrapers, 26 (61%) are on decortication flakes, 14 (33%) on secondary flakes, and 3 (7%) on tertiary flakes. Of the silica group, 13 (50%) are on decortication flakes, 8 (31%) are on secondary flakes, and 5 (19%) are on tertiary flakes. The obsidian breakdown consists of 7 (54%) specimens on decortication flakes, 2 (15%) on secondary flakes, and 4 (31%) on tertiary flakes. Thirty-four of the scrapers are unifacially flaked with the most refined work done on the silica materials. The basalt scrapers are generally of cruder manufacture with working surfaces created by the removal of a few strategic flakes. One basalt specimen is a plano-convex flake, ovate in plan view, with opposing convex edges unifacially flaked; in effect two scrapers in one. Length of working edge on complete specimens ranges between 3.2 and 9.6 cm., with a mean of 5.2 cm. In this category, as in most, tools of obsidian occupy the lower ranges in size, and those of basalt the upper.

Concave Side Scrapers

This group includes those scrapers the working surfaces of which are located on a concave longitudinal edge. In most cases the concavity shape is natural to the flake employed, in one case the concavity was created by retouch (Fig. 9 d). A total of 12 concave side scrapers and fragments represents 4% of the total scraper sample. Ten scrapers are of basalt, 2 are of obsidian. Of the basalt specimens, 5 (50%) are on decortication flakes, 3 (30%) on secondary flakes and 2 (20%) on tertiary flakes. The obsidian specimens were both made on decortication flakes. All of the specimens were unifacially

Fig. 9 (opposite page). Scrapers. a-c, Convex side scrapers; d, Concave side scraper; e-f, Irregular side scrapers; g, End-side scraper.
flaked. The flaking tended to be less steep among this group than any other. The concavity alone shows signs of working, the remainder of the flake having gone unaltered. All are crudely done. The length of the concavity varies between 3 and 7 cm., the mean being 4.0 cm. The notch depth ranges between .3 and .8 cm. with a mean of .4 cm.

Irregular Side Scrapers

Unlike the side scraper categories previously described, this group consists of those scrapers the working edges of which defy neat definition. Throughout its length, the same retouched edge may contain straight, concave, and convex sections (Fig. 9 e-f). A total of 24 irregular side scrapers and fragments represents 7% of the total sample. Eleven scrapers are of basalt, 6 are of silica, and 7 of obsidian. Of the basalt specimens, 8 (73%) are on decortication flakes, and 3 (27%) on secondary flakes. Of the silica scrapers, 3 (50%) are on decortication flakes and 3 (50%) are on secondary flakes. The obsidian breakdown consisted of 1 (14%) specimen made on a decortication flake, 3 (43%) made on secondary flakes, and 3 (43%) made on tertiary flakes. With the exception of a single obsidian specimen, all of these scrapers are unifacial. All are crudely worked. The length of the worked edge on complete specimens ranges widely, between 2.1 and 8.7 cm., the mean being 5.0 cm.

End-Side Scrapers

This category includes scrapers the working edges of which occupy one or two longitudinal sides and an adjacent end. Most often the flake is rectangular or elongated in shape (Fig. 9 g). Six end-side scrapers and fragments, comprising 2% of the sample, include 1 of basalt, 3 of silica, and 2 of obsidian. The single basalt scraper was on a decortication flake. Of the silica specimens, 1 was made on a decortication flake and 2 were on tertiary flakes. The obsidian specimens consisted of 1 on a secondary and 1 on a tertiary flake. All are unifacially worked. The working face located at the end of the flake is steeper than the adjacent side face. Three of the tools demonstrate visible signs of wear on their ends. Measurement of the end face was possible in all specimens but only two were complete enough for tool length measurement. The width of

Fig. 10 (opposite page). Scrapers and Gravers. a-b, Concave end scraper; c, Convex end scraper; d-e, Straight end scrapers; f-g, Oval scrapers; h, Combination scraper; i, Mucronated scraper; j, Corner scraper; k-m, Graving points.
the end face ranges between 1.0 cm. and 2.3 cm., the mean being 1.7 cm.

Concave End Scrapers

This group includes those scrapers the worked faces of which are located on a transverse edge of the flake where retouching has formed a shallow concavity the full width of the flake (Fig. 10 a-b).

A total of 6 complete concave end scrapers, representing 2% of the total scraper inventory, were taken from the site. Five specimens are of basalt, and one of silica. Of the basalt specimens, 3 (60%) are on decortication flakes and 2 (40%) on secondary flakes. The single silica artifact is made on a decortication flake. All of the specimens are unifacial. The basalt specimens are crudely made; the silica scraper demonstrates finer workmanship. As with the concave side scrapers, the secondary flaking occurs throughout the length of the depression. The basalt scrapers have a worked face that between 2.8 and 3.1 cm. in length, the mean being 2.9 cm.; and a depth of concavity ranging between .3 and .5 cm., the mean depth being .4 cm. The silica specimen has a worked face length of 1.2 cm. and a depth of .2 cm.

Convex End Scrapers

This group includes those scrapers the worked faces of which are located on a transverse edge of the flake, and whose edge throughout its length maintains a convex curve (Fig. 10 c). A total of 29 convex end scrapers and fragments was recovered; this represents 9% of the total scraper sample. Sixteen are made of basalt, 8 of silica material, and 5 of obsidian. Of the basalt group, 11 (69%) specimens are made on decortication flakes, 3 (19%) on secondary flakes, and 2 (13%) on tertiary flakes. Of the silica specimens, 4 (50%) are made on decortication flakes, 3 (38%) on secondary flakes, and 1 (12%) on a tertiary flake. Four (80%) of the obsidian scrapers are on decortication flakes and one is on a secondary flake. With the exception of a single silica specimen, all items of this group are unifacially retouched. Three of the basalt specimens appear to have been flaked entirely by percussion; that is, they have large flake scars. An entire spectrum of workmanship is represented, some of the basalt tools being very crude with large, irregular flake scars, and certain of the silica specimens, with small even retouch, being of relatively high quality. The disparity in size is great, ranging from several outsized basalt specimens 7.9 cm. long to the relatively small obsidian "snub-noses" 2.2 cm. long. The worked face on measurable pieces varies between 1.9 and 4.5 cm. in length, with a mean of 3.0 cm.
Straight End Scrapers

This group includes those scrapers the working edges of which are located on a transverse edge of the flake and whose edge maintains a straight line throughout its length (Fig. 10 d-e). Twelve straight end scrapers and fragments, comprising 3.7% of the total sample, included 9 specimens of basalt, 2 of silica, and one of obsidian. Of the 9 basalt scrapers, 8 (89%) are on decortication flakes, and 1 (11%) is on a tertiary flake. The silica scrapers are both made on decortication flakes, and 1 was made on a tertiary flake. The silica scrapers are both made on decortication flakes, as is the single obsidian specimen. Three of the specimens have bifacial retouch. All of the basalt scrapers are crudely made, and all are on relatively large flakes. The obsidian specimen has a narrow, finely-flaked face with a steep (90°) angle. The working edge ranges between 1.6 and 4.6 cm. in length, with a mean of 3.5 cm.

Oval Scrapers

This group includes those scrapers which are oval or nearly oval in outline. In many cases the secondary flaking does not continue completely around the circumference of the artifact, but by definition it covers at least 75% of the edge (Fig. 10 f-g).

A total of 41 oval scrapers, representing 13% of the total scraper inventory were recovered. Of the total, 26 specimens are of obsidian, 14 of silica, and only 1 of basalt. The single basalt specimen is made on a decortication flake. Of the silica scrapers, 3 (21%) specimens are made on decortication flakes, 6 (43%) are on secondary flakes and 5 (36%) are on tertiary flakes. The obsidian breakdown consists of 17 (65%) made on decortication flakes, 2 (8%) made on secondary flakes, and 7 (27%) made on tertiary flakes. This group contains 12 bifacially flaked specimens. In addition to demonstrating the finest workmanship among the Hurd Site scrapers, this group is the most homogeneous morphologically. All specimens are within a very restricted size range and all are either plano-convex or lenticular in cross-section. In 16 instances flaking covers all or most of the dorsal surface. Included in this group are 11 of those specimens known also as "thumbnail" scrapers. The circumferences vary between 4.1 and 11.0 cm. The mean circumference is 7 cm.

Combination Scrapers

This group includes those scrapers that have at least two separate working faces, each of which constitutes a different scraper
type. These scrapers are, in effect, two separate tools on one flake (Fig. 10 h).

Only two of these multi-purpose specimens were found, representing .6% of the total scrapers. Both are of silica material, and both are made on decortication flakes. One of the specimens is a combination of convex side and straight side scraper. The two worked surfaces are separated at each end of the flake by a small unworked area. The second specimen is a combination of straight side and irregular scraper; it also has a separation between the working faces. Both specimens are finely flaked and unifacial. The convex-straight side specimen has edge lengths of 3.5 and 3.1 cm. respectively. The straight-irregular specimen has edge lengths of 3.6 cm. and 6.0 cm. respectively.

Mucronated Scrapers

This group includes scrapers the working edges (generally straight) of which are interrupted by a triangular-shaped projection, or mucronate (Fig. 10 i). Twelve of these mucronated scrapers were recovered from the site. This represents 3.7% of the sample. Nine are of basalt, and 3 of silica. Of the basalt scrapers, 8 (89%) are made on decortication flakes and 1 (11%) on a secondary flake. All three silica specimens are made on decortication flakes. All of the scrapers in this category are unifacial. The mucronate is not merely an unworked cusp projecting from a worked edge, but in most cases, it too, is retouched along its perimeter. Signs of wear are evident in several instances, where it appears that the resistance of the object being worked was perpendicular to the worked edge. The worked edge varies between 2.0 and 3.7 cm. in length, the mean being 3.2 cm. The mucronate itself varies in width between .4 and 1.3 cm. (mean 1.0 cm.), and in height between .3 and .7 cm. (mean .6 cm.).

Corner Scrapers

This group includes scrapers, roughly rectangular in shape, whose straight worked edges converge at a corner of the flake. The dorsal surface at the corner of convergence is, in most cases, retouched (Fig. 10 j). Five examples of corner scrapers were recovered, representing 1.5% of the total scraper inventory. One specimen is of basalt, 3 of silica, and 1 of obsidian. The sole basalt specimen is made on a decortication flake. Of the silica scrapers, 1 specimen is made on a secondary flake and 2 are on tertiary flakes. The single obsidian example is on a secondary flake. The obsidian specimen is bifacial. Wear at the point of convergence indicates that the tool was probably used with the worked corner making the most substantial
contact with the material being operated on. The worked faces converging at the corner vary between 1.9 and 3.5 cm. in length, the mean being 2.2 cm. The angle of convergence ranges between 70° and 120°. Two of the 5 specimens have a corner angel of 90°

Non-diagnostic Scraper Fragments

In addition to the scrapers and scraper fragments described above, there were a moderate number of tool fragments found, which though recognizable as belonging to the scraper class, were not of sufficient integrity to permit more specific classification. A total of 39 non-diagnostic scraper fragments was recovered; this represents 12% of the total scraper sample. Of this number, 13 are basalt, 13 are silica, and 13 are obsidian. Of the basalt scraper fragments, 6 (46%) are on decortication flakes, 4 (31%) on secondary flakes, and 3 (23%) on tertiary flakes. Of the silica specimens, 5 (39%) are made on decortication flakes, 6 (46%) on secondary flakes, and 2 (15%) on tertiary flakes. The obsidian breakdown consists of 3 specimens (23%) made on secondary flakes, and 10 (77%) made on tertiary flakes.

Graving Points

This tool class includes those flakes, one edge of which is dominated by the presence of a well-defined and isolated spur or point. The two edges leading to the point may or may not be retouched for any great distance out from the graving point, but the point itself and the immediately adjacent area at its base are often retouched. The "beak" is frequently created by simply removing two closely situated flakes and utilizing the point naturally formed by the intervening unremoved portion (Fig. 10 k-m). A total of 57 graving points comprise 5.7% of the flake tool category. Of this total, 10 specimens are basalt, 31 silica, and 16 obsidian. Of the basalt specimens, 7 (70%) are on decortication flakes, and 3 (30%) on secondary flakes. Of the silica specimens, 19 (61%) are on decortication flakes, 8 (26%) on secondary, and 4 (13%) on tertiary flakes. Of the obsidian specimens, 10 (63%) are on decortication flakes, 3 (19%) on secondary and 3 (19%) on tertiary flakes. While most points are unifacial, 4 are flaked around their entire circumference. Wear, in the form of a crushed tip, is observable on many of the specimens. The working points vary between .1 and .7 cm. in height (mean .3 cm.), and in basal width between .1 and .8 cm. (mean .4 cm.).
Spokeshaves

This artifact class includes those flakes whose edges have one or more deep notches, the peripheries of which are flaked to a steep angle by purposive manufacture or prolonged use. The flake is unaltered except for this notch. This tool is differentiated from the concave scraper by the extreme depth-width ratio of its concavity (Fig. 11 a-c). A total of 70 spokeshaves comprises 7% of the total flake tool inventory, making this the third largest flake tool class behind projectile points and scrapers. Of the total specimens, 29 are of basalt, 33 of silica, and 8 of obsidian. Of the basalt specimens, 20 (69%) are on decortication flakes, 7 (24%) on secondary, and 2 (7%) on tertiary flakes. Of the silica specimens, 18 (55%) are made on decortication flakes, 8 (24%) on secondary, and 7 (22%) on tertiary flakes. Of the obsidian samples, 7 (88%) are on decortication flakes and 1 is on a secondary flake. All flaking appears to be unifacial, but constant back and forth use has, in many cases, caused the notch to take on a bifacial appearance. Although most flakes used tended toward flatness, this characteristic, as well as that of overall size, does not seem to have been critical. Of the total spokeshaves collected, 8 specimens had more than one well-defined notch; 7 of these multi-notched specimens were basalt. Notches vary between .15 and .6 cm. in depth (mean .3 cm.), and between .4 and 1.5 cm. across (mean .9 cm.).

Drills

This artifact class includes those tools the outstanding feature of which is a relatively long, narrow, tapering, finely flaked point. These points are usually biconvex to oval in cross-section. Flaking is usually bifacial but not always. The bases are usually expanded into a flat, oval or triangular shape to facilitate grasping. Less often the base is an unmodified and irregular shape (Fig. 11 d-f). Thirteen drills and drill fragments were recovered, representing 1.3% of the flake tool inventory. Two are of basalt, 6 of silica, and 5 of obsidian. Both basalt drills are made on tertiary flakes. Of the silica tools, 3 (50%) are made on decortication flakes, and 3 (50%) on tertiary flakes. All 5 obsidian drills are made on tertiary flakes. The most finely made drills are of obsidian and all are bifacial. Two of the drill specimens are unifacially flaked, and 3 others appear to be fortuitous flakes containing natural perforating points in need of minimum human modification. Shaft length on measurable specimens ranges between .5 and 2.8 cm., with a mean of 1.5 cm. Broken shafts on some of the longer specimens indicate that this range was occasionally

Fig. 11 (opposite page). Wood-Working Tools. a-c, Spokeshaves; d-f, Drills; g-h, Burin-like tips; i-l, Reamers.
exceeded.

*Burin-like Tips*

This small class of tools includes two flakes that are characterized by an abrupt transverse (chisel) edge made by the removal of on flake (Fig. 11 g-h). One is obsidian and one silica; both are made on secondary flakes. Neither was retouched. In both cases, wear is observable on the chisel tip.

The tip lengths are .3 cm. for the obsidian specimen, and .4 cm. for the silica specimen.

*Flake Knives*

This artifact class includes those flakes whose edges are modified for use in a direction parallel to the worked edge. Bifaciality, often considered a distinguishing characteristic, is not considered so here; exceedingly thin and large (and often naturally "backed" with cortical material) flakes of basalt would have served well with minimal unifacial working. These unifacial flake knives are distinguished from side scrapers by the extreme sharpness of the worked edge (Fig. 13 g-i). A total of 43 knives and fragments comprise 4.3% of the flake tool category. Of this number, 24 specimens are of basalt, 15 are of silica, and 4 of obsidian. Of the basalt knives, 18 (75%) are on decortication flakes, and 6 (25%) on tertiary flakes. Of the silica specimens, 5 (33%) are on decortication flakes, 6 (40%) on secondary, and 4 (27%) on tertiary flakes. Of the obsidian knives, 2 are on secondary flakes and 2 on tertiary flakes. All of the non-basaltic knives (19) are bifacial; 7 of them are shaped. The basalt specimens are by far the largest, all but one are unifacial, and all are exceedingly thin along the worked edge. Nine of the basalt specimens are fully backed with cortex. The worked edge on measurable specimens ranges between 2.5 and 11.5 cm. in length, with a mean of 5.7 cm. The upper limits of this range were occupied only by basalt knives.

*Reamers*

This tool class includes those flakes the distinguishing

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Fig. 12 (opposite page). Flaked Stone Artifacts. a-b, Multi-purpose tools; c-f, Bifaces; g, Adze.
feature of which is a relatively broad, tapered finely flaked point or bit. The reamer point is differentiated from the drill by its shape, which is generally shorter and broader, and triangular in plan view (Fig. 11 i-1). A total of 30 reamers was recovered, representing 3% of the flake tool category. Of this number, 23 specimens are basalt, 5 are of silica, and 2 of obsidian. Of the basalt specimens, 16 (70%) are made on decortication flakes, 6 (26%) on secondary, and 1 (4%) on tertiary flakes. Of the silica specimens, 4 (80%) are on decortication flakes and 1 (20%) on a secondary flake. Of the obsidian specimens, 1 is made on a secondary flake and 1 on a tertiary flake. The temptation is great to call these tools wood bits, a modern tool which they resemble. There seems to be no preference for bifaciality or unifaciality; the critical factor appears to be the lateral toughness of the point. This is enhanced by making use of the carina or ridge of the flake. This ridge in most cases travels out to the distal tip of the tool. In cross-section the reamer bit is triangular with the flake ridge forming the apex of the triangle. Structurally, these tools would have maximum strength for use in a rotating motion. Bit length varies between 1.3 and 2.5 cm., the mean being 1.7 cm. Basal width ranges between 1.1 and 2.1 cm., with a mean of 1.6 cm. There was a uniformity of basal width, 11 of the specimens having widths of 1.6 cm.

Multi-purpose Tools

Not a class in the ordinary sense, this group includes flakes which contain two or more distinctly different tools (Fig. 12 a-b). Eight multi-purpose tools were recovered, of this sample, 4 specimens are of basalt, 2 of silica, and 2 of obsidian. Of the basalt specimens, 3 (75%) are made on decortication flakes, and 1 (25%) on a secondary flake. One silica specimen is made on a decortication flake and 1 on a tertiary flake. Both obsidian specimens are made on decortication flakes. The following combinations are present: 5 scraper-gravers, 2 spokeshave-scrappers, and 1 knife-reamer. While in some instances it is plainly not the case, in others it is obvious that the second tool came into existence after the breakage or disuse of the first. With the exception of a large basalt spokeshave, which has a notch .9 cm. deep and 2.5 cm. across, all of the combination tools fall within the ranges given under preceding type descriptions.

Bifaces

These tools are well-shaped bifaces and where complete appear to be pointed at the distal end and broader and rounded at the proximal end (Fig. 12 c-f). A total of 9 bifaces and fragments was recovered, representing 1% of the flake tool inventory. Of this total,
7 are of basalt and 2 of silica. Of the basalt specimens, 3 (43%) are made on secondary flakes, and 4 (57%) on tertiary flakes. Both of the silica specimens are made on tertiary flakes.

The two silica specimens, although incomplete, are bifacially and evenly flaked. Both are made on thin flakes of clear quartz; fine flaking covers approximately two-thirds of each surface. The basalt specimens are of a rougher variety, being unevenly flaked throughout their circumference and thick in cross-section. The complete specimens indicate two basic sub-types: one has a lanceolate shape and a length between 7.4 and 7.6 cm.; the other is ovate with a length between 5.1 and 6.0 cm.

Adze (?)

A single basalt artifact resembles an adze. In plan view it is of a symmetrical deltoid shape, with opposing longitudinal edges bifacially flaked. In longitudinal cross-section it is triangular. The distinctive characteristic is an adze-like bevel which originates at the thickest point of the flake, approximately the midpoint of the dorsal surface, and slopes in a clean line to the broad base. This adze-like surface is unusually flat, and unflaked. The cutting edge, which is exceedingly thin, shows distinct small chips removed as the result of wear. The proximal end, pointed and flaked round as it is, might well have been hafted in antler or bone (Fig. 12 g). The specimen is 7.7 cm. long, and 4.3 cm. wide at the base. The angle of bevel is 12°.

CORE TOOLS

Core tools and cores represent a significant percentage of the artifact inventory from the Hurd Site. The core material was broken down for analysis into three major groups: cores and nuclei, unclassifiable chunks, and core tools. While all of the specimens in these three subcategories are in the strictest sense artifactual, they range in cultural utility from chunks handled perhaps once or twice to carefully shaped discoids used regularly. The total of diagnostic cores and core tools numbered 349, which represents 13.5% of the tool artifact inventory.

A core is a block or nodule of lithic material from which flakes have been more or less systematically detached. While any cobble that has had a single flake purposively removed would qualify as a core, only those with multiple detachment scars were tabulated as having been systematically used as a flake source.
Single-ended Platform Cores

These are simple cobble cores from which flakes have been removed in one direction. They are totally unprepared; but the striking platforms in all cases are at only one end of the exterior cortex of the cobble (Fig. 13 a). A total of 9 usable single-ended platform cores and 9 exhausted nuclei was recovered. This represents 5% of the total core tool inventory. All of the full-size specimens and 6 of the nuclei are of basalt (83%); the remaining three nuclei are of silicate material (17%).

The 18 specimens demonstrate successive stages from whole cobble to unusable nucleus. As the core progresses through its use cycle it gets gradually smaller until at the nucleus stage it can no longer produce flakes of usable size. As the specimens approach this final stage they become more "shaped" until they assume the classic plano-convex morphology of the nucleus. Several of the specimens appear to have been made by initially splitting a river cobble on the bias and then proceeding to detach flakes using the acute angle between cortex and interior face as the striking platform. The largest core representing initial stages of use is 12 centimeters long from striking platform to distal end of the face. The largest flake detached was 10.3 cm. long. The smallest core in the prenucleus stage of use had a working face 4.5 cm. long and contained flake scars of equal length.

Amorphous Cores

These are cores from which flakes have been removed by using as striking surfaces the platforms formed by the scars of previously removed flakes. As a result of this technique, cores in this category are multi-faceted (Fig. 13 b). No large cores, but 5 nuclei were found attesting to the use of this technique of flake removal. Two of the specimens are basalt, and 3 are of silica material. Variations in shape are great. One of the silicate specimens resembles the type of amorphous core that Binford describes as a "block core" (Binford and Papworth 1963:83). The irregularity of these cores makes it difficult to produce meaningful measurements. They varied in weight between 17 and 285 grams.

Fig. 13 (opposite page). Miscellaneous Stone Artifacts. a, Single-ended platform core; b, Amorphous core; c, Bipolar core; d, Core scraper; e, Core spokeshave; f, Pecking stone; g-i, Flake knives.
Bipolar Core

This type of core is characterized by diametrically opposite bulbs of percussion. This bipolarity results from the use of a heavy percussion force on a core that has been placed on an anvil (Fig. 13 c). A single specimen attests to both a knowledge of the technique and the rarity of its application. The single silicate nucleus recovered is of the type Binford and Quimby (1963:292) call "ridge-area" cores. The Hurd Site specimen bears close resemblance to the "flat" or "back and front" bipolar core described by McPherron (1967:137-139). The specimen is 2.9 cm. long, 1.3 cm. wide, and .7 cm. thick.

Unclassifiable Chunks

This large category includes cobbles that have been culturally modified, but so minimally and so unsystematically, that a more detailed classification is unfeasible. A total of 1067 unclassifiable chunks was recovered from the Hurd Site. Of this number, 116 specimens (11%) are made of basalt, 340 (32%) are of silica group material, and 611 (57%) are of obsidian. It is suspected that these chunks represent remnants of commonly used method of flake detachment. This method involved simply the splitting of a cobble or pebble, the removal of the desired flake, or flakes, from the newly exposed interior face, and the discarding of the remaining chunk. The ready availability of basalt material probably made it unnecessary to be much more frugal or systematic than this. Flakes for modification into points could have been efficiently supplied by the simple method just described. As the obsidian pebbles used for raw material are usually quite small, detachment in this way would also provide the largest flake possible.

Unifacial Chopping Tools-General

This class contains cobbles modified for use as choppers or cleavers. They are characterized by a uniaxially flaked face which forms an acutely angled, sharp, and occasionally jagged cutting edge or bit. Two basic chopper forms are describable, those made from a whole or split cobble and those fashioned from an irregular chunk of core material (Fig. 14 a-b).

Fig. 14 (opposite page). Core Tools. a-b, Unifacial chopping tools - general; c, Unifacial chopping tool - axe; d, Bifacial chopping tool; e-f, Scraper planes; g-i, Discoids; j-k, Denticulates.
A total of 46 unifacial chopping tools was found, comprising 13% of the core tool inventory. All are of basalt. Twenty-six specimens were prepared by splitting a water-worn cobble across its shortest axis and then flaking—with a minimum number of flake detachments—a sharp cutting or chopping edge. The remaining 20 specimens appear to be chopping tools fashioned in essentially the same way out of irregular chunks of waste. Edge wear varies from barely detectable to heavy. Nine of the specimens appear to be worn beyond the point of usefulness, the bit being battered to a smooth rounded contour. None show signs of resharpening, perhaps because of the relative ease with which new choppers could be made. The length from butt to bit varies between 4.6 and 12 cm., with a mean of 7.2 cm. The width, measured across the working face, ranges between 4.7 and 10.4 cm., with a mean of 7.8 cm. The thickness varies between 2.5 and 6.4 cm., the mean being 4.2 cm.

**Bifacial Chopping Tools**

This category includes split cobbles and core chunks worked to a crude bifacial chopping edge by the removal of a few large flakes from adjoining edges, (Fig. 14 d). Eighteen specimens were recovered, representing 5% of the total core tool sample. All but one are made of fine-grained basalt. One unique chopping tool was made from a flat, oval stream-worn cobble of vesicular basalt. Edge wear varies from minimal to moderately heavy. Only the unique specimen of vesicular basalt appears to have evolved beyond usefulness, its edges rounded by battering. As in the case of the unifacial chopping tools discussed above, there appears to have been no attempt at rejuvenating worn bits. The lack of uniformity and general crudity of these tools seems to indicate that they were made casually from debris underfoot. The tool length from butt to bit ranges between 4.4 and 10.4 cm., with a mean of 8.0 cm. The width across the bit varies between 5.5 and 9.5 cm.; the mean is 7.5 cm. The thickness varies between 2.4 and 5.1 cm., the mean is 3.7 cm.

**Unifacial Chopping Tools—Axes**

This class includes those chopping tools whose flatness, sharply-angled working face, and wear pattern points to possible use as axes. The narrow range of variation in certain attributes separates them from unifacial choppers in general and indicates a specialized use (Fig. 14 c). A total of 39 specimens were recovered, comprising 11% of the total core tool inventory. All chopper-axes are of basalt. All are fashioned from flat or "horsehoof" cobbles. These have been split, and then, by the removal of several large flakes, given an acutely angled face that terminates in a very sharp cutting edge.
In all cases, the heel or butt is unmodified cobble cortex; this natural backing and the heft of the artifact would make them ideal hand-axes. In plan view they resemble some of the choppers from Little Muddy Creek, Oregon, found by Davis (1970: Fig. 11 b). Bit wear varies from imperceptible to very heavy. Five specimens appear to be worn beyond the point of usefulness. Three specimens bear rejuvenating flake scars. One unique specimen appears to have been made on a waterworn chopper lost or discarded at an earlier time. The tool length from butt to bit varied between 6.0 and 15.8 cm., the mean was 9.5 cm. The width as measured across the working face ranged between 6.5 and 13.1 cm., the mean was 1.4 cm. The thickness, a distinguishing characteristic, varied narrowly between 2.2 and 4.2 cm., the mean was 3.3 cm.

**Scraper Planes**

This artifact class includes core tools distinguished by the presence of a steep, unifacially flaked face which terminates in a sharp edge. The underside of the bit is invariably flat and worn, and often the entire ventral surface of the tool is polished, presumably through a planing motion (Fig. 14 e-f). Seventy-nine scraper planes were recovered, representing 23% of the total core tool inventory. All of the specimens are of basalt. Fifty-nine are modified cobbles with cortical material covering a majority of the artifact's surface; 20 planes were made from core chunks and had a minimum or none of the dorsal surface covered with cortex. With only one exception, the underside, or plane surface, is unmodified cortex. Edge wear, generally in the form of crushing, varies widely from light to very heavy; 5 specimens appear to have reached a stage of desuetude.

Twenty-one planes show definite signs of having been rejuvenated, the edge having been returned to its former keeness by the removal of several large flakes. Working faces initially acute are reduced in their acuity by subsequent rejuvenation of the bit until, as is demonstrated with 17 of the Hurd Site specimens, working face adjoins the plane surface at right or obtuse angles. Plane surface wear varies from light to heavy. Heavy wear is characterized by an unnatural flatness of the ventral surface and in some cases a polish; striae running perpendicular to the bit are clearly visible on several specimens. Size varies greatly on a continuum from small to quite large. The lengths, measured on the plane surface of the tool from butt to bit, vary between 3.8 and 14.0 cm., the mean is 7.3 cm. The width, measured across the bit, varies between 4.3 and 10.8 cm., the mean is 7.4 cm. The height or thickness, measured from plane (ventral) surface to the highest point, varies between 2.1 and 7.2 cm., the mean is 4.5 cm.
Discoids

This artifact class includes core tools of a discoidal shape made by the systematic removal of flakes completely around the periphery and over the entire dorsal surface of the subject cobble. The total effect of this systematic flaking is the creation of a "tortoise-back" artifact. The flat ventral surface is largely unworked, and in many cases consists of the unmodified cortex of the cobble. The slope from the center of the ventral surface to the outer perimeter is in most cases relatively gradual resulting in an edge suitable for scraping or cutting (Fig. 14 g-i). Seventy-one discoids and discoid fragments in various stages of manufacture were recovered, comprising 20% of the core tool inventory. Sixty-six (93%) specimens are of basalt, 4 (6%) of silica, and 1 (1%) of obsidian. Edge wear varies from undetectable to heavy. Wear is manifested by crushed edges and, in some cases, a nibbling away of cortex material on the flat ventral surface. Examination of the various stages of manufacture indicates that the round shape is given to the artifact first; after this, flakes are detached from the dorsal surface, lowering its relief and giving it the characteristic "tortoise-back" appearance. There is a great variation in diameter; in thickness the range is not so great. Measurable discoids varied between 3.5 and 12.3 cm. in diameter, the mean was 6.0 cm. They ranged between 1.0 and 3.7 cm. in thickness, the mean being 2.0 cm.

Core Scrapers

This category consists of crude scrapers fashioned on pieces of core material. The working edges have been unifacially flaked to a relatively steep angle. These scrapers are differentiated from scraper planes by the absence of the planar ventral surface (Fig. 13 d). Eight specimens were recovered, comprising 2% of the core tool inventory. All of the specimens are basalt. Secondary flaking is evidenced on 4 of the scrapers. Six of the specimens have convex working faces, 2 have straight faces. The general rudeness of the tools seems to indicate spur-of-the-moment manufacture to serve a casual need. The length between heel and bit varies between 5.3 and 7.9 cm., the mean is 6.8 cm. The width, measured across the working edge, ranged between 6.1 and 8.1 cm., the mean is 7.1 cm. The thickness varies between 2.1 and 4.2 cm., the mean is 3.1 cm.

Core Spokeshaves

This category includes core material on an edge of which is
located a narrow deep concavity, or notch. This notch owes its existence to purposeful modification and/or prolonged use (Fig. 13 e). A total of 10 core spokeshaves were recovered; this represents 3% of the core tool inventory. Of the total specimens, 6 are basalt and 4 are silica. Two of the spokeshaves are made on relatively large split cobbles, the remainder are fashioned on irregular core chunks. One specimen is multi-notched. Notches vary between .2 and .4 cm. in depth, with a mean of .3 cm. The distance across the notch varies between .7 and 1.8 cm., the mean is 1.2 cm.

Denticulates

This artifact class includes core material one edge of which is marked by the presence of a large beak, or denticle. This denticle, triangular in shape, was created by the removal of two closely situated, but not adjoining, flakes, and by the utilization, with minimal modification, of the area remaining between the flake scars. These tools are differentiated from gravers by their much larger size and more uniform shape (Fig. 14 j-k). Ten denticulates were recovered, comprising 3% of the total core tool inventory. All of the specimens are basalt. Denticle wear varies from light to heavy and is manifested in a crushing and rounding of the initially pointed beak. All but two of the specimens have relatively massive butts suggesting that this characteristic was in some way important in the tool's function. Specimens varied between 4.2 and 8.2 cm. in length (measured from butt to denticle tip), the mean being 6.5 cm. Denticle length, measured from base to tip, varied between .6 and 1.4 cm., the mean being .9 cm.

Casual Core Tools

This rather loosely defined category includes core material that exhibits modification by use. The common denominator of this heterogeneous group is the indefinability and casualness of the use signs; as with the casual flake tools already discussed, these appear to have been picked up, used and discarded. They are casual in the sense that they were used as found and in no way demonstrate modification except by use; they bear no signs of purposive shaping, retouch, primary, or secondary flaking. Forty-four casual core tools were recovered, comprising 13% of the total inventory. Twenty-six (59%) specimens are basalt, and 18 (41%) are of silica material. Wear patterns including crushing, nibbling, and polishing, indicate that 31 (71%) tools found use as scrapers, 5 (11%) as planes, 2 (5%) as spokeshaves, 4 (9%) as chopping tools, and 2 (5%) as pecking stones. None of these tools bear signs of heavy use.
GROUND STONE TOOLS

Ground stone tools comprise a relatively small percentage of the total artifact inventory at the Hurd Site. Artifacts included in this group are those that owe their form to some form of grinding, pecking, or abrasive action. A total of 63 specimens, including hammerstones, pecking stones, pestles, mortar fragments, abrading stones, and a single anvil stone were recovered, representing 2% of the total artifact sample.

Hammerstones

This class includes tools made from cobbles or large fragments apparently been selected for size, shape, and fine grain, and used in a manner which produced a heavily battered surface. Three types are represented: globular, where the hammerstone is relatively large and made from a whole or substantially whole cobbles; flaked disc hammerstones, which are relatively flat, round stones exhibiting battering around the periphery on once-sharp intersections of adjoining flake scars; and converted chunks, which appear to be fortuitously fractured rock or worn tools that because of their shape and size were readily convertible to use as hammerstones (Fig. 15 a-b).

A total of 13 hammerstones was recovered, comprising 21% of the ground stone tool inventory. Of the total, 8 (62%) specimens are of the globular, 3 (23%) of the flaked disc, and 2 (15%) of the converted chunk type. All are made of fine-grained basalt; 3 of the globular type are of a highly dense, black variety, and were probably specifically chosen for this property. Several stages of use are represented in the collection with battered areas varying from localized to surface-wide in their occurrence, and from light to very heavy in their extent of wear. It is evident that rocks that are initially angular are in time worn to a roundness by constant battering on the scar ridges and natural protuberances.

The globular specimens range between 7.7 and 10.3 cm. in maximum diameter; the mean is 9.1 cm. The weights vary between 361 and 859 grams, the mean being 575 grams. The smaller flaked discs vary between 6.7 and 8.1 cm. in diameter, the mean being 7.2 cm., and in thickness between 3.3 and 4.4 cm., the mean being 3.7 cm. The two more amorphous specimens weighed 340 and 352 grams.

Fig. 15 (opposite page). Ground Stone Artifacts. a-b, Hammerstones; c-d, Pestles; e, Mortar fragment; f, Abrading stone; g, Pecking slab.
Pecking Stones

The tools in this category are distinguished from hammerstones by their generally much smaller size and their wear pattern, which, unlike that of the hammerstones, is not battered and crushed but is pecked to a smoothness similar to that of a well-used pestle. As with the hammerstones, these tools tend to loose their angularity through repeated use, but, unlike the hammerstones, they do not appear to be typologically subdivisible. All of the specimens appear to be fortuitous pieces or worn out tools converted to use as pecking stones (Fig. 13 f).

Fifteen pecking stones were recovered, representing 24% of the total ground stone tool inventory. All of the specimens are basalt, which varies in granular structure between fine-grained and coarse-grained vesicular. Nine of the specimens appear to have been fashioned from waste chunks, 5 may have been former scraper planes worn beyond usefulness, and one was made from a pestle fragment. Wear varies from moderate to heavy and reflects highly repetitious but lightly conducted pecking. Too amorphous for meaningful linear measurement, these pecking stones ranged in weight between 48 and 660 grams, the mean being 274 grams. The greatest dimension was 7.5 cm. across the largest specimen.

Pestles

This class includes elongated and generally cylindrical tools distinguished by abrasion marks at one or both ends. Pestles from the Hurd Site fall into two basic types: shaped and unshaped. Shaped pestles are of those which show pecked or dressed sides, in addition to the regular use marks. Such alteration produces a variety of symmetrically shaped instruments. The unshaped specimens are cobbles of suitable form used in their natural state and bearing only use marks (Fig. 15 c-d).

A total of 23 pestles and fragments were recovered, representing 37% of the ground stone tool inventory. Twenty are made from various grades of basalt, 2 are made of granite. Of the total, 8 are shaped pestles and 15 are unshaped. The shaped specimens consist of 3 cylindrical pestles, 1 subconical pestle, 1 truncated subconical pestle, 1 subcylindrical pestle with symmetrically flaring sides, and 2 elongated flat cobbles pestles peripherally ground and biconvex in cross-section. Of the entire sample, only 6 pestles are whole.

Fig. 16 (opposite page). Ground Stone Artifacts. a-c, Edge ground artifacts from extreme upper Willamette valley sites; d-e, Large chisel-like tools.
or substantially whole, 9 are distal fragments, 5 are proximal fragments, and 4 are medial fragments. Two specimens appear to have been used in other capacities; one, with use marks from wear along its length, as a mano; the other, with its proximal end battered, as a hammerstone. One usually short specimen may have been used for grinding pigment. One flat, spatula-shaped specimen could only have been used in a restricted rocking motion as the only wear is on the edge of the distal end. End wear on all pestles varies from light to very heavy. In addition to normal wear, 2 shaped pestles have battered concave ends indicating possible use as mauls. Lengths on complete specimens vary between 10.3 and 20.2 cm., the mean being 16.3 cm. The pestles range between 4.5 and 8.6 cm. in maximum diameter, the mean being 6.0 cm.

Mortars

This class includes fragments of large ground stone bowls (Fig. 15 e). Three fragments were recovered, representing 5% of the ground stone tool category. Two of the specimens are of coarse-grained basalt and one is of granite. The bowls do not appear to have been of great size (less than 30 cm. in diameter) and were probably easily portable.

Abrading Stones

This category includes irregularly-shaped, flat pieces of coarse-grained rock bearing signs of abrasive wear. They appear too small and thin to serve as metates, and may have functioned as whetstones or sharpening stones (Fig. 15 f). Seven fragments were recovered, comprising 11% of the total ground stone tool sample. Four of the specimens are yellow-brown tubular sandstone, 2 are limestone, and one is diorite. Wear varies from imperceptible on the large sandstone slab to heavy on the five small fragments. A relatively large pentagonally-shaped sandstone specimen owes its presence in this category more to its similarity to the smaller worked specimens than to perceivable utilization. The large tabular sandstone specimen measures 12.8 by 12.4 cm., and is 2.8 cm. thick.

Miscellaneous Ground Stone Tools

A single anvil stone was recovered from the Hurd Site. The specimen is a medial fragment of a snapped basalt cobble. It is irregular in shape, relatively flat, and marked by an area of rather intense battering on the dorsal surface. The specimen is 8.8 cm. long, 7.7 cm. wide, and 4.9 cm. thick.
A single specimen interpreted as a pecking slab was recovered (Fig. 15 g). This unique tool is a flat, narrow, and irregular (in plan view) slab of columnar basalt, almost the entire periphery of which is neatly rounded by pecking. It appears to have been broken, leaving one long side unmodified. A roughly similar tool was recovered from the Benjamin Site (35 LA 41) and may represent a special form or type of pecking stone.

Manuports

Two large volcanic bombs of vesicular basalt were recovered from the Hurd Site. The use to which they were put or were going to be put is problematical, as they bear no detectable signs of modification. They are cultural remains by virtue of their presence within the site; they could only have been carried there by the inhabitants themselves. Both may have been imported for the future manufacture of mortars. The smaller of the specimens has its vesicles full of charcoal and must have been used near or with an open fire.

The larger specimen is the size and shape of a basketball with a maximum diameter of 28 cm. and a weight of 13,653 grams. The smaller of the two is the size and shape of a football with a length of 27cm., a width at midsection of 16 cm., and a weight of 6,078 grams.

Lithic Oddments

Two interestingly shaped pebbles may have been of cultural significance in their natural unmodified state. One fusiform specimen is a small pebble of dark silica material, symmetrical in shape, wide at the waist and tapering to rounded ends. It is 3.4 cm. long and 2.7 cm. in diameter at the waist. The second specimen, more difficult to describe, is a waterworn botryoidal quartz pebble, creased and protuberant in places so as to have the vague appearance of a Venus form (Fig. 8 v-w).

Petrified Wood

Sixteen pieces of petrified wood were recovered from the Hurd Site. None of the specimens is modified in any way; some tools were made from permineralized wood but these were discussed under the rubric of the tool into which they were made.
No pottery was recovered from the Hurd Site, but a fair amount of burnt clay daub was observed at all levels and areas of the site. Usually minutely fragmented, some larger pieces did occur, especially near features identified as hearths or firepits. A small sample examined in the laboratory indicates that the daub is light-colored river loam, hardened and oxidized to an orange-brown by a close proximity to intense heat. Two pieces of burnt clay taken from Excavation Area One bore distinct wattle impressions.

SUMMARY AND CONCLUSIONS

Archaeological evidence is by its nature fragmentary, and the Hurd Site material is no exception to the rule; only artifacts of stone were recovered. Some badly deteriorated bone was recovered but this was largely unidentifiable. A human burial, a fragment of elk antler, and various mouse bones (Microtus sp.) represent all of the faunal material. Although the ethnographic sources (Jacobs 1945) attest to the importance of wood in Willamette Valley aboriginal culture, none was recovered. Results of palynological tests were negative. Charcoal fragments and carbonized camas bulbs were the only botanical materials found.

Two separate occupation periods are recognizable at the Hurd Site. The earlier occupation which took place some 2800 years ago (850 B.C.), is evidenced by the remains of a large housepit and associated features, including post-holes, a central hearth, and a possible cache pit. A temporal gap of 1700 years separates this earlier occupation from the later, which is dated by a series of 11 C-14 dates which run continuously from modern times back to 1120 B.P. (a.d. 830).

It is assumed that among hunting-gathering people (as the Kalapuyan-speakers who inhabited the Willamette Valley in historic times were) site location would be dictated primarily by the economic resources provided by the surrounding environment. It is also assumed that resources would fluctuate and change seasonally and through time. A logical corollary is that sites would be abandoned temporarily to comply with seasonal changes and indefinitely when the changes were of a more permanent, noncyclical nature. The Hurd Site demonstrates both types of abandonment.

Prior to the apparent abandonment of the site some 2800 years ago, the Hurd Site was probably occupied during the winter months. A description of a pithouse by a Kalapuya informant fits well the
structural remains associated with this early site occupation (Jacobs 1945:39). He emphasizes that, among the Kalapuya, pithouses were the winter quarters; spring and summer shelters were simple windbreaks. This suggests that during the early period the Hurd Site was being utilized during the winter months. This being the case, we may speculate that the same set of circumstances may have led to both the initial abandonment of the site and to a change in its seasonality upon reoccupation some 1700 years later. According to Heusser (1960:186), between 2,000 and 3,000 years ago the Hypsithermal, with its warm dry climate, was giving way locally to the lower temperature and humid climate of the Hypothermal. The date of 2600 B.P. for the transition between Hypsithermal and Hypo thermal (Cooper 1958:943) is close to the 2800 B.P. date for the early Hurd Site occupation. An increase in rainfall and general lowering of temperatures would affect the courses of both the Willamette and McKenzie Rivers. Such a change might be expected to bring about not only an alteration of drainageways but also the creation of different biotic patterns. Maps of the Eugene-Springfield area clearly indicate that the point of debouchment of the McKenzie River into the Willamette River has changed radically at times. The angle of interception that a tributary makes with the main stream is determined to a large extent by its force and volume. The greater the volume and force the more direct the debouchment. In drier times the angle of debouchment would naturally be more acute. The McKenzie River, which now passes in an easterly to westerly direction less than one mile south of the site, might, in drier times, have taken a more southeasterly to northwesterly course and consequently passed to within a half mile of the site, flowing over the Ingram Surface immediately west of and slightly lower than the occupied area.

The total number of artifacts associated with the early occupation is not great and the range of types gives very little clue as to uses, outside of general hunting-gathering activity, to which the site was then put. We can speculate that the local microenvironment may have been different at this time from that which prevailed during later periods.

More is known of the people occupying the Hurd Site during its later phase, from 1100 B.P. to essentially historic times. The processing of camas is directly demonstrable; in addition to the large earth ovens, several carbonized camas bulbs were found. Acorns, while not directly evidenced, were an ethnographic Kalapuya staple (Jacobs 1945:20), and Garry oak (Quercus garryana) constituted one of the dominant species of original Willamette Valley vegetation (Habeck 1961:69-72).

Many of the lithic artifacts suggest an emphasis on woodworking. Large flat unifacial chopping tools carry wear marks consonant with their being used as axes. Scraper planes, spokeshaves, reamers, and denticulates are found in abundance. A majority of the scrapers
recovered are relatively large and indelicate tools whose ventral surfaces show signs of crushing inconsistent with their utilization as hide or flesh scrapers, but wholly consistent with their use as woodworking tools. While no wooden artifacts were recovered from the Hurd Site, it is known that the historic Kalapuya manufactured certain wooden artifacts which would entail having a sizable carpentry kit; among these items were dugout canoes, hewn logs for drying berries, bark buckets, roasting spits, drying racks, and windbreak frames.

There is some archaeological evidence that certain animal resources were utilized for food and clothing. A fragment of elk skull and attached antler demonstrates the possible use of at least one species of mammal. Other species are indicated by the presence of badly preserved and unidentifiable bone fragments. Small, shaped scrapers of various types suggest that at least some hide preparation was being carried out. The presence immediately adjacent to the site of what must have been a marshy lowlands, and a sizable number of projectile points indicates the likely exploitation of various avian species known to have inhabited the valley floor seasonally. The pied-billed grebe, American bittern, Virginia rail, sora, coot, and Wilson's snipe, are a few of the grallatorial species known to have bred in this area. (Bailey 1936:36-40).

A small variety of mineral resources were utilized by the Hurd Site occupants. Fine-grained basalt represents the most abundant artifact material. All of the basalt came from cobbles, which abounded in the nearby McKenzie River and in the gravel underlying the site. Obsidian and dacite were used primarily for points, and they also were used in the manufacture of artifacts, jasper, chert, and chalcedony being the most common. It is of some interest that 75% of the artifacts fashioned from silica group minerals were located in the uppermost levels of the site. No pottery was recovered, but some burnt daub was found adjacent to areas where burning had obviously taken place.

The relatively small area of habitation and the few rock-lined hearths suggest a maximum of only a few family groups. The probably communal camas ovens, while large compared to the individual hearths, are much smaller than those reported by Collier, Hudson, and Ford (1942) for the Upper Columbia region, and also reflect use by a small number of people. The intensity of interaction is indicated by the closeness of various features and the concentration of artifacts in areas around these cultural features. The specialized uses to which the site appears to have been put implies that the occupants engaged in fairly repetitive interaction. The efficient processing of large amounts of camas in what amount to community ovens depends on some cooperation (Jacobs 1945:18).

An hypothesis that in the later period, the Hurd Site
represented a temporary camp, repeatedly occupied during the spring and early summer, may be predicated on several considerations. Conditions of maximum ponding would likely occur in the early spring after the period of heavy local rainfall and upon the melting of snows in the bordering mountains. The months from April to July represent the optimum breeding period for certain marsh birds (Gabrielson and Jewitt 1940). Camas, a Hurd Site staple, grows in moist areas and reaches the harvesting stage by late spring (Hitchcock et al. 1969:782). The absence of any architectural features suggest the use of nonpermanent shelters such as the windbreak or lean-to, traditionally mild weather dwellings (Jacobs 1945:39). Repeated site use is attested to by the presence throughout the fill of minute fragments of charcoal and burnt daub, and the vertical distribution of artifacts. Eleven radiocarbon dates, evenly covering approximately 1100 years, also indicate repetitive occupation.

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THE LYNCH SITE (35 LIN 36)

BY

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In 1971, as a result of a U.S. Army Corps of Engineers Soil Conservation and Flood Prevention Project on Little Muddy Creek—a second order tributary of the Willamette River—a number of archaeological sites were threatened with destruction. The Anthropology departments of the University of Oregon and Oregon State University conducted salvage operations in the area. The Lynch site was chosen for excavation by the University of Oregon, and the summers of 1971 and 1972 were spent in excavation of the site. C. Melvin Aikens and Don E. Dumond were in charge of the excavation in 1971 and 1972, respectively. Field supervisor for both seasons was Patricia R. Sanford, and field assistants in 1972 were Julie A. Follansbee and Janice Peterson.

Both seasons of excavation were carried out with the support of the National Science Foundation, the National Park Service, the University of Oregon Summer School Program, and the Northwest Archaeological Research Institute. The artifacts, field notes, and maps are deposited at the University of Oregon Museum of Natural History, Eugene.

ENVIRONMENTAL CONTEXT

The Lynch site (35 Lin 36) is located in the SW 1/4, SW 1/4, Section 33, T 14 South, R 3 West, Halsey Quadrangle, on the east bank of Little Muddy Creek, 22 miles north of Eugene, Oregon (Fig. 1). The Coburg Hills (foothills to the western flanks of the Cascades) lie two miles east of the site, while 15 miles to the west lie the foothills of the Coast Range. The site is on the edge of the Willamette River alluvial plain on the geomorphic surface termed by Balster and Parsons (1968) the Winkle Terrace. Little Muddy Creek, which heads approximately five miles west of Mt. Tom in the Coburg Hills, flows by the site and continues to the northwest through flat bottomland to join Muddy Creek three miles south of the small town of Halsey. Muddy Creek continues a meandering course northward to join the Willamette River at Corvallis.

The lithologic environment surrounding the site affords a number of possible sources of raw material for tool production. The nearest known outcropping of basalt is Indian Head, a butte two miles northeast of the site. The Powell Hills, eight miles north-northeast of the site, also have basalt outcrops. Chalcedony is found mixed with the soil to the north of the Powell Hills. Amygdales of chalcedony and quartz can be picked up from soils overlying augite andesite flows on the ridges bordering Cochran Creek in the central part of the northwest quarter of the Brownsville Quadrangle. Obsidian may be obtained from float cobbles along the Willamette River.

Tuffs of the welded crystal vitric type, vitric tuff, and dacite tuff outcrop at the base of the hills extending westward from
Fig. 1. Willamette Valley Region, showing location of the Lynch Site.
Fig. 2. Map of Lynch Site.
Indian Head and also in the low hills northwest of Indian Head. In the northwest quarter of the Brownsville Quadrangle, immediately east of the Halsey Quadrangle, silicified wood, agate, and quartz are abundant in outcroppings of tuff, the soil overlying the tuff, and the slope wash below the tuff (Anderson 1963, MacPherson 1953).

All of the types of materials mentioned above were used by the aboriginal inhabitants of the Lynch Site for tool production. Obsidian and cryptocrystalline rocks were used for projectile points and various small flake and blade tools. Basalt was used for coarser flake tools, chopper-chopping tools, and grinding tools.

The ecological setting of the Lynch site is a riparian one characterized floristically by a gallery forest of Garry oak (Quercus garryana) and ash (Fraxinus latifolia). The understory vegetation is dominated by wild rose (Rosa eglanteria), snowberry (Symphoricarpos alba), and blackberry (Rubus procerus or R. laciniatus). In the early spring the landscape is dominated by the purple blossom of the camas, Camassia sp., a member of the Liliaceae. Other seasonal components of the vegetal cover are members of the Compositae, Rubiaceae, Geraniaceae, Umbelliferae, Leguminoseae, Liliaceae, and Gramineae. Wild rose, blackberry, and wild carrot (Daucus carota) are European introductions. Wild rose and blackberry are two of the understory dominants. They have probably displaced the native species of their genera, and their presence indicates that the present environment is not a precise indicator of the aboriginal environment. Nevertheless the modern plant association of commercial seed grass fields interspersed with oak groves is probably comparable to the aboriginal association of "grassland with scattered open grown trees" (Habeck 1961: 72).

The riparian environment is also reflected by the local fauna which includes large numbers of passerine birds as well as wood ducks, blue herons, muskrats, wood rats, rabbits, foxes, and fish. Deer and elk probably came down from the nearby Coburg Hills to forage in the vicinity of the stream.

EXCAVATION AND STRATIGRAPHY

The Lynch site is an accumulation of black organic soil and lithic debris built up by repeated, apparently seasonal, occupation adjacent to the stream (Fig. 2). Alluvial brown clay deposited by overbank flooding has covered the cultural deposit immediately adjacent to the stream channel, but the black organic deposit remains exposed on the surface on the higher elevations of the site.

In order to control the provenience of artifacts and cultural features a two-meter interval grid system was chained out with reference to the surficial indications of occupation, the main axis
paralleling the creek and giving the grid a rough north-south orientation. Primary excavation was carried out with shovels, the dirt being removed in arbitrary 10 cm. levels within larger natural units (to be discussed below) and sifted for artifacts through 1/4 inch mesh screens. Discovery of subsurface features called for secondary excavation with trowels.

GEOLOGICAL STRATIGRAPHY

In 1971 an initial 18-meter-long trench was dug parallel to the creek. It was hoped that a cut along the creek bank might reveal a stratified series of cultural deposits separated from each other by overbank deposition of silts or clays from periodic flooding of the creek, thus giving a cultural sequence based on natural stratification. However, excavation revealed only a single homogeneous midden deposit, characterized by black organic soil flecked with charcoal and bisque (burned clay). Near the north end of the trench a small area was found where the organic occupation zone interfingered with a brown clay overbank deposit up to 64 cm. in thickness, but this was the only area where the ideal situation was approached, and it was not extensive enough horizontally to be useful in excavation. Excavation of two deep stratigraphic pits on the creek bank adjacent to the initial trench revealed a sterile grey clay beneath the midden deposit, in turn underlain by a sterile tan sandy clay. Thus four natural strata were observed in all: Stratum 1 (lowermost), a sterile tan sandy clay; Stratum 2, a sterile grey clay; Stratum 3, a black organic cultural deposit; and Stratum 4, a sterile brown clay (Fig. 3).

The strata exposed by excavation can be attributed to the Winkle Alluvium of the Willamette River alluvial series (see Balster and Parsons 1968). A two-inch diameter soil auger core driven below the deepest stratigraphic cut indicated that the units mentioned rest on gleyed clay which can be correlated with the Diamond Hill member of the Linn gravel, Rowland Formation (Kermit Horn, personal communication).

The interpretation placed on the stratigraphic sequence revealed at the site is as follows: Stratum 1 is an unnamed, localized over-bank deposit of Winkle Alluvium. Stratum 2, a heavy grey clay deposited in a marshy situation, is also attributable to the Winkle Alluvium. Stratum 3, the midden, is a granular black silty clay flecked with many pieces of bisque measuring about .5 mm. in diameter. This contains artifacts, charcoal and cultural features. It can be assigned to the Awbrey soil series (Kermit Horn, personal communication). Stratum 3 has developed as a result of human disturbance of the Awbrey soils down through the A2 horizon. The A2 horizons overlying it have been thoroughly mixed up in the formation of the midden. In some isolated spots (southeast corner of square 4 R 12, southwest corner
of square 6 R 12) remnants of the $A_2$ horizon remain. These look very like ash lenses, but are in fact areas of fine, dry white clay. Between Stratum 2 and Stratum 3 is a zone of intergradation. It exhibits the heavy grey clay character of Stratum 2, but is copiously flecked with charcoal and burned clay particles. Artifacts found at the contact between Strata 2 and 3 are remains of the oldest occupation on the site. Overlying Stratum 3 is a layer of light brown clay designated as Stratum 4, which is attributable to modern alluvial deposition. This layer is continuous along the lower elevations of the creek bank, but thins out as the bank rises, until at the highest elevations it is nonexistent. It covers the midden, Stratum 3, only on the lower parts of the site.

**CULTURAL STRATIGRAPHY**

Having determined that only one geologic stratum contained cultural materials, the next problem set for the archaeologists was to determine whether it resulted from one occupation or many; i.e., was there any stratification due to cultural activity within Stratum 3? The excavation strategy became one of working down through the midden in arbitrary 10 cm. levels until some soil change or cultural phenomenon was encountered. The first layer encountered (Zone A) was a humus or root-zone varying from a mere surface covering to 15 cm. in depth. This layer contained artifacts, but no cultural features. Zone A overlay a layer of river cobbles (Zone B).

Zone B began on the surface in some areas of the site, with little or no Zone A material overlying it. In other areas it was encountered at varying depths beneath Zone A, the deepest being 15 cm. below the surface. This layer of cobbles was generally 10 to 15 cm. thick, but in some places only 5 cm. thick (Fig. 3). Artifacts were encountered in the fill between the rocks. Most of the rocks appeared to be unworked river cobbles, but some were definitely fire-cracked. The cobble layer may be the result of post-occupational disturbance. Although the site area showed no evidence of having been farmed, it lies in close proximity to cultivated fields and the possibility cannot be ruled out. Cultivation would certainly disturb any rock features occurring at the depth of Zone B, and might reduce them to such a layer of cobbles.

Beneath Zone B was Zone C, an approximately 20 cm. thick deposit, exhibiting intense rodent action. The soil was a dark brown to black organic soil with occasional flecks of light orange fired clay.

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**Fig. 3. Views of Excavation (opposite page). Upper, black cultural layer (Stratum 3) sandwiched between subsoil and overbank deposit of Little Muddy Creek. Lower, cobble layer, partially cleared from site.**
flecks were very rough spheroids about 2 to 5 mm. in diameter. They appear to be the result of firing of the midden soil in an oxidizing atmosphere, perhaps during camas baking or the use of incidental fires. (An experiment was conducted on the site to test this hypothesis, with positive results.) In-site activities presumably were responsible for the breakup of these fired clay patches into small particles and their distribution throughout the lower half of the midden. Artifacts were found in this zone, but no cultural features were found.

Zone C overlay a layer of organic soil (Zone D). Zone D was the same color as Zone C, but was differentiated by having a much greater abundance of light orange fired clay flecks. This is the layer in which in situ cultural features were found. Cultural features were of two general types—pits dug into the ground, and rock lenses piled on old surfaces (Figs. 3, 4). Pits may be further subdivided according to function into baking ovens and burial pits. The rock lenses seem to represent heating stones cleared out of the baking ovens. (Detailed descriptions of individual features are presented in a following section.)

Two general periods were recognized in the construction of cultural features. Features 1, 2, 4, 5, 10, 12, 13, and 14 compose the earliest occupation of the site. Partially overlying these, or originating at higher levels in the deposit, were Features 7, 16, 17 and 27, and Burial pits 1, 2, and 3. Features 9, 12 and 15 could not be related to any of the other features, so that their relative time placement is unknown.

The aim of the 1972 season was to extend our knowledge of the site's extent and to test the stratigraphic relationships found during the first season's work (Fig. 6). During the fall of 1971 and the early summer of 1972 the Corps of Engineers had begun alteration of the site in the area of the previous season's work. The original datum mark was destroyed and this plus dramatic physiographic changes in the immediate area of the site made it difficult to initially relate the 1972 excavations to those of 1971. During the course of our work, however, we encountered the eastern edge of the previous year's excavation, thus allowing us to relate the two excavations horizontally and vertically. Excavation in the low-lying eastern part of the site revealed the same surficial deposit of brown clay (Stratum 4) as was encountered during the 1971 season along the creek bank. As excavation moved west, back toward the more elevated center of the site, Stratum 4 thinned out and eventually disappeared, leaving the cultural deposits, Stratum 3, uncapped by any overburden.

Generally speaking, within the Stratum 3 cultural deposit, only Zones C and D were present in the area dug in 1972. Zone C was a loose,

Fig. 4. Cultural Features (opposite page). Upper, typical rock lens; lower, pits dug into subsoil. Rock lenses have been removed.
dark brown-black humus sparingly flecked with burnt orange clay particles, containing few river cobbles and much evidence of rodent activity. Zone D, also brown-black in color, was characterized by an increase in both burnt orange clay flakes and river cobbles, and by somewhat less rodent burrowing. The difference between Zones C and D was difficult to detect during excavation, and only somewhat less difficult to detect in trench wall profiles.

Cultural features (excepting Feature 29) were first observed at the interface of Strata 2 and 3. These features were not assignable to different levels within Zone D of Stratum 3, as was possible in the 1971 excavations. Feature 29--a hard-packed surface--occurred at a depth of 30-40 cm. and was thus 10 to 20 cm. above the midden-grey clay (Stratum 2-3) interface. This suggests that a second occupation level (probably but not necessarily coeval with the second occupation level of the 1971 season) existed in the northern part of the site.

CARBON-14 DATING

Four carbon samples were taken from the midden deposit excavated in 1971. Two charcoal samples from Zone C (15 to 25 cm. depth) yielded modern ages, of 0 ± 80 B.P. (GaK-3690) and 0 ± 90 B.P. (GaK-3693). Carbonized camas bulbs taken from Feature 1, a stratigraphically early rock lens and camas oven in Zone D, yielded an age of 800 ± 80 B.P. (GaK-3691). This determination gives a mean date of 1150 A.D., and a range of 1070 to 1230 A.D. The earliest sample was taken from Zone D at the interface between the bottom of the midden (Stratum 3) and the top of the sterile grey clay (Stratum 2). The age for this sample is 1280 ± 90 B.P. (GaK-3692), giving a mean date of 670 A.D., and a range of 580 to 760 A.D. The C-14 dates are thus in proper vertical order, and do not suggest stratigraphic disturbance of the site, although the possibility (mentioned above) that its upper levels may have been plowed could conceivably be responsible for the recency of the uppermost C-14 samples.

CULTURAL FEATURES

The majority of the cultural features excavated at the Lynch Site are either shallow pits or rock lenses (Figs. 5, 6). All pits except Features 14, 19 and 22 (see individual feature descriptions) are considered to be baking ovens, most probably for camas bulbs as described in Jacobs (1945: 18-19). This is suggested by the fact that charred bulbs and fire-cracked rock are directly associated with some of the pits, and in four cases (Features 1, 11, 22, and 27) a rock lens with charred bulbs actually seems to spill down into a pit.
The rock lenses seem to be the refuse resulting from the opening of a camas oven. That is, it appears that the rocks covering and lining an oven were raked to one side of the oven pit, thus forming a rock lens, during removal of the baked camas. Charred and inedible bulbs were probably discarded among the rocks at this time.

**FEATURE 1**

Trowelling disclosed a shallow, roughly circular to oval-shaped lens of fire cracked rock and burned bulbs. The edges were ill-defined, but the dimensions are estimated to be 170 cm. on the north-south axis and 100 cm. on the east-west axis. The level of origin is assumed to have been at the bottom of the lens, which occurred at a depth of 35 cm. below the surface. The center of the feature was located at grid point 5.6 R 17. The fill between the rocks was a loose black organic soil containing fewer burned clay fragments, but more charred botanical specimens, than the surrounding midden soil. The botanical specimens consisted of hundreds of completely burned liliaceous bulbs, perhaps of the genus *Camassia*, the camas reported by historians and ethnographers to have been in wide use among the Indians of the Willamette Valley and, indeed, the whole Pacific Northwest.

Some of the rock of the lens appears to spill into a roughly oval-shaped pit immediately to the southeast of the lens, and originating about 35 cm. below the surface. The bottom of the pit contains more of the same fire-cracked rock mixed with a few burned bulbs. The pit measures 103 cm. east to west, 84 cm. north to south, and about 20 cm. in depth from its surface of origin. The pit was intrusive into Stratum 2 grey clay. Its center was at grid point 6.3 R 16.4.

**FEATURE 2**

A shallow oval pit was found intruding the sterile grey of Stratum 2. It measured 142 cm. from northwest to southeast and 133 cm. from northeast to southwest. The fill was a mixture of black organic midden-type soil mixed with the grey clay of Stratum 2. Charcoal, burned bulbs, and a few rocks were contained in the fill. This feature was first recognized as a faint organic stain at a depth of 40 to 45 cm. below the surface. Its center was at grid point 10.8 R 17.4.
FEATURE 3

A pile of river cobbles, some of which exhibited fire-cracking, was found in a shallow depression. The rock cluster was first observed in the 15 to 35 cm. level as a sort of figure-eight configuration on the edge of a two by two m. excavation unit. With deeper excavation, the figure-eight configuration became an amorphous trapezoidal shape displaced slightly to the southeast with its center at grid point 9.5 R 13.9. Removal of the rock revealed a shallow pit intruding Stratum 2. The soil in the pit immediately beneath the rock fill was a medium brown, which contrasted with the black midden into which it was dug. No explanation for this anamalous soil color was found.

FEATURE 4

Excavation revealed an amorphous rectangular pit intruding into Stratum 2 clay. The level of origin is uncertain since the pit was not evident until it intruded into the clean grey clay. The bottom of the pit was at 45 cm. below the surface. It measured 120 cm. northeast to southwest and 136 cm. northwest to southeast. Its depth ranged from 12 cm. on the west side of the pit to 24 cm. on the east side. The fill was indistinguishable in color from the surrounding midden soils. The pit's center was located at grid point 8.3 R 17.7.

FEATURE 5

This feature was a depression dug into in the grey clay of Stratum 2 in the northeast corner of square 8 R 18 and the northwest corner of square 8 R 20. Some large rocks formed a border on the south edge of the depression. The depression showed no clear evidence of having been dug, and could have been simply an irregularity of the surface of Stratum 2. The feature may have been the scattered remains of a hearth or a camas oven.

FEATURE 6

A shallow depression was discovered at the 45 cm. level. It contained some large rocks around its south border, and otherwise the fill was mixed midden soil and grey clay. The pit was excavated only in half-section because it continued beyond the eastern limits of the 1971 excavation. It was located on the eastern edges of
FEATURE 7

A lens of whole and thermally cracked rock was found originating at a depth of 7 to 10 cm. from the surface and continuing to a depth of 40 cm. beneath the surface, where it rested in a shallow pit. The interstices between the rocks were filled with midden soil. The rock conformed to the shape of the pit, therefore the dimensions of both the lens and the pit were the same: 106 cm. east to west and 110 cm. north to south. The center of the feature was at grid point 13.2 R 17.8.

FEATURE 8

This feature was a roughly figure-eight-shaped cluster of rocks resting on the 45 cm. level immediately above the sterile grey clay of Stratum 2. It measured approximately 2 m. east to west and approximately 1 m. north to south in each of the lobes. The center of this configuration was at grid point 5.3 R 13.6.

FEATURE 9

A small tightly clustered rock lens originated at 45 cm. below the surface. Only 2 to 4 cm. of midden soil separated it from the underlying Stratum 2. The shape was roughly circular, and it had a diameter of 70 cm. Its center was at grid point 10.3 R 11.

FEATURE 10

This feature was a roughly triangular lens of fire-cracked and un-cracked river cobbles. Its surface of origin was 40 cm. from the surface, only 2 to 3 cm. above Stratum 2. The lens measured 2 m. north to south and 1.5 m. east to west. Its center was at grid point 11.5 R 12.3.

FEATURE 11

Another roughly triangular lens of rock was discovered in square 4 R 10. The level of origin appears to be the interface between the
grey clay of Stratum 2 and the midden of Stratum 3, which would make this feature one of the oldest on the site. This statement as to relative age is further supported by the fact that a red chert Cascade-like point was found approximately 10 cm. above the rock lens. A core of the same rock was found in the same area. The fill between the rocks contained many burned bulbs. The dimensions of the shaped lens are 2 m. northeast to southwest, 1.5 m. north to south, and 1.5 m. east to west. The Feature 11 rock lens appears to spill over into a pit located adjacent to its southwest corner. The level of origin of the pit appears to be the same as that of Feature 11—at the interface of Strata 2 and 3. The lowest depth encountered in excavation of the pit was 67 cm. from the surface at grid point 4 R 10.

**FEATURE 12**

A rock lens in a shallow depression was found at the interface of Strata 2 and 3. A chopper was associated with the feature. The depression measured 1.9 m. north to south and 1.5 m. east to west, and its center was at grid point 9.2 R 11.9.

**FEATURE 13**

Perhaps the most intriguing feature found was a small burned clay bowl-like depression. Its level of origin was 55 cm. below the ground surface, and its depth was 5 cm. The pit was almost perfectly circular, its dimensions being 28 cm. north to south and 27 cm. east to west. A rock intruded the southwest quadrant of the pit. The fill was sterile, composed of three definite layers: brown clay, resting on the burned orange bottom of the pit; a brown clay mixed with burned clay fragments; and a more concentrated layer of burned clay. The pit rests partially on Stratum 2, but the upper sides are within the midden of Stratum 3. Perhaps some of Stratum 2 was puddled and spread over the sides of the pit before firing. This feature may be an example of a puddled hearth. Its center was at grid point 12 R 13.6.

**FEATURE 14**

Feature 14 was a small pit measuring approximately 50 cm. north to south and 40 cm. east to west. Its level of origin was not determined because the pit was not recognized until it intruded the grey clay subsoil of Stratum 2. Its center is at grid point 5.8 R 12.
FEATURE 15

This feature is a lens of firecracked rock which rests in a shallow natural depression in the undulating hard grey clay underlying the midden. The bottom of the lens, its apparent surface of origin, is at a depth of 60 cm. below the ground surface. Maximum length is 80 cm. along the north-south axis; the maximum width along the east-west axis is 60 cm. The feature is located immediately south west of grid point 14 R 16.

FEATURE 16

A roughly oval pit was discovered approximately 40 cm. below ground level. It extended downward to approximately 78 cm. beneath the surface. Its north-south dimension was about 1.5 m., the east-west dimension 1 m. The fill was of midden soil, heavily mottled with streaks, pockets, and lenses of grey clay (from Stratum 2) and tan sandy clay (from Stratum 1). A number of burned bulbs were also found. Into the base of this pit another pit (containing Burial #2, described below) had been excavated. The center of this pit complex was at grid point 12.1 R 16.2.

FEATURE 17

The first feature encountered in the 1972 excavations was a double rock lens. The paired lenses originated at 27 cm. (F-17a, south) and 31 cm. (F-17b, north) beneath the surface. Their vertical thicknesses were 12 cm. and 9 cm. respectively. The maximum length of lens 17a was 63 cm. north to south, and its maximum width was 42 cm. east to west. The maximum length of lens 17b was 80 cm. north-northeast to south southwest, and its maximum width was 47 cm. east-southeast to west-southwest. This feature was located in square N22/W36.

FEATURE 18

A grey clay-capped pit was discovered at a depth of 45 cm. Removal of the cap revealed a pit measuring 93 cm. north to south and 103 cm. east to west. It was 20 cm. deep, filled with midden soil, lumps of grey clay, some fire-cracked rock, and burned bulbs. The base of the pit rested on the grey clay of Stratum 2. At the southwest edge of the pit was an area of dark midden soil. This was excavated and found to run under the pit first recognized. Thus was
revealed a pit within a pit, the second one clay capped as well. The dimensions of the final pit were approximately 73 cm, north to south and 78 cm, east to west. It was 24 cm, deep. This feature thus was used twice, the deeper pit being the older. After the initial use, a new bottom surface of grey clay was constructed, either to avoid recleaning the older pit or to make it smaller. The center of this pit was N19/W35.9.

FEATURE 19

This feature is an irregularly-shaped clustering of fire cracked rock. A burned clay area just northeast of this cluster suggests that the feature may be a remnant of a scattered and destroyed fire hearth. The feature was located in grid square N19/W32.

FEATURE 20

A rock lens was discovered at a depth of 30 cm. Its maximum length was on the north-south axis, at 75.5 cm; its maximum width was on the east-west axis, at 65 cm. This feature was composed of irregularly shaped fire-cracked rocks. Its center was at grid point N30.35/W37.38.

FEATURE 21

A rock-lined depression was discovered intruding the Stratum 2 grey clay at a depth of 50 cm. Its maximum length was 93 cm, north to south, its maximum width 54 cm, east to west. Burned bulbs, charcoal, and midden soil were found among the rocks which were very carefully arranged to cover the entire surface of the depression. Undoubtedly this was a hearth or cooking pit. It was located in the northwest corner of square N26/W36.

FEATURE 22

The tops of two rock lenses were encountered at a depth of 54 cm. The rocks of both lenses were firecracked, and the fill between the rocks heavily impregnated with charcoal and whole burned bulbs. One of the lenses lay in a pit measuring 100 cm, north-south, 63 cm, east-west, and 38 cm, deep. The other lay in a seemingly natural depression measuring 64 cm, north-south by 57 cm, east-west;
the rock lens itself was approximately 23 cm. thick. The center of this feature was at grid point N25/W36.5.

FEATURE 23

Between 12 and 17 cm. below the surface an irregular cluster of rock was exposed which may be the scattered remains of a fire hearth. The feature's center was at grid point N28/W37.

FEATURE 24

An amorphous cluster of river cobbles and fire cracked rock rests at the interface of Strata 2 and 3 in the northwest and northeast quadrants of square N18/W30. It measured 2 m. east to west and 65 cm. north to south. It may result from the destruction of a hearth or cooking pit, since charcoal and five camas bulbs were recovered among the rocks.

FEATURE 25

An irregularly shaped, but tight, cluster of rock was discovered in the northwest corner of square N29/W36. It measured approximately 28 cm. north to south and 10 cm. east to west, and it occurred at a depth of 79 cm. beneath the surface. This may be the remains of a hearth.

FEATURE 26

This feature is a rock lens with a surface of origin 79 cm. below surface. It measured 140 cm. along the north-south axis, and 95 cm. along the east-west axis. It was located at grid point N32,W3/W39,70.

FEATURE 27

Feature 27 is a fairly tightly clustered but amorphous configuration of rock located in the southern half of square N20/W34. The rock cluster measures 1 m. north to south and 1.10 m. east to west, and first appears at a depth of 49 cm. from the surface. To the west, southwest, and southeast of the rock cluster are shallow natural depressions in the grey clay subsoil. Dense concentrations of fired
orange clay particles and charcoal, and a few carbonized bulbs are found in these depressions.

**FEATURE 28**

In square N28/W36 at a depth of 30 to 40 cm., and covering the entire square was a hard packed-down surface that may have been a living floor. Three projectile points, numerous flakes, an obsidian core, charcoal, and camas bulbs were found immediately above it. An attempt to follow this feature into adjacent squares was unsuccessful.

**FEATURE 29**

A roughly stocking-shaped ridge of gray clay underlain by midden was discovered in square N32/W38. Its maximum length was 72 cm. east-northeast to west-southwest and the maximum width was 27 cm. north to south. The vertical thickness of the clay ridge was only 2 cm. at the maximum. Whether this ridge was the result of aboriginal or rodent earth moving activities is uncertain.

**FEATURE 30**

A cluster of 13 biface and 5 uniface stone tools were found eroding out of the stream bank north-northwest of the main excavation.

**SUMMARY OF CULTURAL FEATURES**

The pits and rock lenses of the Lynch site have been interpreted as remnants of camas processing activities. Five definite camas ovens and four clearly associated lenses of heating stones have been discovered. Nine pits and 11 stone lenses have been put forward tentatively as camas ovens and associated heating stones on the basis of their similarity to the clear-cut examples. It is possible that some of these remnants of hearths or ovens were used for processing food other than camas, but in any case these features indicate that cooking was a major activity at the site throughout its occupation.
**Table 1**

Summary of Camas-processing Features.

<table>
<thead>
<tr>
<th>Definite camas ovens</th>
<th>Definite oven cover/lining lenses</th>
<th>Possible camas ovens</th>
<th>Possible oven cover/lining lenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>F 1*</td>
<td>F 1*</td>
<td>F 2*</td>
<td>F 3</td>
</tr>
<tr>
<td>F 12*</td>
<td>F 12*</td>
<td>F 3</td>
<td>F 7</td>
</tr>
<tr>
<td>F 16*</td>
<td>F 22*</td>
<td>F 4</td>
<td>F 8</td>
</tr>
<tr>
<td>F 22a*</td>
<td>F 27*</td>
<td>F 5</td>
<td>F 9</td>
</tr>
<tr>
<td>F 27*</td>
<td>F 6</td>
<td>F 6</td>
<td>F 10</td>
</tr>
<tr>
<td></td>
<td>F 7</td>
<td>F 7</td>
<td>F 12</td>
</tr>
<tr>
<td></td>
<td>F 12</td>
<td>F 15</td>
<td>F 17</td>
</tr>
<tr>
<td></td>
<td>F 14</td>
<td>F 21*</td>
<td>F 20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F 24</td>
<td>F 26</td>
</tr>
</tbody>
</table>

* = Camas bulbs present

**BURIALS**

The remains of six individuals in three separate burial pits were recovered from the Lynch site during the 1971 season (Table 2).

**BURIAL 1**

Burial 1 was located in square 10 R 16. The burial pit was not recognized until the midden had been stripped off the sterile grey clay (Stratum 2) subsoil, and most of the upper part of the pit was lost. A cross-section of the pit preserved at the south edge of the burial indicated however, that the surface of origin of the burial was 30 cm. from the modern surface. This relates it to stratigraphic Zone D. The burial pit extended to a depth of 35 to 45 cm. from its surface of origin.

The body was interred in a tightly flexed position on its left side, facing north with the head tilted up so that the left temporal portion of the skull rested against the west wall of the pit. In general the bone was poorly preserved. Since the burial pit fill was mottled with grey clay, much of which adhered to the bone, exposure
was difficult. The higher bones—vault of the cranium, pelvis, right femur—were better preserved than the lower-lying bones. This is probably due to the fact that the grey clay into which the pit was dug forms an impermeable layer and perches percolating water. Higher bones would be in better drained soil, while the lower ones would be liable to extended periods of soaking. The feet were missing along with the distal ends of the tibiae and fibulae. The surfaces of the breaks in the lower legs did not appear to be recent. Some isolated foot bones thought to belong to this individual were recovered from the midden 85 cm. east of the burial pit. Perhaps rodent action accounts for the scattering of these bones, but this is not certain.

The skeleton is thought to be female due to the generally gracile nature of the skeleton and the wide angle of the sciatic notch. The age of the person at death is difficult to discern since the mandible, maxilla, and teeth are very poorly preserved. The permanent teeth had erupted and endured quite a bit of wear. The molars appear to be missing and the area of their insertion into the mandible and maxilla is smooth, suggesting loss of molars and subsequent resorption of the bone. This indicates that the individual had at least reached adolescence and probably adulthood.

No grave goods accompanied the body.

BURIAL 2

Burial 2 was located in the 1971 excavation, in the southwest quarter of square 12 R 16 and the southeast quarter of 10 R 16. It was intrusive into a camas oven (Feature 16). The feet extend out of the burial pit and rest on a ledge formed by the intersection of the burial pit with the camas oven suggesting that an existing camas oven was converted into a burial pit with a little additional deepening.

The burial was encountered at a depth of 24 cm. from the surface of origin of the camas oven, placing it in Zone D. The individual was placed on the back in a tightly flexed position with the skull to the southwest and the feet to the northeast. The skull was resting on its right side facing the southeast. The knees were drawn up to the left side of the chest and the hands were clasped under the chin. Preservation of the bone was poor, and no determination of age or sex could be made. No grave goods were associated with the body.
BURIALS 3-6

Burials 3, 4, 5, and 6 composed a mass burial in a large deep, bell-shaped pit capped with a thick layer of grey clay. The pit, approximately 50 cm. deep, was located in the central part of the 1971 excavation, in squares 6 R 14 and 8 R 14. It was roughly circular in plan, measuring 1.14 m. north to south and 1.20 m. east to west. It is associated with Zone D.

Burial 3 was a primary inhumation in the east end of the pit. The body was interred in a slightly flexed position on its right side, the right hand under the chin and the left arm extending across the ribs so that the left hand rested on the right side. The skull was turned on its left side, facing southeast. Four projectile points were found in association, one lying on the skull and three occurring in the thoracic-abdominal cavity.

Burial 4 was represented by an isolated mandible found in the pit to the northwest of Burial 3.

Burial 5 was represented by an isolated mass of occluded teeth set in fragments of mandible and maxilla. They lay to the northwest of Burial 4.

Burial 6 was represented by a fragment of occluded teeth recovered from sifting fill from the south part of the pit.

Fourteen badly decayed long bones and fragments were recovered from the same pit as burials 3-6. Eight large enough to be leg bones were recovered from the south section of the pit, and four more, possibly arms or legs, were recovered from the north section of the pit. Two unidentifiable fragments were found near the right knee of Burial 3.

Preservation of all bone from the mass burial was extremely poor, and sexing and aging of the individuals was impossible.

ARTIFACTS

All artifacts recovered from the Lynch Site were lithic specimens. No bone or other perishable tools were found. The fact that human bones as well as some unworked faunal remains were preserved at the site suggests that the lack of bone tools in the artifact inventory may not be casually dismissed as due merely to decomposition (see White, this volume).
Table 2

<table>
<thead>
<tr>
<th>Burial number</th>
<th>Orientation of the skeleton</th>
<th>Orientation of the pit</th>
<th>Pit shape</th>
<th>Pit length</th>
<th>Pit width</th>
<th>Pit depth at bottom</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E-W</td>
<td>E-W</td>
<td>elliptical</td>
<td>63 cm.</td>
<td>45 cm.</td>
<td>75 cm.</td>
</tr>
<tr>
<td>2</td>
<td>SW-NE</td>
<td>SW-NE</td>
<td>trapezoidal</td>
<td>60 cm.</td>
<td>33 cm.</td>
<td>66 cm.</td>
</tr>
<tr>
<td>3</td>
<td>NNE-SSW</td>
<td>E-W</td>
<td>circular</td>
<td>123 cm.</td>
<td>110 cm.</td>
<td>104 cm.</td>
</tr>
<tr>
<td>4</td>
<td>indeterminate</td>
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Table 3

<table>
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<th>Projectile point types</th>
<th>Quantity</th>
<th>Artifact types</th>
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<tbody>
<tr>
<td>1</td>
<td>87</td>
<td>Scrapers</td>
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<tr>
<td>2</td>
<td>54</td>
<td>Drills</td>
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</tr>
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<td>3</td>
<td>32</td>
<td>Awl-gravers</td>
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</tr>
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<td>4</td>
<td>81</td>
<td>Spokeshaves</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>Chopper-chopping tools</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>Bifaces</td>
<td>22</td>
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<tr>
<td>7</td>
<td>7</td>
<td>Fine bifaces</td>
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<tr>
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<td>8</td>
<td>Debitage</td>
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<td>12</td>
<td>Cores</td>
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<td>10</td>
<td>Worked flakes</td>
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<td>13</td>
<td>30</td>
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<td>14</td>
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<td>Pestle-manos</td>
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<td>22</td>
<td>Bowl fragment</td>
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<td>16</td>
<td>8</td>
<td>Abrading stones</td>
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<td>-8</td>
<td>Charm stone</td>
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<tr>
<td>18</td>
<td>2</td>
<td>Pipe fragment</td>
<td>1</td>
</tr>
</tbody>
</table>

Fig. 7. Projectile Points (opposite page). a-k, Type 1; l-u, Type 2; v-hh, Type 3. Actual size.
An attempt to analyze the vertical and horizontal distribution of artifacts within the site was initiated but abandoned when it was decided that such an analysis would not repay the effort involved. The types and quantities of artifacts from the site as a whole are summarized in Table 3, and described above.

**PROJECTILE POINTS**

The Lynch site produced 478 projectile points or point fragments from two seasons' work, of which 424 were whole points or describable basal fragments. The following attributes were used in describing the projectile points and grouping them into 18 types.

1. Shape: Triangular
   Lanceolate

2. Stemmed or unstemmed
   A. If stemmed, then stem: contracting
      expanding
      rectangular
   B. If stemmed, then barbed or unbarbed
      1. If barbed, then barbs: pointed
         square-ended
         longer than stem
         shorter than stem
         same length as stem
         straight
         recurved

3. If unstemmed, then: bipointed
   concave base
   convex base
   straight base

4. Notching: base notch
   side notch
   no notch

Types are summarized according to these attributes and additional comments on quantity, size, presence or absence of serration, etc. are made.

*Fig. 8. Projectile Points (opposite page), a-p, Type 4; q-s, Type 5; t-w, Type 6; x-bb, Type 7; cc-ee, Type 8. Actual size.*
Type 1

Triangular shape, contracting stem, pointed barbs (Fig. 7, a-k). Range of length: 12.6 - 28.2 mm. Average length: 17.5 mm. Range of width: 9 - 19.3 mm. Average width: 12.9 mm. Of 87 points in this type 50 had at least one measurable dimension, 14 had serrated edges, and 6 were more than 23 mm. in length.

Type 2

Triangular shape, contracting stem, no barbs (Fig. 7, i-u). Range of length: 13 - 28 mm. Average length: 18.4 mm. Range of width: 8.5 to 14.8 mm. Average width: 11.4 mm. Of 54 points, 32 had at least one measurable dimension, 6 were serrated, and 9 were more than 23 mm. in length.

Type 3

Triangular shape, expanding stem, no or incipient pointed barbs (Fig. 7, v-hh). Range of length: 13.6 - 25 mm. Average length: 18.9 mm. Range of width: 10 - 16 mm. Average width: 11.9 mm. Of 32 points, 8 were serrated, 23 had at least one measurable dimension, and 6 were more than 23 mm. in length.

Type 4

Triangular in shape, expanding stem, pointed barbs (Fig. 8, a-p). Range of length: 11 - 29.7 mm. Average length: 19.7 mm. Range of width: 8 - 16.9 mm. Average width: 13.8 mm. Of 81 points, 55 had at least one measurable dimension, 22 were serrated, and 7 were more than 23 mm. in length.

Type 5

Triangular shape, rectangular stem, edges concave, pointed barbs or incipient barbs (Fig. 8, q-s). Range of length: 20 - 31.8 mm. Average length: 26.7 mm. Range of width: 12 - 15.7 mm. Average width:

---

Fig. 9. Projectile points (opposite page). a-e, Type 9; f-i, Type 10; j-o, Type 11; p-s, Type 12; t-aa, Type 13; bb-ee, Type 14. Actual size.
14.4 mm. Of 10 points, all had at least one measurable dimension, 4 were serrated, and 8 were more than 23 mm. in length.

_Type 6_

Triangular shape, no stem, no barbs, convex or straight base (Fig. 8, t-w). Range of length: 11.9 - 19.8 mm. Average length: 15.8 mm. Range of width: 7.5 - 18 mm. Average width: 12.6 mm. Of 10 points, 6 had at least one measurable dimension, and none were serrated. The larger specimens may represent reworked points.

_Type 7_

Triangular shape, no stem, no barbs, concave base (Fig. 8, x-bb). Range of length: 13 - 18.5 mm. Average length: 15.7 mm. Range of width: 12.9 - 14.5 mm. Average width: 13 mm. Of 7 points, 5 had at least one measurable dimension, and none were serrated.

_Type 8_

Triangular shape, no stem, no barbs, concave base (Fig. 8, cc-ee). Range of length: 13.4 mm. - 16.3 mm. Average length: 14.4 mm. Range of width: 9.3 - 13.4 mm. Average width: 11.28 mm. Of 8 points, all had at least one measurable dimension, and 3 were serrated.

_Type 9_

Lanceolate shape, bipointed (Fig. 9, a-e). Range of length: 21 - 40 mm. Average length: 28.7 mm. Range of width: 6.8 - 17 mm. Average width: 10.7 mm. Of 12 points, 10 were measurable in at least one dimension, 2 were serrated, and 9 were more than 23 mm. in length.

Fig. 10. Projectile Points (opposite page). a-e, Type 15; f-h, Type 16; i-k, Type 17; l-m, Type 18; n-u, Individual Unique Points. Actual size.
Type 10

Lanceolate shape, rectangular or contracting stem, single shouldered (Fig. 9 f-i). Range of length: 19 - 22.1 mm. Average length: 20.7 mm. Range of width: 10 - 15 mm. Average width: 11.9 mm. Of 3 points, all were measurable in at least one dimension, and none were serrated. These specimens may be reworked points.

Type 11

Triangular shape, contracting or rectangular stem, basally notched, square-ended barbs, barbs as long or shorter than stem (Fig. 9, j-o). Range of length: 13.2 - 21.2 mm. Average length 17.6 mm. Range of width: 8.8 - 17.9 mm. Average width: 14.4 mm. Of 24 points, 17 were measurable in at least one dimension, 11 were serrated, and 10 had at least one barb broken off.

Type 12

Triangular shape, contracting stem, base notched, pointed barbs, barbs as long or longer than stem (Fig. 9, p-s). Range of length: 15.4 to 30.6 mm. Average length: 20.2 mm. Range of width: 8.5 - 17.6 mm. Average width: 13.6 mm. Of a total of 10 points, all were measurable in at least one dimension, 3 were serrated, 2 were more than 23 mm. in length.

Type 13

Triangular shape, rectangular stem, pointed barbs (Fig. 9, t-aa). Range of length: 14.4 - 24.8 mm. Average length: 19.4 mm. Range of width: 9.8 - 17.3 mm. Average width: 14.3 mm. Of 30 points, 23 were measurable in at least one dimension, 8 were serrated, and 2 were more than 23 mm. in length.

Type 14

Triangular shape, contracting stem, recurved barbs, all examples serrated (Fig. 9 bb-ee). Only one has a complete stem, the rest have the stem and one barb broken off. The range in length of these incomplete points is 13 - 20.6 mm. The range in width is 12.3 - 16 mm. There were 8 points in this category.
Type 15

Triangular shape, rectangular stem, no barbs or incipient barbs (Fig. 10, a-e). Range of length: 13 - 24.1 mm. Average length: 18.6 mm. Range of width: 10.3 - 15.3 mm. Average width: 11.9 mm. Of 22 points, 18 were measurable in at least one dimension, 4 were serrated, and one was more than 23 mm. in length.

Type 16

Triangular shape, no stem, no barbs, base various (straight, concave, or convex), deep (1 - 2 mm.) rectangular serration (Fig. 10, f-h). Range of length: 13.5 - 16.8 mm. Average length: 15.4 mm. Range of width: 6.8 - 12.8 mm. Average width: 9.6 mm. Of 8 points, all had at least one measurable dimension.

Type 17

Lanceolate, stemmed, side-notched to corner notched (Fig. 10, 1-k). Range of length: 22 - 30.1 mm. Average length: 27.9 mm. Range of width: 11.6 - 16.8 mm. Average width: 14.6 mm. Of 8 points, 6 were measurable in at least one dimension, none were serrated, and 4 were more than 23 mm. in length.

Type 18

Lanceolate shape, unstemmed, parallel ribbon flaking on bases, very large, but unmeasurable (Fig. 10, 1-m). Represented by only 2 base fragments.

Individual Unique Points

A. Triangular shape, expanding stem, serrated edges, point curved (Fig. 10, n). Length: 38.4 mm. Width: 14 mm.

B. Triangular shape, contracting stem, barbs, side-notched, serrated edges (Fig. 10, o). Length: 29.8 mm. Width: 16.5 mm.

C. Triangular shape, side-notched, barbed, serrated edges (Fig. 10, p). Length: 29.6 mm. Width: 15.8 mm.
D. Triangular shape, rectangular stem, no barbs (Fig. 10, q). Length: 33.3 mm. Width: 19.2 mm.

E. Triangular shape, contracting stem, no barbs (Fig. 10, r). Length: 29 mm. Width: 19.2 mm.

F. Triangular shape, base notched, serrated (Fig. 10, s). Length: 19.6 mm. Width: 9 mm.

G. Triangular shape, contracting stem, stem asymmetrically placed, no barbs (Fig. 10, t). Length: not measurable. Width: 14.2 mm.

H. Triangular shape, contracting stem, stem curved, possibly reworked (Fig. 10, u). Length: 15.6 mm. Width: 13.4 mm.

SCRAPERS

Scrapers are defined here as flakes that have been carefully worked on at least one edge. Each of the 32 scrapers had characteristics which made it a unique tool, therefore no types were defined within this category. However, all the scrapers did fall into either unifacial or bifacial groups. Thirteen were unifacially worked and 19 were bifacially worked. Fifteen of the scrapers were worked around the complete circumference of the tool, and exhibited flake scars on the top and bottom as well. Four scrapers were triangular in outline, 3 were oblong and still displayed the bulb of percussion, 2 closely approximated a circle (one of these is faceted like a turtleback scraper, and one had the shape of a french curve). Only three scrapers were made of obsidian, while 29 were made of various cryptocrystalline rocks. The toughness of cryptocrystalline rock makes it more suitable for the sort of rubbing action involved in scraping wood or animal skins since the worked edge will not splinter or break readily. Obsidian is not suitable for such activities since a worked edge will more readily splinter or break. This structural-functional difference between the two rock types is reflected in the high ratio of cryptocrystalline to obsidian rock types in the scraper category.

DRILLS

Twenty specimens were categorized as drills. Drills are defined as cone-shaped artifacts of flaked stone that are at least three times

Fig. 11. Flaked Stone Tools (opposite page). a-d, Scrapers; e-g, drills; h-j, Spokeshaves; k-n, Awl-gravers. Actual size, except for k, l.
longer than the widest cross-section of the cone. These occurred as whole specimens with the bit of the drill depending from a rough flake base (6 specimens); as bits broken from their bases (5 specimens), or as bases with a part of the bit still attached (9 specimens). Only one of these artifacts was made of obsidian, the rest being of cryptocrystalline or meta-sedimentary rock. The same structural-functional relationship between rock type and artifact type as was observed for scrapers is also reflected in the drills.

AWL-GRAVERS

There were 22 specimens in this category. Twenty of these had blunt cone-shaped bits, which were about as long as the width of the cone cross-section. These bits were worked onto the corner of a flake. Two awl-gravers were made on thin (2 to 4 mm. in thickness) flakes of fine-grained mudstone or chert in such a manner that two sides of the flake, which were at right angles to each other, were flaked into a dull point. These tools were made of basalts or cryptocrystalline rock. The choice of material probably reflects the same considerations mentioned for the scrapers and drills discussed above.

SPOKESHAVES

Spokeshaves are defined as flakes exhibiting a semi-circular indentation worked into one edge. These are rough flakes with no additional working. Again as in the awl-gravers there are no obsidian specimens; all are made of cryptocrystalline or basalt rock. The spokeshaves range from 2 to 10 cm. in length and 1 to 5 cm. in width. There were 11 specimens.

CHOPPER-CHOPPING TOOLS

This category applies to large, rough unifacially and bifacially worked flakes ranging from 10 to 20 cm. in length and 10 to 18 cm. in width. All, excepting one of quartz, were made of basalt. There were 3 chopper tools (unifacially flaked) and 9 chopping tools (bifacially flaked).

Fig. 12. Choppers and Bifaces (opposite page). a, b, d, Choppers; c, e, f, Bifaces.
BIPACES

This category is comprised of large bifacially flaked lanceolate stone tools. It is possible that they may have been used as knives, but no edge-wear analysis has been performed to bear this out. They might also have been "blanks" or "preforms". These bifaces range in size from 8 to 15 cm. in length and 2 to 4 cm. in width. There were 22 such specimens.

FINE BIPACES

Medial and distal fragments of bifacially flaked implements not included in the category of projectile points because of their larger size were put into this category. There were some 41 of these specimens, 27 of which were chalcedony, the rest being composed of quartz, ignimbrite, and cryptocrystalline rocks. These may have been spear or lance points, but most were too fragmentary for definite assignment.

DEBITAGE

Some 45 cores, 13,054 unmodified flakes, 533 used flakes and 290 worked flakes were recovered from the Lynch Site.

PESTLE

A basalt pestle with a heavily battered and flattened distal end was recovered from the site. It was 14.6 cm. long and 6.9 cm. wide at the widest part, tapering to 4.5 cm. at the distal end. It was 4.5 cm. thick, with an oval cross-section. The proximal end was broken off and not recovered in excavation.

PESTLE-MANOS

Two basalt pestle-manos were recovered. Specimen A was 14.6 cm. long and in width tapered from 6.3 to 2.5 cm. It was triangular in cross-section. The narrow end was battered and the battering continued

Fig. 13. Ground Stone Tools (opposite page). a, Pestle; b, c, Pestle-manos; d, e, Abrading stones.
up one side to a distance of 3.7 cm. from the base. The other two sides were ground smooth, probably reflecting use of the tool as a mano. The distal end was broken off and not recovered in excavation.

Specimen B was complete and battered on both proximal and distal ends. It was 19 cm. long and tapered from 7.5 cm. at the distal end to 2.5 cm. at the proximal end. It was triangular in cross-section. The sides had been smoothed as a result of grinding activities, but there were three longitudinal areas of roughness at the angles of intersection of the three faces.

**Bowl**

A section of a bowl made of a reddish volcanic rock was found. No estimate was made of the size of the complete bowl. The thickest part was the bottom, from which the sides tapered gradually to form a thick lip.

**Abrading Stones**

This category consists of chunks of rock into which grooves have been worn by the rubbing of some object back and forth, as in the process of sharpening. Specimen A was a flat piece of fine-grained sandstone in the shape of a right triangle with rounded corners. It measured 8.2 by 7.6 by 10 cm., and was 1.9 cm. in thickness. There were two grooves on either side.

Specimen B was a fragment of a larger abrading stone of red volcanic rock. In cross-section it is an irregular quadrifoil, the result of longitudinal grooves having been made in the sides of a rectanguloid rock. Specimen B was 2.3 cm. long by 2.5 cm. wide, and 1.9 cm. thick.

**Pipe Fragment**

This thin, slightly curved piece of soapstone is a fragment of a pipe bowl. It is dark grey in color and about 1.8 cm. long. In width it tapers from .8 to .4 cm.

---

Fig. 14. Ground Stone Artifacts (opposite page). a, b, Two views of bowl fragment; c, Pipe fragment; d, Charm stone
CHARM STONE

This is a piece of red vesicular basalt measuring 3.5 by 2.5 by 1.9 cm. The shape is that of a prolate spheroid, the ends of which have been ground smooth. It is girdled vertically and horizontally with two grooves. It may have been a talisman suspended by some arrangement of leather or twine in the grooves. Or it may have been a net-sinker.

PIPE FRAGMENT

This thin, slightly curved piece of soapstone is a fragment of a pipe bowl. It is dark grey in color and about 1.8 cm. long. In width it tapers from .8 to .4 cm.

FAUNAL REMAINS

A small collection of unworked bone fragments represents deer, elk, squirrel, beaver, mouse, and hare, all species common to the site vicinity today (although elk now rarely venture onto the populous valley floor). The identifications presented in Table 4 were made by Donald K. Grayson.

Table 4. Identified Bones from the Lynch Site

<table>
<thead>
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<th>Species</th>
<th>Elements</th>
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<td>Elk (Cervus canadensis)</td>
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<td>Squirrel (Scapanus townsendii)</td>
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<td>Beaver (Castor canadensis)</td>
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<tr>
<td>Mouse (Microtus cf. longicaudus)</td>
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</tr>
<tr>
<td>Hare (Lepus Americana)</td>
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CONCLUSION

The earth ovens and charred bulbs from the Lynch Site show that it was primarily a camas processing station. Other Liliaceous bulbs, such as Brodiaea, may also have been harvested. Pestles, pestle-manos, and chopper-chopping tools may have been used in the process of turning
the baked camas bulbs into storable bricks of carbohydrate and starch. Camas processing was probably the task of women and children.

That men were present is indicated by the large number of projectile points found at the site. The amount of debitage suggests that this may have been an area where the men refurbished their hunting kits. The animal bone recovered during the 1971 season shows that deer, beaver, elk, squirrel, and rabbit were present at the site, with deer being best represented in the bone count. Perhaps some of the fires we have so much evidence for were used in smoking and preserving meat.

Projectile point styles and four Carbon-14 dates ranging from 670 AD to modern times show that this is a fairly recent site, hence is probably attributable to the Kalapuya Indians, who occupied the Willamette Valley at the time of white contact. The subsistence pattern revealed at the site agrees with that described for the Kalapuya by Jacobs (1945). The only unusual feature of the Lynch Site is the mass burial, consisting of one primary interment and three secondary interments in a bell-shaped pit. This practice has not previously been reported from the Willamette Valley.

REFERENCES

Anderson, Robert W.

Balster, C.A. and R.B. Parsons

Habeck, James R.

Jacobs, Melville

MacPherson, Bruce A.
THE LINGO SITE

BY

LINDA S. CORDELL
When my initial report on the Lingo Site was written (Cordell 1967), the only available data from similar Willamette Valley sites were the brief reports on the Virgin Ranch and Smithfield Middens (Collins 1951:58-59), Spurland and Miller Middens, two middens near Halsey and Shedd, Fuller and Fanning Middens (Laughlin 1941, 1943) and the midden on Perkin's Peninsula at the Fern Ridge Dam site (Collins 1951:62). All of these sites, including the Lingo Site, are located on poorly drained land on lesser tributaries of the Willamette River, and all lack observable cultural stratigraphy and structural remains. The Lingo Site differed from the others in being the only one which also lacked European trade items and faunal remains. In view of the two radiocarbon dates obtained from the Lingo Site (2180 ± 110 B.C. and 95 ± 120 B.C.), the absence of material of European manufacture is completely understandable. The lack of faunal remains continues to be an interesting problem for which I suggest below a possible functional solution.

When I became involved in the excavation of the Lingo Site in 1966, it seemed reasonable to me that intra-site variability in artifact distributions would be present. For this reason, I proposed excavating a number of one-meter square test pits randomly distributed throughout the site in order to test as many different areas as possible. The landowners objected to the proposed procedure, and it was scrapped. Further, no structural features were encountered in our excavation, and it was therefore not possible to infer activity loci with reference to them. All of this is an attempt to explain why the emphasis in both my original report and this summary is on the formal attributes of the artifacts recovered. Simply, lacking the appropriate contextual data for an intra-site analysis, it seemed that one logical starting point for the development of a framework within which to discuss chronological or cultural variation in the Willamette Valley was the formulation of a rigorous classification of the artifacts. This I tried to do with the most numerous artifact class recovered from the Lingo Site, projectile points. Neither in my original report nor in this one do I address the important questions of how the numerous middens in the Willamette area were built up or why there was such a high rate of loss of unbroken projectile points. These would seem to be critical subjects, and I hope that others will investigate them.

**EXCAVATION PROCEDURES, STRATIGRAPHY AND DATING**

The Lingo Site is located about 300 m. east of the Long Tom River (sec. 55, T 16, R 5, Lane County, Oregon) on land owned by Ralph, Carl and Ernest Lingo. The site is an open midden which, before excavation, formed a nearly circular mound about 50 m. in diameter (Henrickson 1965:1 and Fig. 1 this report).
Map of Willamette Valley Region, showing location of the Lingo Site.
Between 1962 and 1966, the Kalapooya Chapter of the Oregon Archeological Society excavated in the southwestern part of the site. Two small parts of the site had been previously disturbed by unauthorized persons, and no records of their findings are available (Otto Henrickson, personal communication 1966). The Kalapooya Chapter excavated in arbitrary 6-inch levels, screened all fill and, in accordance with the wishes of the Lingos, backfilled their excavations and re-buried the human skeletal remains they found. Through the courtesy of Mr. Otto Henrickson, some of the records and artifacts obtained by the Kalapooya Chapter were made available to me. This information is treated as a unit for comparative purposes in this report, because not all the artifacts and notes were available for study.

For six weeks during the summer of 1965 and again for the same length of time in 1966, the University of Oregon class in archeological field methods, under the direction of Dr. Dwight T. Wallace, carried out the excavations upon which this report is based. During the 1965 season, the class excavated eight one-meter-wide cuts, designated trenches 13, 15, 18, 20, 23, 25, 28 and 30, in the eastern half of the site. Trenches 13, 18 and 28 were 14 m. long. Trenches 23, 25 and 30 were 8 m. long, and trenches 15 and 20 were 6 m. long. During the summer of 1966, the class excavated trench 19, which was 1 m. wide and 24 m. long, and made a 4 m. extension of trench 20 (excavated in order to recover two burials partially exposed in trench 19). Other excavations were trench 29, which was 1 m. wide and 20 m. long, and a 13 meter-long extension of trench 30 (Fig. 2).

Horizontal controls were maintained by dividing each trench into 1 m. sections, which were given letter designations beginning in each case at the western end of the trench. Excavation proceeded by 20 cm. levels in two adjacent 1 m. sections at a time, and all fill was screened through one-quarter inch mesh.

Two fairly distinct soil levels were observed in each of the excavation units (Fig. 3). The soil in the upper levels of the site is a dark brown silty loam containing artifacts and flecks of charcoal. This clearly defined occupational layer varies in thickness from 100 to 120 cm. in the center of the midden to only 70 to 80 cm. at its edges. Below the dark brown silty loam, the soil changes gradually to a lighter yellowish loam subsoil. This clean loam was not completely devoid of artifactual material or features, despite its lack of organic stain and residue. A river cobble coated with red pigment was recovered within the yellow loam subsoil in level 5 of trench 18, sections E and F. One fragmentary burial in trench 20, sections A and B, was also at least partially within this subsoil. In addition, three firepits (see following section on Cultural Features) occurred in the yellow loam.

Trench 15 and sections C and D of trench 18 were excavated to
a depth of 120 cm. Trench 19 was excavated to one 20 cm. level below the soil change from dark to light loam, which usually occurred in levels 4 or 5. Insufficient time prevented all sections of trenches 29 and 30 from being excavated down to the yellow loam. Excavation in all other trenches was terminated at the level in which the soil change occurred.

Dr. L.R. Kittleman, curator of Geology at the University of Oregon Museum of Natural History, kindly consented to direct the analysis of soil samples from the Lingo Site. The analysis showed the samples to vary in grain size, sorting and acidity (Fig. 4) but to be relatively uniform in their mineralogic composition. This suggests aggradation by periodic flooding. The change in soil color observed in the field probably reflects the increasing percentages of clay present at successively deeper levels. Dr. Kittleman did not find evidence of colloidally transported clay minerals in the samples, and suggested that the clay may have been initially deposited as sediment. These interpretations are based on the laboratory analysis, as Dr. Kittleman did not have the opportunity to examine the soil profile in the field.

Pollen samples were taken from the surface in unexcavated areas of the site and at successive 20 cm. levels from the east wall of trench 19. Unfortunately, the results of the pollen analysis were inconclusive, since pollen was not sufficiently concentrated in the samples to permit thorough study. The taxa that were identified all grow in Oregon today and are common stream-side and meadow or wasteland types (Jane Gray, personal communication 1966).

Two radiocarbon assays were made on charcoal from the Lingo Site. Sample 1, from the fire pit in section P of trench 19 (see Cultural Features, below), yielded a date of 2180 ± 110 B.C. (Gak 1120) Sample 2 was a composite sample taken from within the dark silty loam in section G of trench 19. It yielded a date of 95 ± 120 B.C. (Gak 1121). I am uncertain as to why there is such a great discrepancy in the radiocarbon dates. It is possible that sample 2 was contaminated by roots of the Alta fescue grass which grew on the site, penetrating the midden to a depth of about 100 cm. On the other hand, the date obtained from the first sample may be too early.

CULTURAL FEATURES

FIRE PITS

Three shallow basin shaped fire pits were uncovered in trench 19.
Fig. 2. Map of Lingo Site, showing excavation units.
Fig. 3. Cross-section of Lingo Site deposit.
Fig. 4. Soil sample characteristics.
All had been dug into the yellow loam subsoil and were either partially or completely overlain by water-worn pebbles. None was lined with pebbles.

The fire pit in level 5, sections G and H of trench 19 (Figs. 5, 6), was only partially excavated because it extended south of the trench into the area of the site which the Oregon Archeological Society was excavating. The exposed portion of the fire pit measured 60 cm. along the south wall of the trench. The layer of compacted ash inside the pit was 15 cm. deep, extending from 110 cm. to 125 cm. below the surface. Pebbles were scattered above the pit and beyond its perimeter. None showed evidence of having been burned. Three carbonized camas bulbs (Camassia quamash) were recovered from the ash lense.

The second fire pit was uncovered in level 5, section P of trench 19. Pebbles were scattered around the fire pit, extending from it to nearby Burial 3 (see Burials, below). None of the pebbles had been burned. The fire pit was roughly circular with a diameter of 61 cm. The layer of ash within the pit was about 10 cm. thick.

The third fire pit was uncovered 10 cm. below Burials 4 and 5 in sections Q and R of trench 19. The pit was not centered directly beneath the burials but extended southeast of the skeletons. Pebbles scattered about the pit were not numerous. The fire pit seems to have originally been roughly circular, but it had been disturbed along its southern portions. It was not possible to determine its precise dimensions, but was estimated to have been about 85 cm. in diameter.

A "burned area" is mentioned in the notes of the Oregon Archeological Society as having been found at a depth of 33 inches from the surface in excavation unit H11. The notes do not give the dimensions of this area.

**BURIALS**

Data concerning four burials excavated by the University of Oregon field class in 1966 are presented below. Burial 1, which was located during the 1965 field season in levels 4 and 5 of sections A and B of trench 20, was badly disturbed, apparently by rodent burrows. The skeletal remains were fragmentary, and bones were distributed vertically for a distance of 10 cm. in the north wall of the trench (Fig. 5, a).
Burial 2

Location: Trench 19, sections M and N, levels 6 and 7
Type: Flexed
Position: On right side, head to west
Sex: Male
Age: Adult
Preservation: Fair
Associations: None
Comments: Skeleton incomplete

Burial 3 (Fig. 6)

Location: Trench 20, section P, level 5
Type: Flexed
Position: On back, head to southwest, head extends into trench 19
Sex: Male (?)
Age: Adult
Preservation: Good
Associations: Scattered pebbles above and around skeleton

Burial 4

Location: Southwest corner of section R of trench 20, extending into sections Q and R of trench 19, level 5
Type: Flexed
Position: On back, head to southwest
Sex: Female
Age: Adult
Preservation: Fair
Associations: Pestle (Fig. 12) and beaver mandible in pelvic region, fragment of shell pendant (Fig. 9) near ribs

Burial 5

Location: Trench 19, sections Q and R extending into trench 20, section R, level 5
Type: Flexed

Fig. 5 (opposite page). Cultural features. Above, Burial 1; below, Fire pit in south wall of trench 19.
Position: On left side, head to southwest
Sex: ?
Age: Immature
Preservation: Poor
Associations: None
Comments: This burial lay alongside burial 4. Pebbles were scattered around both skeletons.

The Oregon Archeological Society uncovered ten burials at the Lingo Site (Henrickson, personal communication 1966). Notes pertaining to five of these were made available for this report. The skeletal material, with the exception of the skull of Burial C, was not available for further study. Letter designations are given in the descriptions below in order to distinguish these burials from those excavated by the archeology class.

**Burial A**

Location: E10 and F10, 16 inches below surface
Type: Flexed
Position: On right side, head to southwest
Sex: ?
Age: ?
Preservation: Fair
Associations: None

**Burial B**

Location: D15 and E15, 19 inches below surface
Type: Flexed
Position: On right side, head north
Sex: ?
Age: ?
Preservation: Poor
Associations: None

**Burial C**

Location: J13 and K13, 20 inches below surface
Type: Flexed
Position: On left side, head to southwest

Fig. 6 (opposite page). Burial 3.
Sex: Female (?)  
Age: Adult  
Preservation: Good  
Associations: Olivella shell beads and abalone pendant around neck, clam shells near elbows and behind legs, projectile point at rear of skull in fill

Burial D

Location: K12, 23 inches below surface  
Type: Flexed  
Position: On left side, head to north  
Sex: ?  
Age: Immature  
Preservation: Poor  
Associations: None

Burial E

Location: K13, L12, 24 inches below surface  
Type: Flexed  
Position: On right side, head to northeast  
Sex: ?  
Age: ?  
Preservation: Poor  
Associations: Broken pestle on right femur

In general, the burials from the Lingo Site came from the central part of the midden. The grave type is consistently a simple pit, although in three cases pebbles were found scattered above the skeletons. The skeletons uncovered by the archeology class were all at least partially within the layer of yellow loam subsoil. The soil directly above the burials and among the bones was the darker silty loam of the upper levels of the midden.

ARTIFACTS

The artifacts from the Lingo Site consist of 257 projectile points, 12 drills, 8 gravers, 23 scrapers, 54 bifaces, 129 marginally retouched flakes, five ground stone pestles, one stone bead and two

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Fig. 7 (opposite page). Projectile points. Numbers refer to types.
modified river cobbles.

**PROJECTILE POINTS**

The projectile points are uniformly quite small (range 0.9 cm. to 4.0 cm., median 1.5 cm. - 1.6 cm.). All but 14 specimens, which are of cryptocrystalline silicates, are made of obsidian. Points show variation with respect to haft configuration, being either stemmed or unstemmed (Fig. 8:1-6, 8; Fig. 7). Among the stemmed points, some are barbed (Fig. 8:1, 5, 6), others not (Fig. 7: 1,2). Variation in shape, surface treatment and weight is also apparent. A review of the literature available at the time of analysis (Laughlin 1941, Strong, Schenk and Steward 1930, Collins 1951, Cole 1954) failed to provide classification schemes which seemed relevant with respect to the observed variability in points from the Lingo Site.

The number of points from the Lingo Site alone was considered sufficiently large to permit a statistical approach to classifying them. (In retrospect, I believe that the sample size was probably not fully adequate, and that a number of the statistically significant attribute associations might disappear given a larger sample.) Out of a preliminary list of 17 variables (cf. Binford 1963), four were selected as the basis of the typology. These were chosen because bivariate combinations of these four yielded Chi-square scores of one percent probability or better and V-scores between .172 and .477 (cf. Sackett 1966:368). Further, the scores did not seem to be the result of mechanical interdependence (Cordell 1967:26-37). Interestingly enough, the presence or absence of barbs and variations in edge modification (criteria often utilized in classification) were found not to be statistically significant. The four variables which met the criteria noted above are haft configuration, Length/A, blade surface treatment, and weight. Descriptions of these variables and their attributes are given below.

Haft configuration is either stemmed or unstemmed. Length/A is a ratio between the length of the point and the distance from its base to its widest part. The four attributes recorded for this variable are 0-4.0, 5.0-8.0, 9.0-12.0 and unity (when the widest part of the point is coincidental with the basal edge). Blade surface treatment refers to the characteristic flaking on both faces of the point irrespective of the flaking confined to the edges. It was recorded as both faces modified (bifacial flaking), and both faces unmodified.

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Fig. 8 (opposite page). Projectile points and bifaces. 1-6, 8, projectile points; 7, biface Group VIII; 9, biface Group IX; 10, 11 biface Group X; 12, biface Group IV.
or mixed (unifacial flaking). The three attributes recorded for weight are 0.1-0.2g, 0.3-1.0g and 1.1g+. In the case of the two metrical variables (Length/A and weight) grouping was based on frequency distribution tables constructed from the arrays of measurements of those specimens which were complete with respect to the variable being measured. Groupings were designed so as not to obscure the salient features of the distributions.

The distribution of projectile points with respect to the four variables noted above yielded 17 types of stemmed points and 23 types of unstemmed points. Tables 1 and 2 below provide the diagnostic attributes and numbers of specimens of each type for stemmed and unstemmed points respectively.

**DRILLS**

Drills are bifacially flaked stone artifacts with a clearly defined elongated bit or bore element and a fairly well-defined grip or base element. The bore element is nearly circular or oval in transverse cross section. Base elements tend to be rectangular in cross section. In all examples from the Lingo Site, the bore element exhibits evenly spaced, parallel-sided flake scars. Flake scars on the base element tend to be less evenly spaced, and in some cases, the base element exhibits no secondary flake scars.

For descriptive purposes, the twelve drills from the Lingo Site were divided into four groups distinguished primarily on the basis of size and base treatment. Group I (Fig. 9:4) consists of two specimens. These most nearly correspond to Collins' (1951:80) "hand-held type" in that the base elements are expanded, semi-circular in outline and quite carefully retouched on both faces. Both drills are 2.3 cm. long. One is of quartzite, the other of basalt.

Group II (Fig. 9:3) consists of three diminutive drills (length range 1.2-1.4 cm.) of obsidian. The bore elements on all three are finely flaked, but the base elements are unretouched, irregular in shape and only slightly expanded.

Group III (Fig. 9:5) consists of only one quartzite specimen. It resembles Collins' "bit type drill," the most common form at the Fanning and Fuller middens (Collins 1951:80). The single example from the Lingo Site resembles a projectile point in that the base element is corner-notched with a straight-based, slightly contracting stem. The bore element, however, is elongated and oval in cross section. The specimen is 3.0 cm. long.

Group IV (Fig. 9:6, 7) consists of five examples with roughly retouched basal elements. The bases are irregular in form, but unlike
Table 1. Diagnostic attributes and number of stemmed points

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<thead>
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<th>Length/A</th>
<th>Blade Surface Treatment</th>
<th>Weight</th>
<th>Number of Points</th>
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<td>8</td>
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Total 76
Table 2. Diagnostic attributes and number of unstemmed points

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Total 107
specimens of Group II these drills are of diverse materials (3 quartzite, 1 jasper, 1 basalt) and are not especially small. Complete specimens range in length from 2.30 cm. to 3.20 cm.

GRAVERS

Eight unifacially flaked artifacts were classified as gravers following the description given by Strong, Schenk and Steward (1930:86). All of the gravers from the Lingo Site correspond to the G2 variety as described by Cole (1954:12). They are made on thin, irregular flakes. Marginal pressure flaking is restricted to the area forming the point of the tool. The transverse cross section of the pointed end is triangular and flake scars occur only on the face. In all examples, the tip is narrow (Fig. 9:12). Seven of the eight gravers from the Lingo Site are obsidian, one is jasper. They range in length from 1.1 to 1.7 cm.

SCRAPERS

Scrapers are unifacially flaked artifacts which have marginal flake scars along one or more edges. In all the examples from the Lingo Site, the chipped edge or edges exhibit polish as a result of wear. As used here, the term scraper follows the definition of Strong, Schenk and Steward (1930:86) rather than that of Cole (1954:108, 111). The scrapers were divided into four groups on the basis of shape of the scraping edge or edges, and position of this edge or edges in relation to the longitudinal axis of the flake.

Group I (Fig. 10:1-3) includes 13 scrapers, all of which have one convex scraping edge perpendicular to the longitudinal axis of the flake. The flakes are relatively thick at the scraping edge. Thickness varies from 0.3 cm. to 1.2 cm. Lengths range from 1.4 cm. to 3.1 cm., and widths from 1.4 cm. to 2.7 cm. This group corresponds to the Type G scrapers described by Strong, Schenk and Steward (1930: 86-87). Eight of the scrapers are chalcedony. Two are obsidian. Two are jasper and one opal.

Group II scrapers (Fig. 10:4, 5) consist of six specimens. They have nearly straight scraping edges parallel to the longitudinal axis of the flake. Only one scraping edge has been prepared on each flake. Thicknesses range from 0.2 cm. to 0.6 cm. Lengths range from 2.3 cm. to 3.2 cm., and widths from 1.4 cm. to 1.9 cm. Two are obsidian, two chalcedony, one jasper and one chert.

Group III (Fig. 10:6) consists of two thick, broken flakes with one convex scraping edge. This edge is perpendicular to the axis of
the flake and extends a short distance along the lateral edge of the flake parallel to its axis. The flakes are 0.8 cm. and 1.1 cm. thick, and 2.8 cm. and 2.9 cm. in length. Their widths are 2.6 cm. and 3.0 cm. One is chalcedony, the other jasper.

Group IV (Fig. 10:7) includes two scrapers, nearly elliptical in shape and having a convex scraping edge extending almost completely around their perimeters. They are comparable to the "throwing stones" described by Strong, Schenk and Steward (1930:89) and by Steward (1928). Both scrapers are 0.8 cm. thick. Their lengths are 2.4 cm. and 4.1 cm., and their widths are 1.7 cm. and 3.4 cm. One specimen is obsidian, the other is basalt.

BIFACES

The term, biface, as used here refers to those artifacts which have flake scars over all or most of the surface of both faces. Within this rather broad category, it has been possible to distinguish 11 groups of artifacts on the basis of size, shape and pattern of retouching. Functional labels have been abandoned in favor of descriptive terminology. In those cases where comparative material is available, the functional terminology of other authors will be referred to.

Group I (Fig. 11:1-3) consists of 10 specimens. Six are jasper, two opal, one obsidian and one chalcedony. All are nearly rectangular in transverse cross section and relatively thick. All examples are rounded on one edge and broken on the other. The rounded edges describe arcs ranging from 20° to 30°. A similar class of artifacts is described by Cole (1954:107, Plate XI 14-20), who suggests that they may be either complete artifacts or fragments of knives. These artifacts range from 1.2 cm. to 3.9 cm. in length, from .85 cm. to 2.6 cm. in width, and from 0.6 to 1.0 cm. in thickness. They are flaked entirely over both surfaces, with flake scars irregular in direction and size.

Group II (Fig. 11:12, 13). The two examples in this group are relatively thick and oval in cross section. They are nearly triangular in outline, although the lateral and basal edges are slightly convex. These artifacts are 3.2 cm. and 3.6 cm. in length, 2.5 cm. and 2.7 cm. in width, and 0.9 cm. and 1.2 cm. in thickness. The pattern of retouching is the same as that of Group I bifaces. This group conforms to the first variety of bifacial knives described by Cole (1954:107 Plate XIV 11, 12, 13). One is obsidian, the other chalcedony.

Fig. 9 (opposite page). Stone and shell artifacts. 1, 2, gravers; 3, drill, Group II; 4, drill, Group I; 5, drill, Group III; 6, 7, drills, Group IV; 8, stone bead; 9, shell pendant.
Group III (Fig. 11:10, 11) consists of three specimens which may be broken examples of Group II bifaces. They are like Group II artifacts in all respects except that the basal portions have been broken off, making it impossible to determine either their original size or the original configuration of the basal edge. All are 2.3 cm. in length, with widths varying from 1.7 cm. to 2.5 cm. One is chert, one obsidian and one quartzite.

Group IV (Fig. 11:7-9) consists of seven biface fragments. Like Groups II and III, these are oval in cross section and triangular in outline. They differ from the above, however, in that their lateral edges are straight rather than convex, and they are generally narrower. All are broken, making description of the basal edge configuration impossible. They range in length from 1.4 cm. to 2.1 cm. and in width from 1.0 cm. to 1.6 cm. Their thicknesses range from 0.5 cm. to 0.8 cm. Four are obsidian, one jasper, one chalcedony and one quartzite.

Group V (Fig. 11:14, 15) consists of one complete and three incomplete bifaces. The complete specimen is pointed at one end and convex at the other. Its lateral edges are irregular in outline. All three examples are plano-convex in cross section, having been completely flaked on one surface and only marginally flaked on the other. Conchoidal marginal flake scars are present on all edges of both surfaces. The complete example is 5.1 cm. long. The widths of the group range from 1.9 cm. to 2.2 cm. and the thicknesses from 0.6 cm. to 0.9 cm. Two are chalcedony, one is jasper and one is basalt.

Group VI (Fig. 11:6) consists of only two fragmentary examples. In both cases, bifacial flaking is complete and the lateral edges are smoothed somewhat by wear. The sides are nearly parallel and straight. The base of one example is intact, and it is only slightly convex. Both examples are plano-convex in cross section. They are 1.4 cm. and 1.5 cm. wide, and both are 0.7 cm. thick. One is obsidian, one is basalt.

Group VII (Fig. 11:4, 5) consists of one complete and one broken specimen of obsidian and chalcedony. In both cases, one surface is completely covered with regular, parallel-sided flake scars, and the other surface has flake scars only at the margins. Both examples are plano-convex in cross section. The complete artifact has straight sides. It is rounded at one end and straight at the other. The sides of the fragmentary example are straight, but both ends have been broken. The complete example is 2.0 cm. long.

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Fig. 10 (opposite page). Scrapers and biface. 1-3, scrapers, Group I; 4, 5, scrapers, Group II; 6, scraper, Group III; 7, scraper, Group IV; 8, biface, Group XI.
Both specimens are 0.4 cm. thick. Their widths are 1.1 cm. and 1.8 cm.

Group VIII consists of four obsidian specimens having flake scars over the entirety of both surfaces. They are nearly oval in outline although one example (Fig. 8:7) has a short projection at one end, making it almost tear-shaped. All examples are oval in transverse cross section. They range in length from 1.9 cm. to 3.5 cm., in width from 1.3 cm. to 1.6 cm. In thickness they range from 0.5 cm. to 0.9 cm.

Group IX (Fig. 8:9, 12). The six artifacts in this group are like those of Group VIII in being nearly oval in outline. Unlike the artifacts of the above group, these are completely retouched only on one surface and marginally retouched on the other. They are plano-convex in transverse cross section. Five specimens are obsidian, and one is jasper. They range in length from 1.4 cm. to 2.4 cm. and in width from 1.2 cm. to 2.0 cm. Their thicknesses range from 0.4 cm. to 0.7 cm.

Group X (Fig. 8:10, 11) consists of two specimens having over-all retouching on one face and marginal retouching on the other. They are plano-convex in cross section. Both are pointed at one end and have parallel, straight sides below the point. One example is fragmentary. The sides of the other example begin to diverge at 1.7 cm. below the point, and are then slightly convex, as is the base. The complete example is 5.2 cm. long. It is 1.9 cm. wide at its expanded end, but only 0.8 cm. wide below its point. One specimen is obsidian, one basalt.

Group XI (Fig. 10:8) consists of one large, irregularly flaked basalt specimen. It is nearly triangular in shape, but the lateral edges are irregular and slightly convex. It has shallow bifacial flake scars only on the margins of its three edges. In cross section it is rectangular.

Eleven artifacts meet the criterion of bifacial retouch but are otherwise too fragmentary to be classified. None of them showed any unusual flake scar patterns or were made of materials different from those of the specimens described.

**MARGINALLY RETouched FLAKES**

The 129 flakes in this category show no modification other than some marginal retouch scars restricted to only a part of one or two

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Fig. 11 (opposite page). Bifaces. 1-3, Group I; 4, 5, Group VII; 6, Group VI; 7-9, Group IV; 10, 11, Group III; 12, 13, Group II; 14, 15, Group V.
edges of the flake. None of the retouched edges has been smoothed by wear. Twenty-three are secondary decortication flakes. All are irregular in shape.

It has been possible to divide these specimens into three groups based on the position of the retouched edge or edges in relation to the longitudinal axis of the flake, and the number of partially modified edges on each flake. Thirty-five have one modified edge which is transverse to the axis of the flake and distal from its more bulbous edge. Fifty-six have been partially retouched along an edge lateral to the longitudinal axis of the flake. Twenty-three have partial marginal retouch along both lateral edges.

PESTLES

Two complete basalt pestles and three fragments were excavated by the archaeology class. They are cylindrical in shape and oval in cross section. The complete specimens taper toward one end, and the base at this end is battered and flattened (Fig. 12). The complete examples are 18.3 cm. and 23.9 cm. in length. Widths range from 5.0 cm. to 8.9 cm. and thicknesses from 4.3 cm. to 6.5 cm.

STONE BEAD

One circular flat stone bead was recovered. It is 1.7 cm. in diameter and 0.3 cm. thick. The hole through the center of the bead was drilled from one side (Fig. 8).

MODIFIED RIVER COBBLES

Two modified river cobbles were recovered. One is nearly spherical in shape and is broken. One edge is battered and bears traces of red pigment. The cobble is 6.1 cm. long, 8.0 cm. thick and 6.0 cm. wide. The other specimen is battered on one face and also bears traces of red pigment on that surface. It is 12.2 cm. long, 10.3 cm. wide and 5.9 cm. thick.

Unmodified river cobbles were fairly numerous throughout the site, but these were the only two showing signs of use.

Fig. 12 (opposite page). Ground stone pestles.
CONCLUSIONS

The Lingo Site shares certain general characteristics with other reported Willamette Valley sites. These include its location on poorly drained land, the presence of flexed burials in simple pits, and the following artifact classes; projectile points, drills, scrapers, bifaces and pestles. The styles of artifacts within each class from the Lingo Site are often quite different from the other reported sites. The Lingo Site was found not to contain the following classes of artifacts which do occur at other valley sites; bone flakers, needles, awls, harpoon points, skin dressers, wedges, digging stick handles, whale bone clubs, ground stone mortars, net sinkers, tubular pipes, European trade goods such as trombac beads, copper tube beads, copper rings, and glass trade beads, and faunal remains of elk, deer and bear (Collins 1951:65-84).

The absence of European trade goods at the Lingo Site is to be expected in view of the antiquity of the site as reflected by the radiocarbon dates. The absence of bone tools and faunal remains is not so easily explained. As indicated in Fig. 4, the soil samples were measured for their pH value and found to range between a pH of 4.5 and 5.1. The relatively high acidity of the soil might be thought responsible for the decomposition of bone. On the other hand, the human skeletal remains at the site were fairly well preserved despite this acidity. In addition, microscopic analysis of the soil samples indicated a lack of animal bone fragments and fish scales, which would probably have been preserved even if the acid soil had disintegrated larger faunal remains (L.R. Kittleman, personal communication 1966). It would seem reasonable to conclude that bone tools and faunal remains were not originally deposited at the Lingo Site.

The lack of certain classes of ground stone tools such as mortars and net sinkers, in addition to the lack of bone tools and faunal remains, suggests that the economic activities pursued by the Lingo Site people might have been rather specialized. This may be reflected in the relative homogeneity of the distribution of artifact classes within the site, as shown in Table 3. Trench 13 indicates the distribution of artifact classes in the southeastern portion of the site. Trench 29 reflects this distribution in the northwestern part of the site. The tabulations have been adjusted so that the number of units of excavation is the same (ten 1 m. sections and five 20 cm. levels) in each case. Vertical distribution is indicated in the table by the tally of artifacts recovered from levels 1-2 and 3-5 of trench 19. The tally of artifacts from trench 19 is not comparable with the tabulations from either trench 13 or trench 29, but the distribution of artifact classes does not suggest that different activities were carried out in different areas of the site. Nor is there indication
Table 3. Artifact Distributions

<table>
<thead>
<tr>
<th>Trench</th>
<th>Levels</th>
<th>Drills</th>
<th>Gravers</th>
<th>Scrapers</th>
<th>Bifaces</th>
<th>Points</th>
<th>Pestles</th>
<th>Chips per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>s-4</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>21</td>
<td>1</td>
<td>13.95</td>
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<tr>
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<td>s-4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>26</td>
<td>1</td>
<td>19.07</td>
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<td>s-2</td>
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<td>1</td>
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<td>8</td>
<td>26</td>
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<td>3-5</td>
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<td>0</td>
<td>2</td>
<td>2</td>
<td>25</td>
<td>1</td>
<td>49.80</td>
</tr>
</tbody>
</table>

that different activities were carried out at different times, as might be reflected by the vertical distributions of artifacts. Had the site been occupied continuously for any length of time, one would expect to find more evidence of diverse activities.

Ethnohistoric information suggests a plausible inference regarding the function of the site in the economy of its inhabitants. According to Collins (1951:40) the Calapuya, who occupied this area in historic times, are reported to have built semi-subterranean houses and sweat lodges at their winter camps. The remains of such structures were not found at the Lingo Site, suggesting that it functioned in some other way than as a winter camp. Laughlin (1943:226), Collins (1951:39) and Cressman (1940:128) note the importance of camas to Calapuya subsistence. Camas grows on poorly drained meadow or wastelands (Sipe et al. 1940:106), and the pedologic samples from Lingo suggest that the soil had been deposited by periodic flooding, which would have produced a wasteland condition. In addition, the taxa recognized in the pollen samples are all meadow, wasteland or streamside types. It seems plausible therefore to infer that the Lingo Site was inhabited for short periods during the summer months for the purpose of exploiting the camas in the area.

ACKNOWLEDGEMENTS

I gratefully acknowledge the cooperation of Ralph Lingo and Otto Henrickson, who enabled the University of Oregon field class to participate in excavating the Lingo Site. I also wish to acknowledge the assistance of Dwight Wallace, LeRoy Johnson, L.R. Kittleman, Jane Gray, Alexander Sonok, Robert Holmes, and the late Stephen Bedwell.
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THE BENJAMIN SITES (35 LA 41, 42)

BY

FLOYD EUGENE MILLER
During the summer of 1967, aided by students from the summer archaeological field session of the University of Oregon, the author tested five midden sites on the John Benjamin property near the community of Franklin, on the western edge of the Willamette Valley, west of Eugene, Oregon (Fig. 1). Those tested were selected from a total of eleven sites located in the area. The middens tend to be circular in form, to vary from 25 to 40 meters in diameter, and to range from 80 to 100 centimeters in elevation above the surrounding terrain. All of the sites are located in close proximity to an old channel of the Long Tom River in an area which is now planted with fescue grass. The middens are separated from one another by distances varying from 20 to 70 yards (Fig. 2).

Two of the larger sites tested, 35 LA 41 and 35 LA 42, were selected for fuller excavation. The former site was excavated under my direction that same summer with the other to follow a year later under the direction of Dwight Wallace (Miller 1970).

None of the sites tested contained any visible physical or cultural stratification and the original plan in excavating 35 LA 41 was to obtain balanced spatial representation by excavating alternate two-by-two meter squares using arbitrary 20 centimeter levels. The procedure of digging only alternate squares was abandoned upon the discovery of a large number of cultural features and the importance of these features to explaining the specific nature of the site.

Approximately 34% of the total midden at 35 LA 41 was excavated, each grid square was excavated to a minimum depth of 10 centimeters below the top of the sterile subsoil. Where adjacent squares were excavated, 10 centimeter baulks were left standing between the two squares until excavational details could be recorded. Average depth of the squares was over 80 centimeters, with the deepest penetrating over 130 centimeters (Figs. 3, 4). All of the soil removed was carefully screened through a heavy duty 1/4 inch wire mesh using rubber mallets and trowels to break up the lumps and clods.

In the excavation of site 35 LA 42 during the summer of 1968, the same excavation procedures were followed except that the grid squares selected were confined to the center of the mound (Fig. 7). Six squares were excavated to an average depth of 80 to 90 centimeters, with the deepest pit reaching just slightly below the yellow clay subsoil at 100 centimeters.

**PHYSICAL CHARACTER OF THE DEPOSITS**

Although the middens evidently lack any physical stratification in the form of visual evidence of discrete depositional components, there are obvious color and texture differences in the midden accumulations.
Fig. 1. Willamette Valley Region, Showing Location of Benjamin Sites
as well as between the midden deposits and the underlying subsoils. Both mounds may be said to exhibit three different types of fill that vary in thickness depending upon location and conditions within the site.

Zone A consists of a greyish brown (Munsell 10YR4/2) loosely compacted soil varying in depth from less than 22 centimeters on the fringes of the midden to over 80 centimeters in the center. It differs from the topsoil beyond the midden area in that it is slightly browner and contains a great deal of charcoal. The upper section of Zone A has been plowed to a depth of 18 to 26 centimeters with roots of fescue and rye penetrating as deep as 40 centimeters. Rodent action within this zone is evident in nearly all of the units excavated.

Zone B is a transition zone showing a definite difference in color from the soils above and below it. The color of the soil is Munsell 10YR5/3. The zone does not extend over the whole of either site, and its presence is directly related to the existence of camas roasting pits or baking ovens, detected where they penetrated into the underlying Zone C. The color and texture of Zone B was apparently produced during the process of scooping out holes extending down into the clayey Zone C to make these pits. Yellowish-orange burned clay briquette resulting from the firing of the pits is also incorporated into Zone B. Charcoal and stone fragments are especially abundant in this fill, increasing in density closer to the roasting pits. This zone apparently represents the occupation level from which the roasting pits originate.

Zone C at both sites is composed of a very fine yellow (Munsell 10YR6/4) clay silt. Its contour beneath both middens varies considerably due the aboriginal digging of roasting pits, whereby the scooped-out soil formed small piles adjacent to several of the camas roasting pits. In general, however, the zone follows a contour similar to that of the clay subsoil outside the midden area, and there is little evidence from the soil zone contours that the sites were originally located on natural rises. Zone C is generally sterile below the area disturbed by habitation, although artifacts were recovered as deep as 10 centimeters into this layer, presumably as a result of mixing by the inhabitants or as a result of settling during seasonal floods. There are also sporadic non-artifact inclusions in this zone, apparently originating from the same sources.

CULTURAL FEATURES

Features at the Benjamin sites were limited to two varieties of fire pits, designated herein as fire hearths and roasting pits. No burials, dwelling remains, or other such cultural features were in evidence.
The fire hearths are rather shallow, ill-defined depressions filled with earth and charcoal that is usually, but not always, associated with a large number of fire cracked rocks. The hearths were all badly disturbed either by the original inhabitants or by events occurring subsequent to occupation, and while the lack of well-defined boundaries makes their size difficult to measure precisely, they range between 50 and 70 centimeters in diameter and from several to 20 centimeters in depth.

Four hearths, Features 1, 2, 3, and 17, were uncovered at 35 LA 41. Three of these four were located at depths of between 40 and 45 centimeters as measured from the ground surface to the top surface of the hearth; the remaining Feature, number 17, was only slightly deeper at 48 centimeters below the surface. While hearths were not found at any other levels, it is conceivable that they could have existed in the upper 40 centimeters but were disturbed beyond all recognition by plowing and by the root action of grasses planted on the site. Rocks, charcoal, and fired inclusions are found throughout the upper levels at both 35 LA 41 and 35 LA 42 and offer some support for this suggestion.

The two hearths excavated at site 35 LA 42 lie at approximately 32 centimeters from the surface of the midden.

Roasting pits are distinguished from hearths in that they possess a more definite form, tend to be much larger on the average, and have considerably greater depth. The 13 roasting pits uncovered at 35 LA 41 literally cover the center of the site at a depth of about 80 centimeters below the surface, and 20 centimeters above the yellow, sterile clay Zone C subsoil (Fig. 6). The pits are roughly circular in form and were constructed by scooping out relatively deep holes in the clay, to a depth ranging from 12 centimeters (Feature 16) to over 64 centimeters (Feature 5). Their average depth was about 46 centimeters, measuring from the rim to the bottom of the pit. Diameters range from a low of 52 centimeters (Feature 16) to over 165 centimeters (Features 5, 6, 8, 9, and 10).

The lining of the roasting pits consists of a very hard blue-grey fire-hardened clay from five to eight centimeters in thickness. On the interior surface of the lining, there is a much less cohesive, but compact, dry layer of bright reddish-orange oxidized clay, occurring as a result of repeated firing. All of the pits were filled with quantities of fire-cracked rocks, charcoal, and whole carbonized camas bulbs. The obvious inference is that they were camas roasting pits, although they may have functioned also as sweatbath pits. Both traits have been described as common among the ethnographic inhabitants of the Willamette Valley (Collins 1951). Although the excavations failed to reveal any evidence of perishable sweathouse structures associated with these pits, the abundance of fire cracked rocks and the location of the sites in
Fig. 2. Map of Benjamin Site Locality.
Fig. 3. Map of Site 35 LA 41. Excavation units are two-meter squares. Contour interval is 10 centimeters.
Fig. 5. Cultural Features of Level III, 35 LA 41. Squares are two by two meters.
Fig. 6. Cultural Features of Level IV, 35 LA 41. Squares are two by two meters.
Fig. 7. Map and North-South profile of 35 LA 42. Excavated two by two meter units indicated by cross-hatching. Contour interval 10 centimeters. Vertical elevations in centimeters.
close proximity to water makes this a real possibility.

The formal differences between the firehearths and the roasting pits, in addition to their differences in vertical placement, introduce the possibility of at least two distinct cultural components being represented in each midden.

Radiocarbon dates obtained from 35 LA 41 lend support to the possibility of multicomponent occupation at the Benjamin sites. The dates were taken on some carbonized camas bulbs found in direct association with Feature 5, level V, and from Feature 2, level II. Ages of 2320 ± 80 B.P. and 1640 B.P. respectively (Libby half-life of 5570 years).

ARTIFACTS

The archaeological assemblage from the Benjamin sites belongs entirely to two lithic industries: chipped stone and ground stone. Bone and shell implements, common on the coast, the Columbia River, and in the lower Willamette Valley-Tualatin areas, are conspicuously absent.

Chipped stone artifacts are divided into a number of classes for descriptive and comparative purposes and include projectile points—both stemmed and unstemmed—scrapers, drills, bifaces, and marginally retouched flakes. With the exception of numerous crude chopper tools made from basalt, as well as the ground stone implements, the majority of the more refined artifacts are made from obsidian, with but a few being manufactured from either chert or basalt. Large obsidian flakes or artifacts are extremely rare and the very small size of the obsidian flakes throughout the site suggest that the primary source of this material was as riverborne pebbles.

Ground stone implements include pestles, mortars and mortar fragments, and a number of small round stream pebbles from Benjamin site 35 LA 41, the high density of which almost certainly implies a cultural function. Ground stone mortar fragments, while not abundant, are distributed vertically throughout the various levels of this site.

Although some implication of function is inherent in the conventional designations of the above artifact classes, the objective of the analysis is not necessarily to provide a "functional" classification but rather to facilitate description and comparison by grouping similar artifacts according to shared morphological characteristics. The classification is primarily an analytical device and should not be interpreted to mean that all of the artifacts in a given class necessarily functioned in the manner implied by the term used to designate that class. It is not at all certain, for instance, that the
small, thin, serrated stemless points (Fig. 8a) were hafted on the end of a shaft, as the term "projectile point" would imply.

The system of classification of projectile points for the Benjamin sites was originally presented in a Master's thesis written by the author while at the University of Oregon (Miller 1970). The procedure selected was to adhere to an essentially descriptive typology and then to evaluate the meaningfulness of the combination of variables upon which type was based. This was done by computing Chi square values from bivariate contingency tables, in order to suggest the probability of independence between any two variables. The analysis proceeded in three steps. First, a descriptive attribute list was prepared, upon which each of the individual specimen was described and coded. Second, a typology was created, based upon certain variables intuitively selected by the author. Third, Chi square tests of independence between the selected variables were calculated. Artifacts other than projectile points were classified according to existing typologies for the area, and no statistical measures were applied.

Omitted here, but included in the original thesis, is a more extended discussion regarding the theoretical approach to the classification as well as the list of attributes by which the points were described, the Chi square values with expected and observed frequencies, the contingency tables, and a discussion of the significance of the attribute combinations utilized in the typology (Miller 1970: 98-115). Only the resulting types, and sub-types, of that classification are presented here.

For comparative purposes, the projectile points recovered by Cordell (1967; this volume) from the nearby Lingo Site (35 LA 29), located a few miles downstream on the Long Tom River, are included in this analysis.

The term "projectile point" refers to any chipped stone artifact that is pointed at one end and modified at the other for possible hafting. The class is divided into stemmed and unstemmed categories since different variables were utilized in the construction of types in each category.

UNSTEMMED PROJECTILE POINTS

Unstemmed points are bifacially flaked artifacts that are pointed at one end, have the other end modified by flaking, but contain no distinct shoulder or stem for the purpose of hafting. Some of the larger specimens of this category have been referred to elsewhere as knives (Cole 1967:19) and while this may be functionally
correct no such distinction is made here. Of the total of 424 points examined, 177, or 41.3% fall into the unstemmed category.

Three variables were selected as criteria in the definition of types in the unstemmed category: 1) thickness, selected as the most consistent index of size—based upon its higher association with other attributes relating to size—as well as for its temporal significance; 2) the configuration of the base, whether concave, convex, or straight; and 3) the relative length of the tang in regard to the total axial length of the projectile point, expressed as L/Tang Length.

Attributes used for the definition of sub-types were chosen for their apparently limited temporal or spatial distribution, or to distinguish some notable morphological differences occurring between the specimens of a given type. These attributes are 1) serration of the blade, 2) symmetry of the basal ears, and 3) the removal of one large flake near one end of bi-pointed or leaf-shaped specimens. These attributes were selected in terms of their vertical and horizontal placement in the Benjamin sites. The following types, and sub-types, have been distinguished in the unstemmed category. Vertical distributions of the major point types are summarized graphically in Figs. 14-17.

Type I. Thin untangled points with a concave base

Fig. 8a; 8 specimens
Sub-types A and B, symmetrical and asymmetrical ears.
Thickness: $R=.18-.40 \ X=.27 \ cm.$
Length: $R=.90-2.00 \ X=1.48 \ cm.$
Remarks: Sub-type A found at all three sites in the top 40 cm.; sub-type B is of much cruder workmanship, is found in the lower 40 cm. at 35 LA 29 and 35 LA 41

Type II. Thin untangled points with a straight base

Fig. 8a; 24 specimens
Sub-types A, B, and C corresponding to unserrated, lightly serrated and deeply serrated points respectively.
Thickness: $R=.16-.40 \ X=.24 \ cm.$
Length: $R=1.00-2.30 \ X=1.40 \ cm.$
L/Tang Length: 0-12 cm.
Remarks: Sub-type A at all levels in all sites; sub-type B at 0-40 cm. level in all sites; sub-type C, with a deep notched serration, is found only at 35 LA 29 and 35 LA 41 in the upper 40 cm.
Type III. Thin short-tanged points with a convex base

Fig. 8a; 8b; 72 specimens
Sub-types A, B, and C, same as above
Thickness: R = 14-.34 X = .22 cm.
Length: R = 1.00-2.20 X = 1.48 cm.
L/Tang Length: .14-.32 cm.
Remarks: Sub-types A and B found at all sites predominately in the upper 40 cm.; sub-type C not found at 35 LA 42

Type IV. Medium thick points with short tangs and a convex base

Fig. 9a; 8 specimens
Thickness: R = .50-1.10 X = .72 cm.
Length: R = 2.10-4.25 X = 3.20 cm.
L/Tang Length: .14-.32 X = .22 cm.
Remarks: Type is distributed relatively evenly throughout the various levels at all the sites. Contains some of the larger points in the collection

Type V. Medium thin points with moderate tangs and a convex base

Fig. 9a; 12 specimens
Thickness: R = .38-.66 X = .50 cm.
Length: R = 2.40-3.90 X = 2.80 cm.
L/Tang Length: R = .32-.40 X = .34 cm.
Remarks: Referred to elsewhere as "Cascade" points. All are lightly serrated with the exception of specimen P-276. Terminal basal notch on the points could have been used in hafting

Type VI. Thin points with long tangs and a pointed base

Fig. 9b; 6 specimens
Sub-types A and B serrated and unserrated
Thickness: .22-.34 X = .26 cm.
Length: 1.60-2.40 X = 1.90 cm.
Remarks: Found in the top 40 cm. at all sites, and is a small replica of the bi-pointed leaf-shaped points referred to below in type VIII
Type VII. Medium thick long tanged points with a convex base

Fig. 9b; 5 specimens
Thickness: .42-.90 cm.
Length: 2.40-3.10 cm.
L/Tang Length: .42-.50 cm.
Remarks: Longitudinal flakes removed from the base of the point distinguish this type from pointed specimens of type VIII. Type VII also has a greater width to thickness index than the type below although both have been included elsewhere under the same label of "Cascade" points.

Type VIII. Medium thin points with long tangs and a pointed base

Fig. 9b, 10a; 40 specimens
Sub-types A and B unmodified and modified base by the removal of one large flake at a lateral side on one end.
Thickness: .40-.82 X=.52 cm.
Length: 2.10-5.30 X=3.00 cm.
L/Tang Length: .42-.50 cm.
Remarks: Type A, with the unmodified base, is found at all three sites, with 17 of the 20 specimens occurring in the 0-40 cm. levels. Type B has nearly the opposite distribution, with 18 of the 20 points located below the 40 cm. level. Points show a tendency towards a bi-triangular transverse outline of the blade and seem typical of what has been termed elsewhere a "Cascade" point.

Type IX. Thick long tanged points with a pointed base

Fig. 10a; 2 specimens
Thickness: 1.15 and 2.28 cm.
Length: 7.95 and 7.00 cm.
Remarks: Also referred to elsewhere as knives; primary flaking only on P-31

Type X. Thick long tanged points with a convex base

Fig. 10a; 2 specimens
Thickness: .90 and 1.80 cm.
Length: 4.80 and 6.10 cm.
Remarks: Commonly referred to as knives. Longitudinal flaking on the base of the points, restricted to 35 LA 29 and 35 LA 41.
STEMMED PROJECTILE POINTS

This group contains those points possessing well-defined shoulders and stems for hafting, and includes 247 points. Variables selected for the definition of types are thickness (F), blade edge configuration (H), shoulder treatment (O) and stem configuration (S). Sub-types are distinguished by serration as well as by the placement and configuration of notches. Vertical distributions of the major point types are summarized graphically in Figs. 14-17.

Type XI. Thin points with acute shoulder, straight blade, and straight stem

Fig. 10b; 20 specimens
Sub-types A, B, and C:
  XI-A - end notched, unserrated
  XI-B - corner notched, unserrated
  XI-C - corner notched, light serration
Thickness: .22-.40 X=.28 cm.
Length: 1.50-2.60 X=1.88 cm.
Remarks: None

Type XI B. Medium thick points with acute shoulder, straight blade and straight stem

Fig. 10b; 1 specimen
Thickness: .60 cm.
Length: 4.10 cm.
Remarks: Found at 35 LA 42, in the 40-60 cm. level

Type XII. Thin points with acute shoulder, straight blade, and contracting stem

Fig. 10b

Type XIII. Thin points with acute shoulder, straight blade, and contracting stem

Fig. 11; 52 specimens
Sub-types A and B, unserrated and serrated specimens
Thickness: .18-.44 X=.28 cm.
Length: 1.20-3.40 X=1.90 cm.
Remarks: Constitutes the dominant type at 35 LA 41 and 35 LA 42 in the upper 40 cm. levels. All have concave shoulder configuration.

Type XIV. *Medium thin points with acute shoulder, straight blade, and expanding stem*

Fig. 11a; 8 specimens
Thickness: .34-.48 X=.38 cm.
Length: 2.00-2.50 X=2.20 cm.
Remarks: From 0 to 40 cm. at all three sites.

Type XV. *Thin points with acute shoulder, convex blade, and straight stem*

Fig. 11b; 17 specimens
Sub-types A and B, unserrated and serrated specimens
Thickness: .20-.32 X=.26 cm.
Length: 1.20-2.20 X=1.60 cm.
Remarks: Occurs in all three sites, with all but two specimens coming from the top 40 cm.

Type XVI. *Thin points with acute shoulder, convex blade, and contracting stem*

Fig. 11b; 9 specimens
Thickness: .14-.30 X=.28 cm.
Length: 1.20-1.70 X=1.50 cm.
Remarks: Associated with upper 40 cm. in all sites.

Type XVII. *Medium thick points with acute shoulder, convex blade, and expanding stem*

Fig. 11b; 7 specimens
Thickness: .46-.80 X=.64 cm.
Length: 2.50-3.40 X=2.90 cm.
Remarks: Uniformly distributed in the three sites at various levels. Specimen P-18 from 35 LA 42 was found in direct association with a firepit at 92 cm. during the testing of that site.
Type XVIII. Thin points with acute shoulder, concave blade, and straight stem

Fig. 11b; 9 specimens
Sub-types A and B, end notched and corner notched
Thickness: .22-.34 X=.28 cm.
Length: 1.40-2.20 X=1.80 cm.
Remarks: Found at all sites in 0-40 cm. levels

Type XIX. Thick point with acute shoulder, concave blade, and straight stem

Fig. 11b; 1 specimen
Thickness: .76 cm.
Length: 4.60 cm.
Remarks: Specimen P-245 from 35 LA 41 is associated with Feature 5 at 86 centimeters

Type XX. Thin points with acute shoulder, concave blade, and contracting stem

Fig. 12a; 55 specimens
Thickness: .16-.40 X=.24 cm.
Length: 1.20-2.30 X=1.70 cm.
Remarks: One of the most popular types of projectile points, especially at 35 LA 41 and 35 LA 42

Type XXI. Thin points with right angle shoulder, straight blade, and straight stem

Fig. 12a; 5 specimens
Thickness: .26-.34 X=.32 cm.
Length: 1.70-2.90 X=2.20 cm.
Remarks: Restricted to 35 LA 41 and 35 LA 42

Type XXII. Medium thin points with right angle shoulder, straight blade, and expanded stem

Fig. 12b; 9 specimens
Thickness: .40-.70 X=.50 cm.
Length: 2.50-3.60 X=3.00 cm.
Remarks: Specimen P-240 from 35 LA 41 was found in direct association with a possible floor level at 94 centimeters.

Type XXIII. Thick points with right angle shoulder, straight blade, and expanding stem

Fig. 12b; 2 specimens
Thickness: .70 and 1.00 cm.
Length: 4.50 and 7.30 cm.

Type XXIV. Medium thin points with right angle shoulder, convex blade, and contracting stem

Fig. 12b; 6 specimens
Thickness: .50-.70 X=.56 cm.
Length: 2.80-3.70 X=3.20 cm.
Remarks: Specimen P-11 came from grid square OR-12 at 35 LA 41, near the edge of site. Except for this single specimen, the remainder of the points are from the center of the same site.

Type XXV. Medium thin points with obtuse shoulder, convex blade, and expanding stem

Fig. 12b; 13; 16 specimens
Sub-types A and B, wide vs. narrow notching
Thickness: .42-.80 X=.58 cm.
Length: 2.10-4.20 X=3.20 cm.
Remarks: Sub-type B is uniform in size and appearance and differs significantly from sub-type A in the depth to width ratio of its notching as well as the thickness to width ratio.

Type XXVI. Medium thick points with obtuse shoulder, straight blade, and expanding stem

Fig. 13; 2 specimens
Thickness: .66 and .70 cm.
Length: 2.90 and 3.40 cm.
Remarks: Specimen P-60 is made from petrified wood.
Type XXVII. Medium thin points with obtuse shoulder, straight blade, and expanding stem

Fig. 13; 6 specimens
Thickness: .42-.50 X=.44 cm.
Length: 2.30-2.50 X=2.40 cm.

Type XXVIII. Medium thick points with obtuse shoulder, straight blade, and contracting stem

Fig. 13; 2 specimens
Thickness: 60 cm.
Length: 2.80 and 3.95 cm.

Type XXIX. Medium to thick points with obtuse shoulder, convex blade, and contracting stem

Fig. 13; 5 specimens
Thickness: .50-.90 X=.70 cm.
Length: 2.60-3.40 X=2.90 cm.
Remarks: Specimen P-242 associated with a firepit at 35 LA 41, square OR-22, 80 centimeters

Type XXX. Thin points with obtuse shoulder, convex blade, and contracting stem

Fig. 13; 3 specimens
Thickness: .16-.26 cm.
Length: 1.20-1.70 cm.
Remarks: Restricted to the 0-20 cm. level at 35 LA 41

Type XXXI. Thin points with obtuse shoulder, straight blade, and side-notched stem

Fig. 13; 2 specimens
Thickness: .22 and .28 cm.
Length: 1.40 and 1.50 cm.
Remarks: Also known as "Desert Side-notched"
Type XXXII. Thin points with obtuse shoulder, concave blade, and contracting stem

Fig. 13; 8 specimens
Thickness: .22-.44  $X= .32$ cm.
Length:  1.30-2.00  $X= 1.60$ cm.

OTHER ARTIFACT CLASSES

The emphasis of this paper has been upon the construction of a projectile point typology. In regard to the other artifacts recovered during the excavation of the Benjamin sites, the report will closely adhere to previously established typological classifications. The main referents are Cordell's (1967, this volume) classification for the Lingo Site (35 LA 29), the Strong, Schenck, and Steward classification (1930: 85-88) upon which Cordell's non-projectile point artifact typology was largely modelled, and David Cole's (1967) classification of artifacts from the Fall Creek area.

Drills

Drills are distinguished from other artifacts by a finely flaked, elongated perforating element on one end and a well-defined base or grip element on the other. While Cordell (1967: 55), classified drills on the basis of size and base treatment, this report classifies them on the basis of three variables: size, presence of a modified vs. an unmodified base element, and length of the tang relative to the length of the drill. As with projectile points, the length of the tang is determined by measuring from the base of the drill to the point at which the projected symmetry of the base element changes direction back towards the central axis of the drill. A modified base is one with flaking on the basal end. Among such specimens from the Benjamin sites, the basal ends are convex in configuration.

The eight drills recovered from the Benjamin sites fall into five groups on the basis of the above criteria:

Group I

Small, modified base, long tang
Length:  2.10 cm.
Tang length:  .80 cm.
Relative tang length:  .38 cm.
Fig. 14. Vertical Distribution of Major Projectile Point Types, 35 LA 41.
Fig. 15. Vertical Distribution of Major Projectile Point Types, 35 LA 42.
Fig. 16. Vertical Distribution of Major Projectile Point Types, 35 LA 29.
Fig. 17. Vertical Distribution of all types of Projectile Points at 35 LA 29, 41, and 42.
Group II

Small, unmodified base, long tang
Length: 2.10 cm.
Tang length: .80 cm.
Relative tang length: .38 cm.

Group III

Large, modified base, long tang
Length: 5.40 cm.
Tang length: 2.00 cm.
Relative tang length: .37 cm.
Remarks: Same as group III in Cordell (1967; this volume)

Group IV

Large, unmodified base, long tang
Length: 3.00-4.50 cm. X=4.00 cm.
Tang length: 1.00-2.00 cm. X=1.80 cm.
Relative tang length: X=.40 cm.
Remarks: Irregular base

Group V

Large, unmodified base, short tang
Length: 3.20 cm.
Tang length: .50 cm.
Relative tang length: .16 cm.
Remarks: Base element sharply expanded, corresponding to Collin's (1951) "hand-held" type. Reported also by Cordell (1967: 55; this volume)

Scrapers

Scrapers, as the term is used here, are unifacially flaked cores or flakes having a steep, relatively thick, marginally flaked working edge on one or more sides. With two exceptions, the classification of scrapers from the Benjamin sites follows that of the Lingo site (Cordell 1967; this volume), which in turn is modeled after Strong, Schenck, and Steward (1930: 86).
Cordell's classification is based upon two main variables: the configuration of the working edge and the position of that edge in relation to the longitudinal axis of the flake. In addition to these two variables, the following classification includes a division into core and flake tools and a sub-classification within two groups of the flake tool category on the basis of either the shape of the base element or whether the specimen has retouched or unmodified lateral edges. Based upon these criteria, the scrapers from 35 LA 41 and 35 LA 42 fall into five groups.

Group I, core tools with a convex working edge perpendicular to the axis of the core, is represented by a single large specimen from the 0-20 cm. level at 35 LA 41.

Group II is composed of flake tools with a convex working edge perpendicular to the axis of the flake. This group traditionally referred to as "end scrapers", consists of 25 specimens of varying thickness and length. Thickness ranges from .26 to 1.00 cm. with an average of .60 cm. Length is from 1.70 to 3.10 cm. with an average of 2.60 cm. The group is sub-divided into category II-A, tools with retouched lateral edges and category II-B, tools with unmodified lateral edges. The former sub-type is confined entirely to site 35 LA 41 and contains two stemmed specimens among its number. Group II corresponds to group I in Cordell's (1967; this volume) classification.

Group III, flake tools with a concave working edge perpendicular to the axis of the flake, consists of a single specimen from the 20-40 cm. level at 35 LA 41.

Group IV, flake tools with a convex working edge parallel to the axis of the flake, consists of 16 specimens, generally referred to as side scrapers. The group is sub-divided into categories IV-A, containing scrapers with only one flaked working edge; IV-B, composed of scrapers having two convex working edges; and IV-C, which is made up of scrapers having a convex working edge and a concave base. Lengths vary, ranging from 1.70 to 5.00 cm.; thickness ranges from .30 to 1.80 cm. Group IV corresponds to Cordell's group II.

Group V, flake tools with a circular working edge, consists of three scrapers with a working edge extending around the perimeter of the flake. The group is the same as Cordell's group IV.

Biface

The term "biface" was used by Cordell in her report on the Lingo site to describe artifacts having flake scars "over all or most of the surfaces of both faces" (Cordell 1967: 61). The 11 types she defines are extremely heterogeneous in form and probably in function,
representing fragments of several classes of artifacts. For that reason, no effort will be made here to either augment or duplicate that classification. Most of the diverse forms described in her report are also to be found among the bifacially flaked artifacts recovered from the Benjamin sites, but such items are described in this report under other categories.

**Marginally Retouched Flakes**

A comparatively large number of flakes (212) recovered from the Benjamin sites displayed some evidence of marginal retouch on one or more edges. These flakes are extremely variable in size and configuration and include primary flakes, where the original surface of the module is still present, as well as large numbers of secondary flakes. In contrast to the flakes found at the Lingo site, many of these show signs of wear along one edge.

The attributes of these flakes are as follows: 147 have retouch scars on a lateral edge in relation to the longitudinal axis of the flake and the bulb of percussion, 67 have flaking on the opposite or distal edge in relation to the bulb of percussion, and 49 have use or knapping scars along more than one edge of the flake.

**Chopper-type Tools**

In addition to the previously described flaked artifacts, there is a large number of fragments which show some sign, either in form or use scars, of having been used as tools. These are generally large and crudely made in comparison to the other artifacts and are nearly all manufactured from basalt.

**Mortars and Pestles**

Seven basalt mortar fragments and eight basalt pestles were recovered from the two Benjamin sites. Two of the mortar fragments have finely ground rims and one, specimen M-2, was recovered less than 10 centimeters above the sterile clay (Zone C) in close proximity to Feature 5, Level V, at site 35 LA 41. Mortar fragments, as well as pestles, are distributed throughout the various levels of both sites.

Pestles range from 8.00 cm. to 16.00 cm. in length, are cylindrical in outline, and usually show signs of use or wear on one end or on a lateral edge.
Small River-washed Pebbles

Twenty-four small river-washed pebbles were recovered from varying depths at 35 LA 41, quite often away from the rubble of fire pits or other rocks. Those recovered show no signs of having been notched or grooved, as they presumably would have been if they were used as net sinkers, and most of them are made from basalt.

CONCLUSION

The location of the Benjamin sites on the Long Tom River in an area subject to frequent seasonal flooding, together with the lack of evidence of permanent housing, strongly favors the interpretation that these were seasonal rather than permanent habitation sites. The history of flooding at the Lingo site, located a few miles to the north, was substantiated by a soil analysis made there by L.R. Kittelman of the University of Oregon (Cordell 1967; this volume). Flood control was, moreover, the main reason behind the construction of the Fern Ridge Dam, on the Long Tom River just south (upstream) of the Benjamin property.

There can be little doubt that one of the primary purposes of the Benjamin sites' occupants was to gather and roast camas bulbs. The blue camas grows abundantly in the general area (Sipe 1940:106), and ethnographic reports record camas as being important as a staple throughout the region (Coues 1897:811). In the initial occupation levels especially, fire pits containing an abundance of carbonized camas bulbs literally covered most of the excavated area of the two sites.

There is good evidence, on the other hand, that the efforts of the inhabitants were not confined entirely to this pursuit. Mortars and pestles, small round stones, and the relatively large number of projectile points and obsidian flakes present suggest that hunting, fishing, and tool-making activities were also performed. Since the ethnographic literature reports a division of labor in which women gathered camas while men hunted and fished, one can easily envision a situation where different kinds of activities, social and economic, occurred simultaneously. Mention has already been made of the ethnographic reports of men taking sweat baths, and this would be a plausible alternative or supplementary interpretation of the abundance of fire-cracked rocks at site 35 LA 41. The lack of architectural remains of either sweat-houses or of dwellings of any kind could be due to light and insubstantial construction. Where shelters were described ethnographically, there appeared to be seasonal variation, with semisubterranean bark and dirt houses being constructed in the winter, and temporary wind breaks built under the protection of oak
trees during the summer (Collins 1951: 39).

In neither of the sites' lower levels does there occur the abundance of artifacts recovered from the upper 40 centimeters of both. This is especially true in the proliferation in the upper levels of the small, unstemmed, convex-based projectile points of Type III and the small, stemmed and barbed points of Types XI, XIII, and XX. In contrast to the intensification of tool-making in the upper levels of the Benjamin sites, the majority of cultural features were recognized in the lower levels at around 70 to 80 cm., depths from which very few artifacts were recovered. As mentioned previously, the roasting pits in the lower levels of site 35 LA 41 are much more numerous and often twice as large as the fire hearths in the upper 40 centimeters.

While the small number of hearths reported for the upper levels could conceivably be due to their being disturbed beyond recognition by recurrent use of the site as well as by rodent and root actions (let alone modern plowing) it is also possible that the roasting of camas constituted a specialized activity restricted to earlier periods, and that more varied kinds of activity were being carried on during the later periods of occupation. Perhaps as the middens built up above their damp surroundings they allowed more extensive exploitation of the environment. Perhaps the subsistence habits of the occupants changed through time, with increasing reliance on smaller animals and on fish. This might correspond to the increasing preponderance of small micro-points.

Radiocarbon dates of 2320 and 1640 B.P. from site 35 LA 41 indicate the general time range of the Benjamin sites, though they are too few to delimit it with precision. It seems likely that the area was occupied into later times as well.

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ARTIFACTS FROM FANNING MOUND
WILLAMETTE VALLEY, OREGON

BY

CARSON N. MURDY AND WALTER J. WENTZ
Fanning Mound was excavated in the Spring of 1941 by Dr. W. T. Edmundson was reported by W. S. Laughlin (1943) in an article that also included a report on Edmundson's excavations at the nearby Fuller Mound. Fanning Mound is located on a terrace of the Yamhill River approximately six miles upstream from Whiteson, Oregon, on the farm of Mr. B. G. Fanning. The mound measures 61 meters long, 38 meters wide and about 150 centimeters at greatest depth, with the long axis oriented roughly northeast to southwest. A total of 18 burials was recovered by Dr. Edmundson in his excavations, most of them quite fragmentary. Laughlin described the associated grave goods with three of the more complete burials and summarized all of the burials in a table (Laughlin 1943:222).

In his report, Laughlin said very little about the provenience of any of the artifacts found and gave no systematic description and tabulation of the types of artifacts present. For example, his treatment of the points from the site was limited to the statement that he classified 500 projectile points using a plan outline classification system devised by Strong (1935), and that "twenty-eight percent were of type SAA, thirteen percent were of type SAB, thirteen percent were a type SCB2 and eight percent were of type SBA" (Laughlin 1943:227). The following restudy of the artifacts provides more systematic and complete descriptions than heretofore published, and presents a new, more finely subdivided classification of the chipped stone materials. The excavation records on deposit with the collection in the Museum of Natural History, University of Oregon, did not permit systematic study of artifact provenience within the site, and the presentation here is primarily descriptive.

CHIPPED STONE

The approach to the Fanning Mound chipped stone artifacts parallels that described for Fuller Mound in the preceding paper by Woodward, Murdy, and Wentz. The numerical designators used for Fanning types are not uniformly synonymous with those used for the Fuller collection, but cross-references between similar or identical types are supplied in the type description. All measurements are in centimeters.

PROJECTILE POINTS

Type I

Subtype A: Larger. Symmetrical, barbed, expanded or straight stem. N=51
Length: R=1.8 - 2.9  X=2.15
Map of Willamette Valley, showing location of Fanning Mound.
Width: \( R=1.2 \text{ - } 2.0 \) \( X=1.50 \)  
Thickness: \( R=0.2 \text{ - } 0.5 \) \( X=0.34 \)  
Remarks: Same as Fuller Type 1A. Two of these had slightly convex lateral edges (Fig. 1, a).

Subtype B: Smaller. \( N=21 \)  
Length: \( R=1.4 \text{ - } 2.0 \) \( X=1.78 \)  
Width: \( R=1.2 \text{ - } 1.6 \) \( X=1.29 \)  
Thickness: \( R=0.2 \text{ - } 0.4 \) \( X=0.31 \)  
Remarks: Same as Fuller Type 1B (Fig. 1, b).

Type 2

Symmetrical, rounded barbs, expanded or straight stem. \( N=17 \)  
Length: \( R=2.1 \text{ - } 2.8 \) \( X=2.41 \)  
Width: \( R=1.2 \text{ - } 1.8 \) \( X=1.43 \)  
Thickness: \( R=0.3 \text{ - } 0.6 \) \( X=0.41 \)  
Remarks: Similar to Fuller Type 2 (Fig. 1, c).

Type 3

Small, symmetrical, pointed shoulder, expanded or straight stem. \( N=12 \)  
Length: \( R=1.4 \text{ - } 2.1 \) \( X=1.84 \)  
Width: \( R=1.0 \text{ - } 1.4 \) \( X=1.15 \)  
Thickness: \( R=0.3 \text{ - } 0.4 \) \( X=0.33 \)  
Remarks: Similar to Fuller Type 3 (Fig. 1, d).

Type 4

Asymmetrical, pointed shoulder, expanded stem, serrated lateral edges. \( N=10 \)  
Length: \( R=1.8 \text{ - } 2.2 \) \( X=2.05 \)  
Width: \( R=1.0 \text{ - } 1.4 \) \( X=1.15 \)  
Thickness: \( R=0.3 \text{ - } 0.5 \) \( X=0.37 \)  
Remarks: Same as Fuller Type 4 (Fig. 1, e).

Type 5

Subtype A: Longer, thinner. Symmetrical, pointed shoulders, straight stem, serrated lateral edges. \( N=3 \)  
Length: \( R=2.3 \text{ - } 2.4 \) \( X=2.35 \)  
Width: \( R=1.3 \text{ - } 1.5 \) \( X=1.43 \)
Subtype B: Shorter, thicker. N=5
Length: R=1.6 - 1.9 \quad X=1.8
Width: R=1.0 - 1.3 \quad X=1.14
Thickness: R=0.3 - 0.4 \quad X=0.32
Remarks: (Fig. 1, g).

Type 6

Asymmetrical, barbed, straight stem, serrated lateral edges. N=7
Length: R=2.0 - 3.0 \quad X=2.51
Width: R=1.4 - 1.9 \quad X=1.56
Thickness: R=0.3 - 0.5 \quad X=0.4
Remarks: (Fig. 1, h).

Type 7

Symmetrical, one shoulder barbed, the other pointed, straight stem. N=2
Length: 2.6 and 3.3
Width: 1.1 and 1.4
Thickness: 0.2 and 0.3
Remarks: (Fig. 1, i).

Type 8

Thick, asymmetrical, barbed, straight stem. N=1
Length: 3.2
Width: 1.7
Thickness: 0.5
Remarks: (Fig. 1, j).

Type 9

Asymmetrical, pointed shoulder, expanded or straight stem, concave serrated lateral edges. N=9

Fig. 1 (opposite page). Projectile points. a, Type IA; b, Type 1B; c, Type 2; d, Type 3; e, Type 4; f, Type 5A; g, Type 5B; h, Type 6; i, Type 7; j, Type 8; k, Type 9; l, Type 10; m, Type 11.
Length: R=2.6 - 3.0  X=2.9  
Width: R=1.1 - 1.6  X=1.3  
Thickness: R=0.3 - 0.5  X=0.36  
Remarks: (Fig. 1, k).

Type 10

Symmetrical, pointed shoulder, pointed stem.  N=87  
Length: R=1.4 - 2.6  X=1.74  
Width: R=0.8 - 1.6  X=1.24  
Thickness: R=0.2 - 0.4  X=0.30  
Remarks: Same as Fuller Type 5 (Fig. 1, l).

Type 11

Symmetrical, barbed, pointed stem.  N=23  
Length: R=1.7 - 2.2  X=1.98  
Width: R=1.3 - 1.7  X=1.33  
Thickness: R=0.2 - 0.4  X=0.30  
Remarks: Some of these had convex lateral edges (Fig. 1, m).

Type 12

Narrow, symmetrical, barbed, pointed stem, parallel oblique flaking on blade surface.  N=12  
Length: R=1.8 - 2.5  X=2.07  
Width: R=1.0 - 1.3  X=1.2  
Thickness: R=0.3  X=0.3  
Remarks: Same as Fuller Type 8.  Some of these have serrated lateral edges (Fig. 2, a).

Type 13

Subtype A:  Serrated lateral edges.  Symmetrical, barbed, pointed stem.  N=8  
Length: R=2.2 - 2.7  X=2.43  
Width: R=1.0 - 1.3  X=1.18

Fig. 2 (opposite page).  Projectile Points.  a, Type 12;  b, Type 13A;  c, Type 13B;  d, Type 14;  e, Type 15;  f, Type 16;  g, Type 17;  h, Type 18;  i, Type 19;  j, Type 20;  k, Type 21;  l, Unclassified.
Thickness:  R=0.3 - 0.4  X=0.36
Remarks:  Same as Fuller Type 9. Two of these had quite pronounced barbs (Fig. 2, b).

Subtype B: Concave lateral edges.  N=14
Length:  R=2.0 - 3.0  X=2.35
Width:  R=0.8 - 1.6  X=1.24
Thickness:  R=0.2 - 0.5  X=0.41
Remarks:  Same as Fuller Type 11 (Fig. 2, c).

Type 24

Symmetrical, pointed shoulder, pointed stem, convex lateral edges, rounded point.  N=2
Length:  1.7 and 2.0
Width:  1.4 and 1.5
Thickness:  0.3 and 0.4
Remarks:  One obsidian and one chert point. May have been used as bunts for stunning small game (Fig. 2, d).

Type 25

Thick, narrow, side notched, flat base.  N=4
Length:  (undetermined, all specimens broken)
Width:  R=0.9 - 1.2  X=1.02
Thickness:  R=0.4 - 0.7  X=0.50
Remarks:  These may be drills rather than projectile points (Fig. 2, e).

Type 26

Thick, symmetrical, side notched, flat base.  N=2
Length:  1.8 and 2.2
Width:  1.0 and 1.4
Thickness:  0.2 and 0.3
Remarks:  Same as Fuller Type 12 (Fig. 2, f).

Type 27

Thick, symmetrical, side notched, convex base.  N=1
Length:  3.2
Width:  1.7
Thickmess: 0.9
Remarks: (Fig. 2, g).

Type 18

Large, thick, symmetrical, rounded shoulders, straight stem. N=1
Length: 4.7
Width: 3.0
Thickness: 1.2
Remarks: Biconvex in cross-section, cortex remaining on end of stem (Fig. 2, h).

Type 19

Small, symmetrical, concave base. N=4
Length: R=1.4 - 2.2  X=1.83
Width:  R=1.1 - 1.3  X=1.2
Thickness: R=0.2 - 0.4  X=0.3
Remarks: (Fig. 2, i).

Type 20

Small, symmetrical, flat base. N=7
Length: R=1.5 - 2.1  X=1.74
Width:  R=0.8 - 1.2  X=1.01
Thickness: R=0.2 - 0.5  X=0.25
Remarks: Same as Fuller Type 13 (Fig. 2, j).

Type 21

Small, symmetrical, convex base. N=4
Length:  R=1.4 - 1.9  X=1.87
Width:   R=0.7 - 1.5  X=1.17
Thickness: R=0.3 - 0.5  X=0.37
Remarks: (Fig. 2, k).

Ninety-three projectile point forms were left unclassified (Fig. 2, l). Of these specimens, 11 were considered to be preforms, 14 were unfinished, 37 were irregular in shape, and 31 were broken.
Fig. 3. Perforators and Knives. a, Type 1 Perforators; b, Type 2 Perforators; c, Type 3A Perforators; d, Type 3B Perforators; e, Type 1 Knife; f, Type 2 Knives; g, Type 3 Knives; h, miscellaneous chipped stone artifacts; i, discoidal cores.
Fig. 4. Scrapers. a, Type 1; b, Type 2; c, Type 3; d, Type 4; e, Type 5; f, Type 6.
KNIVES

Eighteen artifacts were classified as knives. Some of these may actually have been preforms for projectile points, particularly those of Type 3. However, they are usually made of coarser raw materials than the projectile points found at this site.

Type 1

Thin, bifacially flaked over total surface, flat base. N=1
Length: (Undetermined, broken)
Width: 3.6
Thickness: 0.5
Remarks: Made of chalcedony (Fig. 3, e).

Type 2

Thick, bifacially flaked over total surface, convex base. N=5
Length: R=3.6 - 4.2 X=3.93
Width: R=2.3 - 2.8 X=2.5
Thickness: R=0.7 - 0.9 X=0.84
Remarks: Same as Fuller Type 2 (Fig. 3, f).

Type 3

Thick, bifacially flaked on lateral edges, butt unmodified. N=12
Length: R=2.8 - 4.4 X=3.45
Width: R=1.7 - 3.5 X=2.3
Thickness: R=0.4 - 1.1 X=0.68
Remarks: Same as Fuller Type 3. Some of these may be projectile point "preforms" (Fig. 3, g).

PERFORATORS

Type 1

Bifacially flaked on lateral edges of point, butt unmodified. N=9
Length: R=1.8 - 2.4 X=2.2
Width: R=1.2 - 1.8 X=1.5
Thickness: R=0.3 - 0.5 \ x=0.44
Remarks: Same as Fuller Type 1 (Fig. 3, a).

Type 2

Thick, bifacially flaked over total surface, pointed or rounded butt. N=5
Length: R=2.0 - 2.9 \ x=2.4
Width: R=0.9 - 1.3 \ x=1.1
Thickness: R=0.4 - 0.9 \ x=0.63
Remarks: Same as Fuller Type 2 (Fig. 3, b).

Type 3: Drills

These are perforators with long, narrow points. Length has been measured along the bifacially flaked point, exclusive of the unmodified butt. Width has been measured at the juncture of the worked point with the butt.

Subtype A: Long points. N=3
Length: R=2.7 - 2.9 \ x=2.8
Width: R=0.8 - 1.0 \ x=0.9
Thickness: R=0.2 - 0.6 \ x=0.4
Remarks: Same as Fuller Type 3A (Fig. 3, c).

Subtype B: Short points. N=5
Length: R=1.0 - 1.3 \ x=1.16
Width: R=0.5 - 0.9 \ x=0.7
Thickness: R=0.2 - 0.6 \ x=0.36
Remarks: Same as Fuller Type 3B (Fig. 3, d).

SCRAPERS

Type 1

End scrapers with bifacial convex cutting edge. N=12
Remarks: Same as Fanning Type 1 (Fig. 4, a).

Type 2

Small, circular, bifacially worked all around circumference. N=3
Remarks: (Fig. 4, b).
Type 3

Bifacially worked all around circumference. These may be "preforms" for projectile points. N=2
Remarks: Same as Fuller Type 3 (Fig. 4, c).

Type 4

Circular, unifacially worked all around circumference. N=2
Remarks: Same as Fuller Type 4 (Fig. 4, d).

Type 5

End scrapers with unifacially flaked, steep, straight or convex cutting edge. N=8
Remarks: Same as Fuller Type 5 (Fig. 4, e).

Type 6

End scrapers with unifacially flaked straight or convex cutting edge. N=6
Remarks: Same as Fuller Type 6 (Fig. 4, f).

CORES

Two small discoidal cores were found, one of chalcedony and the other of obsidian (Fig. 3, i).

MISCELLANEOUS CHIPPED STONE ARTIFACTS

Informal tools include one bifacially worked piece of white chalcedony, triangular in plan, and 22 utilized flakes. Of these, four had unifacial retouch and seven had bifacial retouch (Fig. 3, h).
SUMMARY OF CHIPPED STONE FROM FANNING MOUND

A total of 500 lithic artifacts was examined. This total included 402 projectile points, 18 knives, 22 perforators, 33 scrapers, 2 discoidal cores, 1 triangular biface, and 22 utilized flakes. The following tabulation gives the counts and percentages of each type within each artifact class.

### Projectile Points

<table>
<thead>
<tr>
<th>Type</th>
<th>Total (N)</th>
<th>Percent</th>
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<th>Total (N)</th>
<th>Percent</th>
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**Unclassified** 93 23.1

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GROUND AND PECKED STONWORK FROM FANNING MOUND

Six incised pebbles (net weights?). These are rounded pebbles of dense stone with V-shaped grooves cut around them, ranging in size from 2.2 - 3.7 cm. in diameter (Fig. 6, 1, m).

Cylindrical sandstone object, superficially resembling a salmon vertebra, which has slight ridges around each end with chipped grooves outside them. Length = 3.7 cm., diameter = 2.0 cm.

Tubular pipe, 2.7 cm. high by 1.2 cm. in diameter (Fig. 5, k).

Tubular pipe fragment, 2.5 cm. high by about 2.0 cm. in diameter.

Small, broken bowl-shaped object (pipe bowl?), 1.8 cm. high by 2.0 cm. in diameter (Fig. 5, t).

Flat, oval sandstone pebble, measuring 6.3 by 4.5 by 1.0 cm., with a pecked depression on one face, measuring 2.5 by 2.2 by 0.2 cm.

Broken stone object resembling the toe of a Turkish slipper or the bow of a covered canoe. The fragment is 2.9 cm. long.

SHELL

Abalone shell pendant with hole bored near wider end for suspension, about 5 cm. long and 2 cm. across.

Three soft shell beads (probably mussel shell); one is 0.7 cm. and the other two are 1.0 cm. in diameter.

Dentalium shell, 3.9 cm. long.

Shell of local freshwater "periwinkle" (Bittium sp.), 1.4 cm. long.
Notes written by the excavator of the site indicate that many fish vertebrae and local mussel shells were found but were not included in the collection.

WORKED BONE AND ANTLER ARTIFACTS

ANTLER CAMAS-DIGGER HANDLES

Five fragments of camas-digger handles were found: two points and three shanks with remains of holes bored through them. All three shanks have been broken across the hole, which ranged from 2.0 to 2.5 cm. in diameter (Fig. 6, g, h). The antler itself was generally 4 cm. in diameter at the point where the hole was bored. One shank, having been broken across the original hole, was bored with another hole 6 cm. (center to center) below the first hole. This hole was also eventually broken through. This particular fragment was well-worn and polished, apparently indicating long use (Fig. 6, g).

All of the fragments except one had been used long enough for the natural corrugations of the antler to be worn smooth. On worn specimens from both the Fuller and Fanning Mounds, the shaft on the pointed side just below the hole had a shallow groove worn around it, either indicative of some specialized manner in which a finger gripped the tool or the way in which the tool was bound to a handle.

One of these tools which was apparently little-used is a segment of antler 12 cm. long, showing traces of a hole bored near the thick end. The natural corrugations have not been worn away and the base of a secondary tine is still visible.

Three tips of digging stick handles from both the Fanning and Fuller Mounds have a shallow groove cut around the tip. These grooves are apparently too shallow to hold any sort of a binding and they may be due to some secondary use (Fig. 6, h).

BONE AND ANTLER FLAKING TOOLS

Twenty-one tools pointed at one end and broken off at the thick end are believed to be tools for manufacturing chipped stone artifacts. These range in length from 2.0 to 7.0 cm. Twenty specimens are antler tines, one is of bone. Most of the tips show signs of use; some are still fairly sharp (tip width 0.2 cm.), while others are very worn (tip width about 0.6 cm.). One tip shows signs of having been re-sharpened with a steel blade. Five of the larger points may have been broken tips from camas-diggers, described above (Fig. 5, g, h).
Fig. 5. Bone and Stone Artifacts. a, Long Carved Bone Points; b-f, Bone Awls or Needles; g, h, Bone and Antler Flaking Tools; i, j, Bone Beads; k, Tubular Pipe; l, Barbed Bone Point; m, Ground Antler Tip; n, Gaming Piece; o, Antler Tip; p, Bone Pendent; q, Barb of 3-Piece Harpoon Head; r, Point of 3-Piece Harpoon Head; s, Phallic Item; t, Pipe Bowl (?); u, Carved Owl’s (?) Head.
Fig. 6. Miscellaneous Artifacts. a, b, Brass Finger Rings; c, Brass Thimble; d, Glass Bead; e, f, k, Antler Wedges; g, h, Antler Camas-Digger Handle Fragments; i, j, Brass Buttons; l, m, Incised Pebbles.
LONG CARVED BONE POINTS

Five specimens, approximately round in cross-section, range in diameter from 0.6 to 0.8 cm.; the longest fragment is 10.9 cm. long (Fig. 5, a).

BONE AWLS OR NEEDLES (?)

Five points (one burnt black) and two fragments of shanks; one is approximately square in cross-section. Diameters range between 0.3 and 0.55 cm., lengths between 2.0 and 4.8 cm. (Fig. 5, b-f).

BONE AND ANTLER WEDGES

Five specimens with rounded edges range from 1.5 to 2.2 cm. in width. Two of these are of antler, three of bone; all are broken at one end. The two antler wedges appear to have been socketed, though this may be due simply to decay of the soft center at the butt.

Four specimens with rounded edges are 0.9 to 1.4 cm. in width. All are broken at one end. The longest fragment (9.7 cm.) is a section of antler (Fig. 6, e), the others are apparently made from antler tines (Fig. 6, f, k).

Three specimens with rounded edges are 0.3 to 0.5 cm. in width. All are worked antler tines, and may also be flakers, as described above.

BONE BARBS AND HARPOON POINTS

One point with a single barb on one side is 3.1 cm. long and 0.5 cm. in diameter. The barb is 0.75 cm. across (Fig. 5, l). Another very fragmentary point of bone has four notches like simple barbs.

An object that is probably the point of a leaf-shaped three-piece harpoon head is approximately round in cross-section, 0.8 cm. at widest diameter. The point fragment is 3.3 cm. long and was apparently broken off at a shallow groove perpendicular to its long axis. A shallow fluting is visible along one flat side. Diagonal abrasions from manufacture are clearly visible (Fig. 5, r).
A three-piece harpoon head may also be represented by one whole and one broken barb or valve. The complete specimen is 5.0 cm. long and 0.8 cm. wide. The fragment was originally slightly larger (Fig. 5, q). These three-piece harpoon heads are similar to those illustrated from Wakemap Mound (Strong 1959).

**BONE BEADS**

Six tubular beads of bird bone ranged in length from 1.8 - 3.6 cm. and in diameter from 0.4 - 0.7 cm. One bead had rows of narrow grooves cut across its faces. One of these beads, of a heavier bone which was polished like ivory, was 2.6 cm. long, and 1.0 cm. in diameter (Fig. 5, i, j).

**MISCELLANEOUS BONE AND ANTLER ARTIFACTS**

A phallic item, carved of human metacarpal bone and stained or burned black, is 3.5 cm. long. The upper side of the shaft is marked by transverse lines and rows of dots lightly carved into the bone (Fig. 5, s).

A carved bone head (owl?) has oval eyes and heavy brows like an inverted chevron merging into the beak or nose. Field notes list it as having been found in association with Fanning burial no. 5. The fragment is 3.2 cm. high and 2.3 cm. wide (Fig. 5, u).

A gaming piece, 1.8 cm. long and 0.45 cm. wide, is roughly square in cross-section with a double row of dots on the two opposing faces. One side has twelve small incised or drilled dots in two unequal rows, the other side has nine larger dots in two unequal rows (Fig. 5, n).

A bone pendant, concave on one side and convex on the other, has a hole for suspension near the narrower end. Length is 2.0 cm., width is 1.0 cm. (Fig. 5, p).

A bird bone, unpierced, is stained with copper salts.

A small spatulate item or very thin wedge, has rounded end tapering back to sharp edges. Length is 2.2 cm., width is 1.0 cm., thickness is 0.3 cm.

Three small pieces of worked bone are of ambiguous form and purpose.
Twenty-one fragments of broken bone include four from small animals; the others are splinters or fragments from larger bones.

Two small fragments of antler were found, one worn into a smooth cylinder before breakage.

TRADE GOODS FROM FANNING MOUND

METAL

Two brass buttons 3.3 cm. in diameter. The face of one is plain, that of the other bears a circle of shallow dots. Both have brass loops soldered on the back. These buttons are similar to those from historic sites in the Southeast labelled Type 9 by South (1963). They probably date from the late 1700's (Fig. 6, i, j).

Two brass finger rings are 2.2 cm. in diameter and about 0.5 cm. wide (Fig. 6, a, b).

A brass spike, roughly square in cross-section, is 2.7 cm. long.

A brass thimble, 1.3 cm. in diameter, is pierced for suspension at the top (Fig. 6, c).

One crumpled copper strip, originally about 4.5 by 2.0 cm., is perhaps the remains of a tubular copper bead.

BEADS

One opaque white glass bead is shaped like a small Olivella or cowrie shell. Length is 0.9 cm., diameter is 0.4 cm. (Fig. 6, d).

One small opaque light blue bead is about 0.5 cm. in diameter.

One transparent aqua bead is about 0.7 cm. in diameter.

One opaque blue bead with rough surface is about 0.8 cm. in diameter.

One dark blue bead which is almost transparent, was faceted while hot. It measures 0.8 cm. in diameter.

Dating the entire mound occupation to the period indicated by these trade goods would be unwarranted, since the exact provenience of
artifacts was seldom recorded in the field notes. The faceted bead was found on the surface. The brass thimble was found three to six inches below the surface. The provenience of the other artifacts among the trade goods is unknown. In general it can be said that most of white trade artifacts are from the late historic period.

CONCLUSION

The data summarized here suggest that Fanning Mound was a two-component site, occupied from prehistoric into historic times. Laughlin noted that there appeared to be a separation between the upper 50 centimeters of the mound deposit and underlying levels, in that "Arrow points on or near the surface were comparatively crude, while those on or near the bottom were of medium workmanship (Laughlin 1943:227)." In the course of preparing the present report, it was noted that points with pointed stems (types 10-14) were generally less well-made than those with straight or expanded stems (types 1-9). Thus, two components may tentatively be distinguished, in part on the basis of chipped stone workmanship, in part by different modes of hafting projectile points. Historic trade goods, found mostly with burials exhibiting cranial deformation of the ethnographically known Chinook type, show that the later occupation of the site was of historic date. The duration of the prehistoric occupation is unknown.

Fanning Mound shows some affinities in artifact types with cultural areas quite distant. The abalone shell pendant and the Dentalium shell give evidence of contact with the seacoast. The carved bone head of an owl (?) and a fragment from a stone mortar, now missing from the collection (see Laughlin 1943:223), both show a staring eyes motif similar to that found in the Columbia River and Plateau areas.

Fanning Mound shows very strong affinities with Fuller Mound, which is about six miles down the Yamhill River. Fanning had a greater variety of projectile point types, but many types were duplicated at Fuller, as noted in this report. The point types at Fuller suggest that it, like Fanning is a two-component site. Knives were also the same at the two sites except for a few specimens that were unique to each. Perforator and scraper types were the same. In addition, Fuller Mound shows generally the same outside contacts as Fanning Mound in the whalebone salmon clubs from the coast or Columbia River and the staring eyes motif on one of the artifacts from the Columbia River or Plateau areas. Further excavations in these two mounds as well as in other sites of the Willamette Valley will undoubtedly support the impression that Fuller and Fanning were very closely related and roughly equivalent with regard to the activities performed at each. They may have been parts of a cultural sphere within the lower valley that was intermediate in complexity between the Upper Willamette Valley and the Columbia River cultures.
REFERENCES

Laughlin, William S.

Quimby, George I.
1964 European Trade Objects as Chronological Indicators. In Holmquist and Wheeler (Eds.), Diving into the Past.

South, Stanley

Strong, Emory

Strong, W.D.
1935 An Introduction to Nebraska Archaeology. Smithsonian Miscellaneous Collections, 93 (10).
ARTIFACTS FROM FULLER MOUND,
WILLAMETTE VALLEY, OREGON

BY

JOHN A. WOODWARD, CARSON N. MURDY, AND FRANKLIN YOUNG
Dr. D. T. Edmundson partially excavated Fuller Mound, a large
midden near Mc Minnville, Yamhill County, Oregon during several
months in 1941 and 1942. The field notes as well as most of the
artifacts were deposited in the Museum of Natural History at the
University of Oregon, Eugene. An initial report on this site and the
nearby Fanning Mound was written by William S. Laughlin, who described
the Fuller Site as follows:

The Fuller Mound is approximately three miles
west of Whiteson, and one-quarter of a mile
south of the present course of the Yamhill
River, on the farm of Mr. G.C. Fuller. To the
west of the mound is a large oxbow depression.
This remnant of the former stream bed has been
partially filled by aggradation of the western
portion of the mound. The mound is 39 m. long,
24 m. wide, and 100-150 cm. in depth in the
central area. The entire surface of the site
has been cultivated. It has no well defined
form, but the long axis appears to have been
north and south (Laughlin 1943:220-22).

A total of 41 burials was uncovered, and these were discussed
in some detail by Laughlin. Lloyd R. Collins (1951) later reviewed
the Fuller Site and, like Laughlin, illustrated some of the artifacts
recovered from the midden, but a complete classification and
description of the several hundred artifacts from this significant
site was never made. In order to expand the published record, the
authors developed a comprehensive description of the Fuller Mound
assemblage under the direction of C. Melvin Aikens. David L. Cole
of the Museum of Natural History, University of Oregon, kindly placed
the entire Fuller collection at their disposal and J. Arnold Shotwell
identified certain items of shell and bone. Laughlin (1943) provides
a table recording the presence/absence distribution of selected traits
associated with burials, but the excavation records on file at the
Museum did not provide adequate information to permit systematic study
of the within-site distribution of the great bulk of the artifacts,
and the treatment here is thus primarily descriptive.

CHIPPED STONE

The following is a new, more complete and more subdivided
classification of the chipped stone artifacts from Fuller Mound than
that provided by Laughlin (1943). The artifacts include projectile
points, knives, perforators, scrapers, a ceremonial blade, and
miscellaneous items.
Map of Willamette Valley showing location of Fuller Mound
The projectile points were grouped on the basis of size, symmetry, shoulder treatment, stem shape, and plan form. The following descriptive terms were used. **Symmetrical:** axis from the end of the stem to the tip of the point is perpendicular to, and at the midpoint of a line drawn between, the tips of the shoulders. **Barbed:** shoulders form an acute angle with the axis of the stem at its juncture with the blade. **Pointed Shoulder:** shoulder sharply pointed, forming right or obtuse angle with the axis of the stem at its juncture with the blade. **Straight stem:** sides of the stem are parallel. **Expanded stem:** width of the stem is greater at its base than at its juncture with the blade. **Serrated:** lateral edges evenly saw-toothed with shallow notches from shoulder to point.

Classification of the other chipped stone artifacts was based primarily on plan form, measurements of length, width, and thickness, and inferences about function based on ethnographic analogy.

Cross-references to similar forms in the collection from nearby Fanning Mound, reported in the following paper by Murdy and Wentz, are supplied. All measurements are in centimeters.

**PROJECTILE POINTS**

**Type 1**

Subtype A: Larger. Symmetrical, barbed, expanded or straight stem. N=12

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Subtype B: Smaller. N=6

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**Type 2**

Symmetrical, rounded barbs, expanded stem, slightly serrated lateral edges. N=5

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Type 3

Small, symmetrical, pointed shoulder, expanded or straight stem, serrated lateral edges. N=3
Length: \( R = 1.7 - 2.3 \) \( X = 2.06 \)
Width: \( R = 1.3 - 1.4 \) \( X = 1.35 \)
Thickness: \( R = 0.3 - 0.4 \) \( X = 0.38 \)
Remarks: Similar to Fanning Type 3 (Fig. 1, d).

Type 4

Asymmetrical, pointed shoulders, expanded stem, serrated lateral edges. N=3
Length: \( R = 2.0 - 2.3 \) \( X = 2.16 \)
Width: \( R = 1.0 \) \( X = 1.0 \)
Thickness: \( R = 0.3 - 0.4 \) \( X = 0.37 \)
Remarks: Same as Fanning Type 4 (Fig. 1, e).

Type 5

Small, symmetrical, pointed or barbed shoulder, pointed stem. N=52
Length: \( R = 1.31 - 2.15 \) \( X = 1.61 \)
Width: \( R = 0.7 - 1.6 \) \( X = 1.12 \)
Thickness: \( R = 0.2 - 0.4 \) \( X = 0.31 \)
Remarks: Same as Fanning Type 10 (Fig. 1, f).

Type 6

Thick, wide, symmetrical, barbed, pointed stem. N=7
Length: \( R = 2.2 - 2.5 \) \( X = 2.39 \)
Width: \( R = 1.3 - 1.7 \) \( X = 1.46 \)
Thickness: \( R = 0.3 - 0.7 \) \( X = 0.51 \)
Remarks: (Fig. 1, g).

Type 7

Small, symmetrical, pointed or rounded shoulder, pointed stem. N=4
Length: \( R = 1.6 - 2.0 \) \( X = 1.8 \)
Width: \( R = 0.8 - 1.1 \) \( X = 0.9 \)
Thickness: \( R = 0.3 - 0.5 \) \( X = 0.4 \)
Remarks: (Fig. 1, h).
Type 8

Narrow, symmetrical, barbed, pointed stem, parallel oblique flaking on blade surface. \( N=22 \)

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Remarks: Same as Fanning Type 12 (Fig. 1, i).

Type 9

Symmetrical, pointed shoulder, pointed stem, serrated lateral edges. \( N=11 \)

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Remarks: Same as Fanning Type 13 A (Fig. 1, j).

Type 10

Small, symmetrical, pointed shoulder, pointed stem. \( N=6 \)

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Remarks: (Fig. 1, k).

Type 11

Subtype A: Smaller. Symmetrical, barbed, pointed stem, concave lateral edges. \( N=14 \)

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Remarks: Same as Fanning Type 13 B (Fig. 1, l).

Subtype B: Larger. \( N=2 \)

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Remarks: (Fig. 1, m).
Type 12

Thick, symmetrical, side notched, flat base. N=2
Length: 1.9 and 3.3
Width: 1.1 and 1.5
Thickness: 0.4 and 0.5
Remarks: Same as Fanning Type 16. One of these is slightly convex at the base (Fig. 1, n).

Type 13

Small, symmetrical, flat base. N=2
Length: 2.1
Width: 1.0
Thickness: 0.3
Remarks: Same as Fanning Type 20 (Fig. 2, a).

Miscellaneous Projectile Points

One gray chert point, symmetrical, pointed shoulders, straight stem, convex serrated lateral edges. Length = 2.7, width = 1.6, thickness = 0.4 (Fig. 2, d).

One long chalcedony point, symmetrical, pointed shoulders, straight stem. Length = 4.0, width = 1.7, thickness = 0.3 (Fig. 2, b).

One thick obsidian point, asymmetrical, rounded shoulders, expanded stem. Length = 3.1, width = 1.6, thickness = 0.6 (Fig. 2, b).

One thick chert point, one shoulder pointed, the other rounded, straight stem. Length = 3.5, width = 1.4, thickness = 0.6 (Fig. 2, b).

One thick gray chert point, symmetrical-pointed shoulders, expanded stem, serrated lateral edges. Length = 2.9, width = 1.7, thickness = 0.5 (Fig. 2, b).

One single-shouldered chalcedony point with straight stem. Length = 3.9, width = 1.4, thickness = 0.4 (Fig. 2, b).

Fig. 1 (opposite page). Projectile Points. a, Type 1A; b, Type 1B; c, Type 2; d, Type 3; e, Type 4; f, Type 5; g, Type 6; h, Type 7; i, Type 8; j, Type 9; k, Type 10; l, Type 11A; m, Type 11B; n, Type 12.
Fig. 2. Projectile points and knives. Projectile points: a, Type 20; b-d, Miscellaneous. Knives: e, Type 1; f, Type 2; g, Type 3; h, Type 4.
One thick chert point, symmetrical, pointed shoulders, wide straight stem, rounded point. Length = 3.5, width = 2.0, thickness = 0.6. This point may have been a bunt for stunning small game.

One long, well-made obsidian point, symmetrical, pointed shoulders, pointed stem. Length = 3.9, width = 1.6, thickness = 0.3 (Fig. 2, c).

A total of 51 artifacts considered projectile points were left unclassified because they were either unfinished or broken.

**KNIVES**

**Type 1**

Long, thick, bifacially worked over total surface. N=4
Length: R=4.8 - 5.2 X=5.0
Width: R=1.6 - 2.0 X=1.87
Thickness: R=0.9 - 1.2 X=1.02
Remarks: (Fig. 2, e).

**Type 2**

Thick, bifacially flaked over total surface, convex base. N=1
(Broken, measurements undeterminable)
Remarks: Same as Fanning Type 2 (Fig. 2, f).

**Type 3**

Thick, bifacially flaked on lateral edges, butt unmodified. N=3
Length: R=2.7 - 4.0 X=3.4
Width: R=1.7 - 2.4 X=2.13
Thickness: R=0.6 - 1.1 X=0.9
Remarks: Same as Fanning Type 3 (Fig. 2, g).

**Type 4**

Thin, symmetrical, lozenge shaped in plan outline. N=1
Length: 4.5
Width: (Broken, measurement undeterminable)
Fig. 3. Perforators and Scrapers. Perforators: a, Type 1; b, Type 2; c, Type 3A; d, Type 3B. Scrapers: e, Type 1; f, Type 2; g, Type 3A; h, Type 3B; i, Type 4; j, Type 5A; k, Type 5B; l, Type 5C; m, Type 6.
Fig. 4. Stone and Bone Artifacts. a, Ceremonial Blade; b, Net Weights; c, d, Fish Clubs.
Thickness: 0.7
Remarks: (Fig. 2, h).

PERFORATORS

Type 1

Bifacally trimmed on lateral edges of point, butt unmodified. N=3
Length: R=2.6 - 3.5  X=3.1
Width:  R=1.7 - 2.0  X=1.8
Thickness: R=0.4 - 0.6  X=0.5
Remarks: Same as Fanning Type 1 (Fig. 3, a).

Type 2

Thick, bifacially worked over total surface, rounded or pointed butt. N=5
Length: R=2.1 - 2.9  X=2.5
Width:  R=1.0 - 1.4  X=1.15
Thickness: R=0.6 - 0.8  X=0.71
Remarks: Same as Fanning Type 2 (Fig. 3, b).

Type 3 Drills

Subtype A: Long points. N=4
Length: R=3.0 - 4.8  X=3.73
Width:  R=0.5 - 1.2  X=0.87
Thickness: R=0.3 - 0.7  X=0.45
Remarks: Same as Fanning Type 3 A (Fig. 3, c).

Subtype B: Short point. N=1
Length: 1.2
Width: 0.4
Thickness: 0.3
Remarks: Same as Fanning Type 3 B (Fig. 3, d).
SCRAPERS

Type 1

End scrapers with bifacial convex cutting edge. N=12
Remarks: Same as Fanning Type 1 (Fig. 3, e).

Type 2

Bifacial end scrapers with straight cutting edge. N=5
Remarks: (Fig. 3, f).

Type 3

Bifacially worked all around circumference.
Subtype A: Subtriangular in plan. N=5
Remarks: Same as Fanning Type 3. These may be projectile point preforms (Fig. 3, g).
Subtype B: Elliptical or irregular in plan outline. N=3
Remarks: (Fig. 3, h).

Type 4

Circular, unifacially worked all around circumference. N=1
Remarks: Same as Fanning Type 4 (Fig. 3, i).

Type 5

Unifacial end scrapers with steep convex cutting edge.
Subtype A: N=8
Remarks: Same as Fanning Type 5 (Fig. 3, j).
Subtype B: Base of scraper trimmed to a point. N=1
Remarks: (Fig. 3, k).
Subtype C: Base of scraper trimmed to a straight stem for hafting. N=1
Remarks: The bit of this scraper shows polish due to wear. (Fig. 3, l).
Type 6

End scrapers with unifacially worked straight or convex cutting edge. N=6

Remarks: Same as Fanning Type 6 (Fig. 3, m).

Miscellaneous Artifacts

One long, thin obsidian ceremonial blade, pointed at either end with a constriction in the middle and fine parallel pressure flaking over both surfaces of the blade. Length = 24.8, width = a, 4.9; b, 4.0; c, 4.4, thickness = 1.3 (Fig. 4, a).

One bifacially trimmed obsidian blade.

One unifacially trimmed point with some trimming on the dorsal surface of the butt. This point may have been hafted for graving or cutting.

Eight utilized flakes, of which five had unifacial retouch and three had bifacial retouch.

Two unworked flakes.

SUMMARY OF CHIPPED STONE

A total of 287 lithic artifacts included 210 projectile points, 9 knives, 13 perforators, 42 scrapers, 1 ceremonial blade, and 12 miscellaneous items. The following tabulation gives the totals and percentages of each type within each artifact class.

**Projectile Points**

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Unclassified 51 24.2
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GROUND STONE

Artifacts of ground, pecked, and polished stone are notable by their virtually complete absence in the Fuller Mound collection. Pestles, net weights, and a bowl (mortar?) were the only implements found.

Pestles

Although the finding of one complete pestle was recorded in the field notes, there are only two pestle fragments in the collection. One of these is a tapered top about 10.0 cm. long with a diameter of 5.5 cm. at the broken end. The other fragment is a midsection about 6.0 cm. long with a diameter of 5.4 cm. Both artifacts were made from ground and polished basalt.
Net Weights

Three felsite pebbles have encircling grooves about 2.0 cm. deep (Fig. 4, b). These artifacts, with maximum diameters of 3.5 and 4.0 cm., are interpreted as net weights or sinkers.

Stone Bowl

A three inch bowl, undecorated, with the bottom pecked so that it is flat is recorded in the Fuller excavation notes but can not be located in the collection.

ANTLER ARTIFACTS

Fuller Mound produced a rich assemblage of antler tools. Digging stick handles are the most abundant antler artifacts, with flakers and wedges made from antler tines also well represented. Besides utilitarian objects of antler the collection includes three ear spools which are, so far, unique in Willamette Valley archaeology. All the antler artifacts are very well preserved and most show clear evidence of grinding and polishing.

DIGGING STICK HANDLES

Nine fragmentary and three complete specimens (Fig. 5, a-c), constitute this group of implements. These handles, evidently employed to increase the leverage that could be exerted upon the wooden digging stick, were constructed from an antler tine in which a shaft hole was carved at a point about two thirds of the distance from the tine tip to the butt. The digging stick was fitted through the hole at right angles to the handle. The digging stick used with an antler tine handle is known ethnographically for several Columbia Plateau Indian tribes. The Nez Perce, for example, used this implement to unearth the edible camas bulbs. (Spinden 1915:201). The camas plant remains abundant in the Willamette Valley today and in several middens of the upper valley charred camas roots have been found in situ (White, this volume).

The lengths of the three unbroken handles are 26.0, 27.5 and 29.5 cm. The five shaft holes that can be measured range from 2.0 to 2.7 cm. in diameter. Most of the handles show considerable overall polish that can be attributed to use. An interesting feature of one of the complete specimens (Fig. 5, b) is the splintering and pressure
bulging surrounding the shaft hole, which resulted from excessive application of leverage. Two handles (Fig. 5 a, f) are decorated by rectilinear patterns of incised lines; another (Fig. 5, g) has an encircling groove cut 0.7 cm. below the tine tip.

**FLAKERS**

This class includes ten incomplete antler tine points modified by grinding (Fig. 5, p, q). The evidence of wear and the bluntness of the tips suggest that while these artifacts were probably used as stone flakers, some may have served as punches or pick points. Eight of the specimens are broken tips, with the break occurring from 2.7 to 5.5 cm. back from the point of the tine. Two are midsections with an estimated 2.0 to 4.0 cm. of tip missing. There are traces of red pigment on one specimen.

**WEDGES**

Woodworking wedges manufactured by sharpening the end of a midsection of tine to produce a beveled cutting edge are represented by eight fragmentary examples (Fig. 5, u, w). Whether the wedge was made from a wide or narrow section of tine apparently depended upon the desired width of the cutting edge. Five of the bits are sufficiently complete to allow measurement. These range from 0.5 to 3.5 cm. in width, indicating a potential diversity of uses within this class. Several of the wedges seem to show intentional as well as wear polish.

**GOUGE**

One artifact used for woodworking differs from the wedges described above in having the bit hollowed out on one side, producing a concave chisel blade. The width of the bit on this partially complete specimen (Fig. 5, x) is 2.0 cm.

**EAR SPOOLS**

Ground antler tine sections 2.6 and 3.0 cm. in diameter and 0.7 to 1.8 cm. thick were used to fashion ear spools (Fig. 5, j-l). Grooved rims and central holes were cut and ground in these discs, resulting in relatively thin spool-like ornaments. The three examples can be segregated into two categories on the basis of the size of the
Fig. 5. Antler and Bone Artifacts. a-c, Digging stick handles; d, Pick (?); e, Bone blade; f, g, Digging stick handle fragments; h, i, Dice; j-l, Ear spools; m, Nose ornament; n, Flaker; o, Gorge; p, q, Flakers; r, Awl; s, t, Needles or shuttles; u-w, Wedges; x, Gouge; y, Bone saw.
Fig. 6. Ornaments. a, Olivella and glycymeris beads, a brass button, and two copper bangles; b, Copper bangle; c, Bird bone beads.
central hole. One spool has a hole diameter of 1.8 cm.; the two others have hole diameters of 0.7 and 0.8 cm. The latter examples were reported by Laughlin (1943:224) to have been found on either side of and close to the skull of the burial.

**PICK (?)**

A tine 24.5 cm. long and showing slight polish on the point may have been used as a pick, or it may be an unfinished "blank" that was destined for completion as a digging stick handle or some other implement (Fig. g, d). Since its total length considerably exceeds the typical distance between shaft hole and point (16 cm.) on the complete digging stick handles in the collection, it appears unlikely that this artifact is the broken end of a digging stick handle.

**GORGE (?)**

A bipointed ground antler artifact may be a fish gorge (Fig. 5, o). It is 2.8 cm. long and has a maximum diameter of 0.4 cm. The tapering is asymmetrical, a feature which makes the bipoint resemble the foreshaft of a composite fish harpoon, examples of which were recovered from the nearby Fanning Mound. Identification of this object as a gorge is therefore provisional.

**MISCELLANEOUS**

This category includes four objects of antler too fragmentary for identification but showing evidence of grinding, polishing, and wear. Some or all of these artifacts could be fragments of digging stick handles.

**BONE ARTIFACTS**

Artifacts of bone consist of both ornaments and tools, including an especially large sample of polished bird bone beads. Also notable are two large decorated fish clubs of whale bone and a polished and incised eyed needle made from a broad flat splinter of mammal bone. These and the other artifacts of bone are generally well preserved.
BEADS

Tubular polished beads made from cut sections of bird bone range in length from 1.0 to 4.0 cm. (Fig. 6, c). There are 83 specimens, 72 of which were recovered from one burial (Laughlin 1943:221). Only one bead is decorated; it is the longest in the collection, and shows an encircling groove 1.0 cm. from one end.

FISH CLUBS

Two polished and carved paddle-like objects made from whale bone are interpreted as ceremonial fish clubs (Fig. 4, c, d). One example is complete but the other is fragmentary. Both are about 51.0 cm. long, 8.5 cm. wide, and 1.7 cm. thick. The clubs are lenticular in cross section, the fragmentary example having longitudinal ridges on both surfaces, one of which is grooved. The handles of the clubs are decorated with variations of a face-eye motif. This motif is carved on both sides of the complete club, but only on one side of the incomplete specimen. Side grooves exist on the handle of the former and the eyes on one side retain traces of red ocher. The overall polishing, the lack of battering, and the decoration on these pieces argue in favor of a ceremonial or prestige function rather than daily use as clubs in the mundane activities of fishing.

AWLS

One complete and twelve fragmentary artifacts made from bone splinters are classified as basketry awls on the basis of tapering and polishing. The broken examples consist of five tips, five midsections, and two bases. The complete awl is a slender specimen 9.5 cm. long, and 0.8 cm. wide at the butt (Fig. 5, r). One tip was sharpened by whittling in contrast to the grinding on all the other examples. It is possible, though not certain, that the whittling was done with an iron tool.

EYED NEEDLES OR SHUTTLES

Two possible mat or net shuttles were made from flat bone splinters. The larger example (Fig. 5, t) is symmetrically tapered, with maximum length and width dimensions of 10.5 and 1.7 cm. This highly polished piece, decorated with incised lines on both sides, is stained by in situ association with copper artifacts. The
possibility that it served as a pendant rather than a needle can not be ruled out due to its decoration and high polish. The location of the eye on the wide end of the specimen tends to make this interpretation unlikely, however. The second example (Fig. 5, s) differs from the first in being smaller (8.5 by 0.9 cm.), curved, and undecorated.

**BLADE**

A long bone splinter ground to a beveled tip and having a concave socket may be a spear point (Fig. 5, e). The artifact is 18.0 cm. long with a maximum width of 2.3 cm. and a maximum thickness of 1.2 cm. Some polishing is present.

**SAW**

A splinter 8.0 cm. long with a flaked serrated edge probably served as a saw (Fig. 5, y).

**NOSE ORNAMENT**

A curved section of bird bone 5.0 cm. long was decorated by ticking along its length and had an encircling groove cut 0.6 cm. below one end (Fig. 5, m). Since this bone was not hollowed in the manner of beads and the decoration seems unsuited to use as a die, it is tentatively identified as a nose ornament.

**DICE**

One complete and two fragmentary artifacts made from bird bones were polished and marked on two sides with incised lines. The complete specimen (Fig. 5, h), is curved, 4.0 cm. long, 0.5 cm. wide, and 0.3 cm. thick. The two fragmentary specimens are burned.

**FLAKER**

A Sea Lion penis bone was modified by grinding on one end to produce a blunt pointed flaker (Fig. 5, n). This specimen is 15.0 cm. long, and 1.1 cm. wide at the flaking tip.
MISCELLANEOUS

No specific use can be attributed to the 13 bone artifacts in this category and none appear to have any outstanding significance at present. Of some interest, however, are a polished spatulate splinter, a splinter showing tip wear and several cuts along its length, and a polished section of a small mammal bone 4.3 cm. long with an encircling groove 0.8 cm. below the end. Additionally, an unidentified bird bill and masses of feathers are reported to have been found with three burials (Laughlin 1943:224), but they were not available for examination.

SHELL ARTIFACTS

Ornaments are the only artifacts made from shell. These are of several types and are classified on the basis of type of shell, size and shape. Preservation ranges from poor to excellent.

DENTALIUM

There are 82 examples that range in size from section 0.1 cm. long to complete shells 4.2 cm. long. Only one is decorated, a section 1.0 cm. in length was incised with a set of parallel encircling lines 0.3 cm. below each end. This shell shows copper staining.

OLIVELLA

These can be divided into two types: "spire ground off" and "small oval." The first type includes complete shells modified only by having the tip of the spire ground or broken off to allow stringing through the opening (Fig. 6, a). There are 299 such specimens. The second type was constructed from a curved section of an Olivella whorl which was ground and perforated to produce a small thin oval. The four examples of this type are from 0.8 to 0.9 cm. long, from 0.5 to 0.6 cm. wide, and about 0.1 cm. thick.

GLYCIMERIS

There are 20 of these shells, modified only by drilled perforations near the hinges to allow stringing (Fig. 6, a).
HALIOTIS

Two unperforated discs with diameters of 2.2 and 2.6 cm. and thicknesses of 0.2 and 2.6 cm. have rough edges and are probably unfinished beads or inlay blanks.

IPITONIUM

The only example of this shell is a specimen too fragmentary to determine the nature of its modification.

BAKED CLAY

Only one object of fired clay was found. It is cylindrical in shape about 3.0 cm. long with a diameter of about 1.8 cm.

WHITE TRADE GOODS

The following items of white origin were recovered from the Fuller Site. Their presence, however, does not necessarily indicate the existence of whites near the Yamhill River villages during their occupation. Aboriginal traders spread such goods throughout the Northwest long before whites themselves reached many areas.

GLASS BEADS

There are two spherical, robin egg blue, opaque beads, 0.6 and 0.8 cm. in diameter, and a spherical, blue, translucent bead 0.5 cm. in diameter.

BRASS BUTTON

A two-piece button 1.3 cm. in diameter and 0.8 cm. thick with a brass eye soldered to the back (Fig. 6, a) is of a type made between 1812 and 1830 (Olsen 1963).
COPPER BANGLES

There are three complete bangles made by the Indians from trade sheet copper (Fig. 6a, b). They range from 3.5 to 5.3 cm. in length, and from .7 to 2.2 cm. in width.

COPPER BEADS

Two badly preserved, Indian-made, rolled sheet copper tubular beads are about 3.5 cm. long, and about .3 cm. in diameter.

MISCELLANEOUS HISTORIC ARTIFACTS

There are two fragments of sheet copper which may be pieces of bangles. One of these measures 1.5 by 2.1 cm. and has five small intentional perforations. Iron fragments were found, but in all cases are too disintegrated to identify.

CONCLUSION

The Fuller Mound collection, along with that from the nearby Fanning Mound, constitutes the most diverse inventory of artifacts recovered to date from the Willamette Valley. Especially significant is the wide range of well preserved ground and polished antler and bone objects. These artifacts, together with those of stone, give us some insight into the economic life of the prehistoric and early historic Indian groups of the Yamhill River area. The digging stick handles, net weights, and projectile points indicate a mixed economy based upon the varied resources of land and stream. The general lack of milling stones probably means that nuts and seeds were little used.

Since the Willamette Valley is a natural corridor it is not surprising to find there such items of foreign manufacture as the whale bone clubs from Fuller, and the ceremonial obsidian blade from the Fanning Site. What function these objects, "at home" respectively in the Columbia River-Northwest Coast and the Northern California Southern Oregon areas, had among the Yamhill River people is conjectural.
Considering the size and richness of the Fuller midden it is particularly unfortunate that the excavation was not recorded more systematically. Cultural features such as hearths were apparently ignored in most cases and bone refuse was discarded without analysis. Since little attention was given to stratigraphy, it is uncertain to what degree the midden can be placed within or before the period of white trade. It may be significant, however, that with the exception of two trade beads, all artifacts of white origin were apparently associated with only five of the 41 burials reported from the site. Laughlin (1943:225) suggests that these burials are intrusive into a precontact midden which seems likely, although an alternative explanation may be that during the initial period of white trade (via the Columbia River) rare and prized items of iron, copper, brass, and glass constituted wealth or prestige goods concentrated in the hands of a relatively few individuals of high status. The fact that the five graves with historic goods also contained aboriginal artifacts of the types found in the 36 other burials, in any case argues against postulating a very great temporal discontinuity between the two kinds of interments.

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Olsen, S.J.

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ARCHAEOLOGICAL REMAINS AT THE BEEBE SITE (35 LA 216),
IN THE SOUTHEASTERN WILLAMETTE VALLEY FOOTHILLS

BY

JULIE A. FOLLANSBEE
The Beebe Site (35 LA 216) is located at an elevation of approximately 600 feet on a bench of the Coburg Hills overlooking the Willamette Valley (Fig. 1). Excavated in 1972 by students participating in the University of Oregon's summer field school in archaeology, it is one of the few above-valley sites to be analyzed in the Upper Willamette Valley Region. With lithic materials clearly resembling those from the valley floor, the emphasis on tool manufacturing and butchering at the site substantiates the idea that hunting game in the foothills was one of the pursuits of the aboriginal inhabitants of the valley (White, this volume).

The lithic debitage from tool making at this site allowed the steps used in tool production to be reconstructed. Inferences regarding tool use were made from the available evidence. The distributions of cultural features and artifacts were also compared in an attempt to isolate activity areas within the site. Since the deposit was quite shallow and since the small, triangular projectile points could not be separated chronologically on the basis of typology, the site was treated as a single component in this analysis.

SETTING

The site is in a clearing on fairly level terrain adjacent to a steep hill on the south, which provides shade over the occupied area until early afternoon. Fifty feet to the east is a large spring approximately 50 feet long by 3 feet wide. Behind it, the hill rises sharply. A small creek flows not more than 300 feet to the north.

The Beebe Site lies on the Looney geomorphic unit, which is characterized by valleys and ridges on a steeply sloping terrain. Its soils are variable due to differences in age, slope, parent material, vegetation, and climate (Balster and Parsons 1968: 5, 10). The soil at the site was a dark brown to black humus giving way to clay with increasing depth; rocks were mainly basalt.

As White (this volume) has noted, Anglo-American use of the Willamette Valley has radically altered the native vegetation, as well as changing the faunal population. This is probably also true in the foothills, where logging has occurred. When the Beebe Site was excavated, Douglas fir and deciduous trees—primarily oak and various maple species—were predominant, with a ground cover of thistles, ferns, weeds, and patches of poison oak. The large size of the trees indicated that logging had not occurred in the vicinity for quite some time, but since the archaeological excavation the area has been clear-cut. It is not known how much this activity disturbed what remained of the site.

Several white-tailed deer (Odocoileus virginianus leucurus) were sighted, and possible bear droppings were collected on the south
Fig. 1. Map of the Willamette Valley Region, Showing Location of the Beebe Site.
Fig. 2. Measured Sketch Map of the Beebe Site.
hill. Both animals were present in the area before white contact.

EXCAVATION OF THE SITE

The site was tested by an archaeological survey team in the early summer of 1972, and as a consequence of the amount of cultural material recovered, a small crew began excavation in mid-July. Nine contiguous two by two meter units were laid out as a block excavation in the clearing adjacent to the hill. These units encompassed Test Unit B, which was the most productive of the survey team's five test units. Before the close of the field season, 32 square meters were excavated, including a second, much smaller block excavation 2 meters north and 10 meters east of the main excavation (Fig. 2). This and the other four units dug by the survey team contained less material than was found in the clearing, but they demonstrated the extensiveness of the site.

After each unit was surface collected, soil was removed in 10 centimeter levels. The only visible change in the deposits occurred at approximately 40 centimeters depth, where brown clay was encountered. A screen with 1/4 inch mesh was used, but when troweling revealed the presence of microflakes in portions of the site, they were recovered with tweezers. The amount of cultural debris rapidly diminished beyond a depth of 30 centimeters.

Nearly ubiquitous in the excavated area were small fire cracked rocks and charcoal. Burned clay flecks in the soil were observed in one two by two meter unit next to the hill. This situation was reminiscent of that at the Lynch Site (35 LA 36) on Little Muddy Creek in the valley below (Sanford, this volume), where baking camas was a major activity, and where burned clay, charcoal, and cracked rock occurred in conjunction with earth ovens. Nothing resembling these ovens was found at the Beebe Site, however, although several charred bulbs were recovered.

The most prominent cultural feature consisted of a number of large (15 to 20 cm. diameter) fire-cracked rocks forming a rough circle in the eastern two-thirds of the excavation. A stone-enclosed fire hearth containing charred wood, charcoal, and burned bone had been built on top of this feature in its northeast quadrant.

LITHIC TECHNOLOGY

In addition to the cultural features mentioned, cultural material consisted of 1) several classes of flake tools; 2) debitage
or unused flakes; 3) cores and core tools; 4) charred bulbs; and 
5) burned and unburned bone fragments. The bulbs and bone fragments 
will not be described here although they are referred to in the 
concluding sections of this report.

In addition to preserving well in archaeological sites, lithic 
material has attributes of form and location from which much 
information can be gained. Its distribution can be compared to the 
distributions of other cultural items to locate activity areas within 
a site. Its formal attributes, such as wear marks, can be analyzed to 
see how tools might have been used, and this information can be used 
to identify the activities that were performed in certain locations. 
Other formal attributes can be studied in order to reconstruct the 
culturally prescribed methods of producing tools, so that sophisticated 
comparisons may be made of the lithics from different sites. The 
following analysis deals with steps in the production of tools at 
the site. No functional analysis was done, but such analysis might 
substantiate some of the suggestions made about tool use and the kinds 
of activities that the prehistoric inhabitants engaged in.

**TOOL IDENTIFICATION**

In excavation, 32 square meters were dug to an average depth of 
30 centimeters. Within this relatively small area 274 stone tools 
were recovered. A tool is defined here as any worked flake or core, 
either used or unused, or any used flake or unused core. Also recovered 
were 56 stones in some stage of manufacture and 1691 waste flakes. 
Worked stone tools have been either pressure or percussion flaked into 
a desired shape from a flake or core; used flakes are simply those 
used as they are struck from a core. Kinds and numbers of tools 
found are listed in Table 1. In general, the tools resemble those 
known from other Willamette Valley Sites. See Henn, Mack and 
Sanford, this volume, for data on the projectile points from the 
Beebe Site.

In order to distinguish the used from the unused flakes, each 
flake edge was carefully examined with a 10-power hand lens for signs 
of wear. Wear signs include tiny flake scars, worn-down surfaces, 
and/or a jagged appearance along one or more edges of the flake. 
Unfortunately it is not always easy to know if these characteristics 
are the result of aboriginal use, or of such factors as being stepped 
on (either by Indians or archaeologists) or being altered at some 
stage of recovery. If edge damage appeared to be recent, or due to 
causes other than use, the flake was not classified as a tool. Edge 
wear studies on flakes used to cut leather, bone, and wood were 
helpful in making these decisions (Follansbee 1972). It should also 
be mentioned that in some cases where flakes are used to butcher, 
their edges will become coated with fat which protects against edge
TOOLS

<table>
<thead>
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<th>Tool Type</th>
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<tbody>
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<tr>
<td>Worked flakes</td>
<td>29</td>
</tr>
<tr>
<td>Projectile points</td>
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</tr>
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<td>Gravers</td>
<td>5</td>
</tr>
<tr>
<td>Knife fragments</td>
<td>7</td>
</tr>
<tr>
<td>Drills</td>
<td>2</td>
</tr>
<tr>
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<td>4</td>
</tr>
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</tr>
<tr>
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<tr>
<td>Edge battered flakes</td>
<td>2</td>
</tr>
<tr>
<td>Tip-used flake</td>
<td>1</td>
</tr>
<tr>
<td>Biface fragment</td>
<td>1</td>
</tr>
<tr>
<td>Choppers</td>
<td>6</td>
</tr>
<tr>
<td>Oblong river cobbles</td>
<td>4</td>
</tr>
<tr>
<td>Spokeshave/graver/scaper</td>
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</tr>
<tr>
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DEBRIS FROM MANUFACTURE

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<td>Cores</td>
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<td>Core fragments</td>
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<td></td>
<td>56</td>
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</tbody>
</table>

Table 1. Types of Lithic Artifacts
modification. This coating will not be preserved, thus making it impossible to know if the flake has been used (Brose 1975:93). Despite these problems, however, a great deal of information was obtained from those lithics identified as tools.

MATERIALS

Tools were made from river-worn pebbles and cobbles of basalt, obsidian, chert, and jasper. Numerous waste flakes retaining cortex from the outer surfaces of the cobbles and pebbles indicate that tools were made at the site. These cobbles and pebbles were probably found on gravel bars near rivers, and their transportation to the hills probably made some carrying device, like a basket or hide container, necessary. Tools were also made from angular pieces and lumps of cryptocrystalline material (agate, chert, petrified wood) that probably occur naturally in the Coburg Hills.

FLAKE PRODUCTION

Over 90 percent of the tools from the site are either used flakes or are made from flakes. From them and the large amount of debitage, techniques of flake production can be determined. The flakes are always thick and ovoid, never blade-like. This is a result of the manner in which flakes were struck off the core. After a flake was removed from the core, the flat surface remaining was used as a platform for striking off another flake. This was done repeatedly. In this way, the thinnest edges of the core are used for striking platforms and their location will vary according to previous flake removal. Such a procedure results in multiple striking platforms and a core that is shaped quite differently from cores with a single striking platform and from which blade-like flakes are systematically removed. The thickness of the flake is a result of striking toward the center of the core rather than toward its edges.

This type of flake production is related to the rather thick appearance and lack of curvature common to the projectile points at the Beebe Site. These projectiles were manufactured mostly from pebbles of obsidian and jasper, which were first split or broken to produce thick flakes with cortex on one side. From these flakes the knapper chose ones of the appropriate size and thickness, then bifacially flaked them into blanks for projectiles, drills, or gravers. All the steps in the manufacture of these tools are represented in the lithic material at the site. Interestingly, there is one projectile point in the collection which was not made by this technique—in fact, it is unlikely that it was made at the site at all. This thin, small point was collected on the surface; of the type
commonly called Desert Side-notched, it was flaked from a blade. It may have been traded into the Willamette Valley—or, since there is an impact break near the tip, shot into an animal or person that carried it there.

**CORES**

There were 21 cores, 14 core tools, and 24 core fragments in the artifact assemblage. In addition to cores with completely flaked surfaces that were used as tools, there were core tools that were bifacially flaked on one end to produce large choppers. One long oblong cobble had an end broken off—the resulting flat surface may have been used to pound. Other oblong river cobbles were not flaked at all but show signs of use on one or more surfaces—there are four of these 6 to 8-inch long cobbles. The choppers and used cobbles constitute about 6 percent of the tools.

Core fragments are made by hitting a core so that it breaks, producing angular chunks of material showing scars of previous flakes. There were more core fragments than whole cores recovered at the site. There are two possible explanations for these core fragments. The first is that cores were flaked until they got so small that attempts to remove additional flakes shattered the core. This situation appears more likely when it is remembered that in the technique used at the site, blows are directed toward the center of the core in an effort to knock off thicker flakes—an action that is likely to split small cores. The second explanation, suggested by Dr. John L. Fagan, Portland District Archaeologist for the U.S. Army Corps of Engineers, is that the same techniques were used to produce tools from cores as from pebbles. That is, once the core reached a desired size, it was split, just as the obsidian and jasper pebbles were split. One or more of the resulting fragments were then worked into a tool. This idea is supported by the occurrence of worked items that are thicker than the usual flake tool, and could very likely have resulted from using a core fragment instead of a flake as a base for making a tool. Rather than resulting from an accidental shattering of the core, then, as the first explanation implies, the core fragments may result from a deliberate effort to use the core for further tool manufacture when flake removal is complete. Such a procedure would certainly be economical for people who chose to haul rocks up into the hills. They could flake cobbles until they were exhausted cores about the size of pebbles, and use the same techniques on both to produce tools, thus limiting the number of pebbles that would have to be transported. Judging by the size of the cryptocrystalline flakes and cores, it appears that the cobbles of that material were on the whole larger than the obsidian and jasper pebbles. More tools could be obtained from the flakes and core fragments of these larger cobbles, though
the pebbles could more readily be made into projectile points, scrapers, drills, and gravers.

**HAMMERSTONES**

Two hammerstones were recovered. One was a small round stone battered on three surfaces. A hammerstone of this size would be useful for flaking small cores, pebbles, or blanks. The other hammerstone was a large flattened oblong river cobble with a battered end; it would have been efficient in flaking other large cobbles. This stone also exhibited pecking along the thinnest edges, where it may have been gripped or fastened to a handle. Both hammerstones were found on the surface of the site.

**HEAT TREATMENT**

At last he got tired, after quite awhile he became sick. They listened then. His child's heart exploded (in the sweathouse). Again another of his hearts burst. It did like that five times...After quite a while then flint's own heart exploded. Again another of his hearts burst. It did like that five times... and then he died.

Now on the fifth day...when they opened up the sweathouse, flint was completely broken up. Whale said, "You are not to be a person. You will be flint. People will get you, they will make arrowpoints of you, which they will shoot on arrows. You will be fitted on them...and on spears. This is the way it will be done to you (Jacobs 1945:260-261).

This myth depicting the heat treatment of stone prior to flaking it by the Santiam Kalapuya who occupied the Willamette Valley north of the Beebe Site has been corroborated by the archaeologic record. A heat-treatment pit radiocarbon dated at approximately 1400 A.D. was discovered by Oregon State University archaeologists (Davis et. al. 1974). Many of the flakes found in the pit were spalled from overheating. There is also evidence for heat treatment at the Davidson Site on Little Muddy Creek (Davis 1973:24).

Waxy surfaces and multi-colored material appear on many of the cryptocrystalline tools, cores, and flakes at the Beebe Site. Both are traits characteristic of cryptocrystalline material that has gone through the heat treating process, which makes the stone easier to flake. To heat treat stone, a pit is dug, a fire is allowed to burn
down in it, and a layer of dirt is placed over the ashes. Cores and flakes are placed on this dirt layer and another dirt layer is added. Then another fire is built, allowed to burn down, and the pit is opened when the stone has cooled. It is not known whether there were heat treating pits at the Beebe Site. None were observed during excavation, but they may have been outside of the excavated portion of the site, or the raw material may have been heat treated in the valley. Many of the core fragments and flakes showed signs of damage from heat. They were spalled and had uneven, almost congealed surfaces. This could have resulted from overheating during heat treatment, or from being in a fire subsequent to this process.

MICROFLAKES

Noticeable in two areas of the site while excavation was proceeding were quantities of microflakes, small flakes less than 1/4 inch long, which are produced by pressure flaking. As many as possible were recovered. The presence of many unused projectile points in the vicinity made it clear that these were areas of point manufacture. Like the points, most of the microflakes were of obsidian, with fewer flakes of chert, jasper, and agate.

ACTIVITIES

The activities of the Beebe Site inhabitants may be inferred from the tools, waste flakes, cultural features, and plant and animal remains that they left. These items are not scattered randomly through the site; they have a patterned distribution that reflects the focus of certain activities. To get an idea of the spatial structure of the site, tool distributions were plotted in relation to lithic debris, the rock feature, bone fragments, and plant remains. Thus, both the kinds and locations of cultural items were used to infer the pattern of aboriginal activities.

TOOL MAKING

Analysis of the lithics clearly reveals that stone tool making was a major activity at the site. Based on the types of stone tools that are present, it can be inferred that wooden implements were also fashioned, although none were recovered. A spokeshave and several gravers may be considered the best evidence for manufacture of wooden implements at the site. Drills, burin-like tipped flakes, scrapers, used flakes, choppers, and edge-battered flakes might also be considered,
but such types were presumably also used for other purposes.

The inferred wooden implements may have been tools in themselves, or haft elements for stone tools. According to William Hartless, a Mary's River Indian who was interviewed in 1913, the Kalapuya of the Willamette region used wooden bows and wooden hafts for their arrows, spears, knives, and axes (Mackey 1974:37, 38, 42). The large oblong hammerstone found at the Beebe Site may have been hafted to a wooden handle, since it has a definite polish in the center of its largest flat surface.

No unquestionable bone tools were found at the site, although a slightly polished tip was observed on a deer metatarsal fragment. (Dr. Donald K. Grayson of the Bureau of Land Management, Portland, could identify only deer bone from the site collections. Most was too fragmentary for identification). Bone tools are infrequently found in the Upper Willamette Valley (White, this volume), probably due to their deterioration in the acidic soils.

**AREAS OF TOOL MAKING AND TOOL USE**

Since waste flakes were found in all units of the excavation, it would seem that stone tool making was not confined to particular locations at the site. However, certain types of stone occur as debitage in certain portions of the site more frequently than do others, which indicates that tools of different materials were manufactured in different parts of the site. This may relate to differences in the activities for which the tools were used.

When comparing concentration of waste material by flake counts, care should be taken that the flake sizes of the particular material be roughly comparable. For example, an area containing 50 large basalt flakes should not be eliminated as a basalt tool making area simply because 250 small basalt flakes occur in another place. For the same reason, measurements of the concentration of material in an area by weight should take into account differences in flake sizes. To avoid this problem at the Beebe Site, flakes were divided into large, medium, and small categories within each unit at the site, after the different kinds of stone had been separated. Since each unit contained similar proportions of these flake sizes, flake counts were made to see where the concentrations occurred.

Basalt flakes occur in greatest quantity in the northern and southeastern portions of the excavation; obsidian flakes are concentrated in the south; and cryptocrystalline flakes are found in the north and south (Fig. 3). Therefore, stone tool making occurred over all the site, but certain materials were flaked more often in some places than they were in others. Furthermore, since flakes of a
particular material tend to be of the same size wherever they are found, it can be inferred that the manufacturing processes do not vary much within the site. This implies that the same kinds of tools were being made from the same specific material, which is verified by examining the tools themselves. For example, basalt was used to make either large flakes or core tools, never projectile points or drills. Similar tools were most likely used to perform similar tasks.

If the locations of the highest numbers of tools of a particular material are compared to the locations where debitage concentrations for that material occur, it appears that some tools were made in one place and used in another—granting that the tools were deposited not far from the place where they were used (Fig. 3). This inference seems reasonable, since otherwise a very systematic method of discarding tools would have had to be used to produce the differences in locations of tools of different materials. The obsidian debris occurred mainly in the southern part of the excavation, but most of the obsidian tools are found in the northern and eastern portions. Basalt tools occur in the east-central and northern parts of the excavation; none at all are found in the southern portion, although a main concentration of basalt flakes occurs there. Some tools of cryptocrystalline material occur in the southeast (most of the flakes are west of this area) and some occur in the north, where flakes are also present. These distributions suggest that while tools were carried from the place where they were made, the areas of manufacture and use were usually not more than four meters apart, except in the case of obsidian artifacts. In some cases, the highest numbers of flakes and tools of basalt, obsidian, and cryptocrystalline are all found in the same area, but this situation occurs less often.

There is one category of tool whose area of manufacture can be pinpointed in the site—projectile points. While points are found all over the site, split pebbles, blanks, and microflakes are found together only in certain areas, and usually more points occur in these areas. These items, as discussed previously, represent various stages in the manufacture of projectile points and other small tools. Since split pebbles, which represent the first stage, and pressure flakes, which represent the last stage, occur in the same area we can be quite certain that these tools were completed in the same place they were started. This procedure took place in the southeastern and northwestern parts of the excavated area (Fig. 4).

Since the edge-wear analysis which would be necessary to identify all the tools used for woodworking was not made, it is difficult to pinpoint the area(s) where wooden tools and haft elements were made. A combination tool consisting of a graver, a scraper, and a spokeshave was found close to the area where projectile points were made, which suggests that arrowshafts were probably prepared close to the place where points were made. Gravers are found in both the
Fig. 3. Flake and Tool Distributions (Highest Frequencies).
Fig. 4. Distributions of Artifact Types, Bone, Bulbs and Burned Earth.
northern and southern ends of the excavation.

It was mentioned earlier that large fire-cracked rocks found in five of the excavation units formed a rough circle (Fig. 5). Inside this circle were areas of hard-packed dirt, and other areas where the earth was quite soft. In the northeast corner of the excavation, on top of the rocks, was a large stone-enclosed fire hearth containing charcoal, charred wood, and large burned bone fragments. This configuration may represent a living and/or sleeping area, from which rocks were cleared and placed in a circle. Interestingly enough, fewer tools are found outside the circle; the number of tools rises in units containing the rock feature with one exception--the unit containing the fire hearth itself (Fig. 6). During excavation of the rock circle, clusters of tools were noted close by, and many tools were recovered from the soil surrounding the rocks. Activity at the site, then, appears to have centered on the rock circle.

**BUTCHERING AND MEAT PROCESSING**

Several fragments of unburned deer bone exhibiting cut marks, along with knives of various sizes and types, choppers, tiny cutting tools, and many large basalt used flakes and smaller used flakes of other material, are found in highest frequencies only in the northern two-thirds of the excavated area, which suggests a focus of butchering activity. The number of these kinds of tools recovered on and around the rock feature suggests that game may have been placed there to be butchered. Burned and unburned bone fragments were found everywhere except in the unit with the hard-packed soil.

The butchering techniques used cannot be reconstructed in detail from the fragmentary bones that remain. However, the aid of a modern butcher (Robert Ackerman, of Eugene, Oregon) was enlisted to explain what general procedures would be most likely to be used with stone tools. He also examined the tools recovered in order to suggest how they might have been used in the butchering process.

The butcher suggested that without saws to cut rapidly through the bone, the inhabitants of the Beebe Site probably severed the joints to obtain meat cuts, and he pointed out that the small, elongated basalt tools with worked convex edges found at the site would be ideal for this process, since they are small enough to maneuver between the bones to cut the connecting tendons. Choppers and edge-battered flakes may also have been used in the disjointing process.

The ethnographic Kalapuya cooked meat in a variety of ways. It could be stone-boiled in buckets made of bark or roots filled with water (Mackey 1974:43), roasted on hot coals or on spits, or steamed on hot
Fig. 5. Rock Feature and Fire Hearth.
Fig. 6. Tool Frequency Distribution.
rocks in an earth oven (Jacobs 1945:28, 188-89). Both boiling and steaming of meat would require heated rocks. Either process, or both, could account for the presence of the fire cracked rock at the site. Usually, repeated heating causes a rock to crack, since it is weakened by heat. The cracked rock would then be discarded, since it would no longer be of the proper size and shape for retaining heat. The quantity of fire-cracked rock seems too great to be attributed to a single short occupation, and either the site was returned to over several seasons or it was used intensively for a single period of time.

The baked clay lumps and areas of soil containing burned clay flecks found at the site (Fig. 4) may be a consequence of earth ovens, although none were found in the excavations. In the northeastern corner of the excavation below the fire hearth were three interspersed clusters of large fire-cracked rock that may have been removed from earth ovens. The fire hearth may have been used for roasting meat.

According to William Hartless, a Mary's River Indian, in ethnographic times dried meat was kept in baskets tied to the rafters of the winter houses, so it may have been processed for winter months when food was scarce. Meat to be preserved was cut up in slices and either sun-dried or dried by fire. Meat from large and small game animals, birds, fish, mussels, clams, and even whales was preserved (Mackey 1974:42, 43).

The only evidence, which is very slight, for this activity at the Beebe Site, is a single thin river cobble about 7-1/2 inches long. The modern butcher suggested that strips of meat could have been tightly wound around it to keep the meat from rotting, since bacteria will collect in the folds of unstretched sliced meat. The cobble has a slight polish around its edge; experimentation would be necessary to see if this could result from the use suggested.

**HUNTING**

Since materials for tool making were transported from the valley and since many of the tool types found at the site relate to hunting and butchering activities, it seems reasonable to infer that the inhabitants of the Beebe Site went there from valley floor locations primarily to hunt. The size and location of the site and the lack of grinding stones for processing vegetal foods also indicate a hunting emphasis. It seems likely that the few bulbs recovered from the site were brought from the valley floor.

According to Hartless, deer were hunted with bow and arrow and spears, or they were snared. The arrows had stone points for large
game; fire-hardened shafts were used for small game. Spears had larger points than arrows did (Mackey 1974:37-38, 43). Extrapolating from this ethnographic information, the manufacture of small points for arrows at the Beebe Site could imply an emphasis on the hunting of large game, such as deer and elk, in the surrounding hills.

SUMMARY AND CONCLUSIONS

Based on the similarity of its lithic materials to those found at sites on the floor of the valley, and on its proximity to the valley, there seems little reason to doubt that the Beebe Site was used by the Indians of the Willamette Valley. Hunting was probably a main purpose of traveling into the hills, although this may not necessarily be true of all valley edge sites. Tool making, woodworking, butchering, cooking meat, and possibly preserving meat are ancillary activities inferred from the cultural remains at this site. The amount of fire-cracked rock indicates that the site was used either for several seasons or intensively for a short period of time. Its size and the frequency of cultural remains argue for a relatively small group of people.

A cluster analysis of projectile points from nearby sites in the Willamette Valley placed the Beebe Site with the Lynch Site and with the most recent components of the Hurd Site (Follansbee and Reyna 1973; Henn, Mack, and Sanford, this volume). Radiocarbon dates from the later Hurd components and from the Lynch Site range from A.D. 700 to historic times (White, this volume; Sanford, this volume); it is likely that the occupation of the Beebe Site falls within the same time span. The charcoal from the site has not yet been radiocarbon dated.

White suggests that valley edge locations like the Beebe Site were most likely to have been occupied in late spring or summer, when heat and insects in the valley would have driven deer to the foothills. He also points out, however, that an advantage of the valley edge sites would be their location above the level of annual flooding which takes place in winter. From this it would follow that valley edge sites might have been occupied during all seasons of the year. Flooding would drive both people and animals to higher elevations, especially on those occasions when flooding was so extensive that one could canoe from the Coburg Hills to the foothills of the Coast Range (Smith 1925:144, cited in White, this volume). The season of occupation of the valley edge site cannot be assumed: it must be determined from the appropriate data at each site. Unfortunately such data are lacking at the Beebe Site.

The potential of small, single component sites like that reported here is often overlooked, since archaeologists have typically been
concerned with larger sites yielding longer occupational records. However, the small site that has been occupied for only a short time can be a mine of information if it is properly excavated and analyzed. Aspects of behavior can be inferred from these simple sites that would be much more difficult to derive from the data of a more complex site. In this respect, despite the unpretentiousness of the cultural remains at the Beebe Site, a good deal of insight has been gained into the behavior of its occupants.

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A COMPARISON OF TWO PREHISTORIC SITES IN LANE COUNTY, OREGON

BY

RICHARD M. PETTIGREW
In the summer of 1972 two University of Oregon graduate students, Winfield Henn and Richard Pettigrew, sampled several sites in the area of the southern Willamette Valley around Eugene, Oregon through limited excavations. Among these were the Simons Site and the Siuslaw Falls Site (Fig. 1). It was originally believed that these two sites would show little relationship to each other, in view of their apparent geographical and ecological dissimilarity: the Simons Site is located on the flood plain of the Willamette River, and the Siuslaw Falls Site at a cascade of the Siuslaw River in the Coast Range. After analysis of the cultural debris, however, the writer concluded that the data support placement of the two sites within one cultural sphere, as two aspects of a single annual round of activities. In the following pages the sites, the excavations, and the collections are described and compared with each other with the aim of demonstrating this cultural relationship.

SIMONS SITE (35 LA 116)

The Simons Site, first recorded by Michael Southard in July 1970, is located within one-half mile of the Coast Fork of the Willamette River, nearly in the center of the southwest quadrant of Section 50, Township 19 South, Range 2 West, Willamette Meridian. The site is on the property of Mr. E.A. Simons, less than 100 meters east of Bear Creek, a permanent stream which flows into the Coast Fork of the Willamette, and about the same distance north of an intermittent stream which flows westward into Bear Creek. The site is well within the aboriginal territory of the ethnographic Calapuya of the Willamette Valley.

The most obvious feature of the site is a low mound, about one meter above the surrounding surface, and approximately 40 meters in diameter. The area of cultural debris visible on the surface, however, is more extensive; it surrounds the mound and continues toward the north-northwest for approximately 100 meters, paralleling Bear Creek. In its gross physical aspects, this site is typical of valley floor sites in the southern Willamette Valley. It would fit into the category given the name Primary Flood Plain Sites by White (1974:42 and this volume). Contrary to White's generalization for such sites, however, and as described above, this site does have a mound.

The vegetation bordering the site on its south and west sides is typical of what Franklin and Dyrness (1973) call Quercus Woodland, in which Quercus garryana, the Oregon white oak, is the dominant tree. The site itself is part of an open plowed field.

A total of 5 one-meter squares was excavated, 4 in the mound itself and one in an area about 100 meters to the northwest where the
ground was littered with fragments of brick interspersed with aboriginal cultural debris (Figure 2). All five excavation units were oriented according to magnetic compass directions and excavated in 20 cm. levels, and in each case the only discernible differentiation in the deposit was that between the dark brown clayey silt containing cultural material and the sterile substratum, which varied from a reddish-brown gravel to a yellowish-brown silty clay.

Unit A, the first square excavated, was placed at the center and highest elevation of the mound. It was excavated to a depth of 82 cm. below the surface (measured from the southwest corner of the square), where a sterile substratum of brownish clayey silt mixed with rounded stream-laid reddish-brown gravel of pebble to cobble size was uncovered. The first level in this unit comprised the plow zone (about 20 cm. deep), a brown, compact soil with many basalt rocks. Below the first level the soil became looser and darker, with fewer but larger rocks.

Two cultural features were discovered in Unit A. The first was a cluster of fire-cracked angular basalt pebbles and cobbles mixed with charcoal fragments in the west central portion of the square. This feature extended into the west and southwest sidewalls of the square. It was found at a depth of 40-60 cm. below the surface. The second feature was a burial found below the level of the rock cluster. This feature first appeared as a pit in the eastern half of the square, filled with a darker and looser matrix than that surrounding it, and covered in part by the edge of the rock cluster, which extended to the west. The burial was uncovered at a depth of 72 cm. measured from the surface to the top of the cranium. It extended into the south sidewall of the excavation. The skull was lying on its right side facing southwest, the spine pointing northwest. The arms appeared to be flexed underneath the skull. The position of the legs could not be determined, as they were outside the perimeter of the square. The individual appeared to be older than adolescent, and it was not possible to determine its sex. There were no grave goods. The burial lay immediately on top of the sterile substratum.

Unit B was placed 20 meters north of unit A, measured from the southwest corners of each. Again, the first level was the plow zone, the soil turning darker and looser below it. One cultural feature was uncovered in Unit B: a cluster of fist-sized fire-cracked angular basalt cobbles in the southeast quadrant of the square at a depth of 45 to 80 cm. below the surface. The soil matrix of the cluster was quite hard and the deeper rocks of the cluster were smaller than those above them. Adjacent to the cluster, in the center of the square and in the northwest quadrant, was an area of loose, friable soil, possibly indicating the fill of an aboriginal pit. If it was a pit it was dug before the deposition of the rock cluster, since the edge of the cluster covered a portion of the loose soil.
Fig. 1. Location of Simons Site (right) and Siuslaw Falls Site (left).
Fig. 2. Sketch Map of 1972 Excavations at Simons Site.
In the fifth level of Unit B the sterile yellowish-brown silty clay substratum was encountered. The break between the cultural and sterile deposits was not pronounced, there being pockets of soft brown friable soil containing cultural debris intruding into the sterile substratum.

Unit C was located 20 meters south of Unit A, measured from the southwest corner of Unit A to the northwest corner of Unit C. The sterile substratum was encountered near the bottom of the first excavation level, in the form of the same reddish-brown gravel found at the bottom of Unit A. The top of the gravel varied in depth from 15 to 20 cm. below the surface. Since no elevations were taken with a transit or similar instrument it is impossible to say precisely how the elevations of the surface and the top of the gravel varied between Units A and C, but it appeared by sight that the gravel in Unit C was at a slightly higher elevation than in Unit A, though the surface of Unit C was lower than that of Unit A.

Unit D was the only square located in the area to the northwest of the main mound (Fig. 2). The surface surrounding Unit D was littered with large hand-made bricks, as well as a scatter of aboriginal artifacts. At about 20 cm. below the surface an extensive burnt area was encountered, with bricks inlaid into it. This feature appeared just below what was probably the plow zone, the color changing from lighter to much darker and the compaction from hard to friable. The small area excavated made it impossible to be certain, but the feature suggested that either a Euro-American brick structure had burnt to the ground here or we were excavating an early brick kiln. The second level exhibited a thin band of burnt orangish soil near its top, below which was a dark brown clayey silt. In this level a large, partially burnt tree root extended all the way across the unit. After excavating the second level in Unit D it appeared that the relatively low density of aboriginal cultural debris (Table 3) did not justify further excavation in the area, so we abandoned the square before encountering the sterile substratum and moved back to the main mound.

Unit E was placed 20 meters due east of Unit A, measured from the southwest corner of both. Because the field notes for this square have been lost, it is not possible to report on any features encountered, or the exact depth of the cultural deposit, beyond the fact that the sterile substratum appeared in the fourth level.
ARTIFACTS

Flake Tools

Bifacially Flaked Projectile Points

The projectile points from the Simons Site were classified according to the typology presented by White (this volume). Since only 6 specimens were collected, each will be described individually.

Specimen number A-1-16 (Fig. 3a): Type 1b. Obsidian. Length 1.4 cm., width 1.0 cm., thickness 0.2 cm. The very end of the tip is broken off and one corner is truncated slightly by unifacial retouch.

Specimen number D-2-4 (Fig. 3b): Type 3b. Obsidian. Serrated. Length 2.6 cm., width 1.3 cm., thickness 0.4 cm. Neck width 0.8 cm.

Specimen number A-1-15 (Fig. 3c): Type 7a. Cryptocrystalline silicate (CCS). Length ca. 1.7 cm., width 1.3 cm., thickness 0.2 cm. Neck width 0.4 cm.

Specimen number B-1-24 (Fig. 3d): Type 7a. Obsidian. Length 1.5 cm., width 1.2 cm., thickness 0.3 cm. Neck width 0.4 cm.

Specimen number A-1-18 (Fig. 3e): The closest type in White's typology is Type 10, but this specimen has more a wide corner-notch than a base notch. CCS. Length ca. 2.4 cm., width approx. 1.8 cm., thickness 0.4 cm. Neck width 0.5 cm.

Specimen number D-2-7 (Fig. 3f): Type 14a. Obsidian. Thickness 0.4 cm., neck width 1.0 cm. Only the stem portion is present.

Other Bifacially Flaked Tools

Only one other bifacially flaked artifact is complete. Specimen number Surface-28 (Fig. 3g) is a rather short, bluntly pointed obsidian biface. It is rather thick, with a broad base having a portion of rounded pebble cortex still remnant. Length is 2.3 cm., width 1.9 cm.,

Fig. 3 (opposite page). Artifacts from the Simons and Siuslaw Falls Sites. a-j, from Simons Site; k-y, from Siuslaw Falls Site. a-f, projectile points; g, biface; h, uniface cobble chopper; i-j, cores; k-v, projectile points; w, drill or graver; x, pièce esquillée; y, type 5 uniface, worked edge down.
thickness 0.6. In addition, there are three bifacially flaked tip fragments, two of CCS and one of obsidian; one thick, pointed, broken biface of CCS; and three bifacial fragments of uncertain original configuration, all of CCS.

Unifacially Flaked Artifacts

A large proportion of the flake tools from the Simons Site are unifacially flaked, and they numerically dominate the artifact inventory. They have been classified according to the configuration of the flaked edge rather than according to traditional categories such as 'end scraper' and 'side scraper.' Classifying by type of edge seems to allow a more precise way of describing these artifacts, because many of them have two or more types of flaked edge.

The edge types are defined as follows (see Fig. 4):
1. incurvate edge
2. straight edge
3. excurvate edge
4. edge pointed by the intersection of two edges flaked on the same face
5. excurvate edge on the end of a flake, polished from use (resembles the 'end scraper' edge configuration)
6. edge pointed by the intersection of a flaked with an unflaked edge, showing use at the point (distinguished from simple broken unifaces by the presence of minute use scars or polish at the point).
7. notched edge (single notch)
8. edge pointed by the intersection of two flaked edges flaked on opposite faces
9. double-notched edge (notches immediately adjacent to one another)

The unifacially flaked tools are listed in Table 1 according to the edge types described above. Besides those listed in Table 1, there were two CCS specimens too fragmentary to classify.

Cobble Tools

Flaked Cobbles

Flaked cobbles are the second most frequent artifact type at the site (Fig. 3h). There are 12 specimens, all unifacially flaked. Their sizes range as follows: length from butt to bit, 4.7-11.4 cm.; width across the worked face, 6.7-9.2 cm.; thickness 3.3-6.1 cm. Edge
Fig. 4. Unifacially Flaked Edge Types, Simon and Siuslaw Falls Sites.
<table>
<thead>
<tr>
<th>Edge Type(s)</th>
<th>Frequency</th>
<th>Frequency by Material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CCS</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
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<tr>
<td>3</td>
<td>2</td>
<td>2</td>
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<td>6</td>
<td>3</td>
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<tr>
<td>6</td>
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<td>8</td>
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<td>9</td>
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<tr>
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<td>1</td>
</tr>
<tr>
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<td>1</td>
</tr>
<tr>
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<td><strong>62</strong></td>
<td><strong>48</strong></td>
</tr>
</tbody>
</table>

Table 1. Frequency Distribution of Unifacially Flaked Flake Tools from the Simons Site, by Edge Types and Raw Material.
<table>
<thead>
<tr>
<th>Number of Platforms</th>
<th>CCS</th>
<th>Obsidian</th>
<th>Basalt</th>
<th>Total Frequency</th>
<th>Dimensional Range</th>
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<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>length 2.8-9.1 cm. width 2.2-7.4 cm. thickness 0.8-4.4 cm.</td>
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<tr>
<td>2</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>9</td>
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<td>6</td>
<td>0</td>
<td>0</td>
<td>6</td>
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<td>4</td>
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<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>length 2.9-8.7 width 2.6-7.3 thickness 1.2-4.4</td>
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<td>1</td>
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<td><strong>22</strong></td>
<td><strong>4</strong></td>
<td><strong>3</strong></td>
<td><strong>29</strong></td>
<td>length 2.4-9.1 width 1.7-7.4 thickness 0.8-4.4</td>
</tr>
</tbody>
</table>

Table 2. Cores from the Simons Site, by Number of Striking Platforms, Frequency by Raw Material, and Range of Metrical Dimensions (in cm.).
configurations are generally excursive, and 6 specimens have sharp
denticulate-like projections on the flaked edge. All are made from
rounded or subrounded cobbles or cobble fragments, and, except for one
of quartzite, are of hard igneous stone. All specimens show edge wear
in the form of rounding and polishing, percussion crushing, or both.

Cores

A total of 29 cores were collected. There are described in Table
2 according to the number of striking platforms visible on each specimen,
the raw material and the ranges of length, width, and thickness for
specimens of a given number of striking platforms. Of these cores,
none could be described as having produced special sorts of flakes such
as blades or Levallois flakes. As can be seen in Table 2, most
specimens are of polyhedral (Fig. 31).

The 4 obsidian cores listed in Table 2 are all made on split
rounded obsidian pebbles (Fig. 3j). Their dimensions range as follows:
length 2.4-2.9 cm., width 1.7-2.0 cm., thickness 0.9-1.1 cm. These
pebbles were split by bipolar percussion, and split obsidian pebbles of
this kind are commonly found in Willamette Valley prehistoric sites. It
seems reasonable to surmise that, since none of the flaked obsidian in
the site is significantly larger than these split pebbles, the major
source of obsidian for the inhabitants was the local streams, which
commonly contain obsidian pebbles.

Clay Chunks and Concretions

Six consolidated chunks made of clay-sized particles are included
in the site assemblage. One appears to be sun-dried, with impressions
of reed like fibers or sticks; another is an irregular chunk with two
impressions of sticks or reed-like fibers. A third is simply an irregular
chunk with no impressions, and two more are small rounded concretions
or clay pellets. Finally, there is one small piece of a substance
resembling talc which has a perfectly flat use facet on one edge.

Flake Detritus

A total of 1785 pieces of detritus, both flakes and chunks, was
collected. Their distribution by excavation unit and level is illustrated
in Table 3, along with a count of obsidian vs. nonobsidian flakes. The
detritus count is a good measure of the density of cultural debris in any
level and excavation unit, and may be used as a measure of prehistoric
cultural activity in various parts of the site.
<table>
<thead>
<tr>
<th>Excavation Unit</th>
<th>Level</th>
<th>Non-obsidian</th>
<th>Obsidian</th>
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<tr>
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<tr>
<td>Total</td>
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<td>1579</td>
<td>206</td>
<td>1785</td>
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</table>

Table 3. Flake Detritus Count for Simons Site, by Excavation Unit, Level and Raw Material.
SIUSLAW FALLS SITE (35 LA 173)

The Siuslaw Falls Site, recorded by Thomas Olsen in July 1971, is located at Siuslaw Falls, on the north bank of the Siuslaw River, in the SW 1/4 of the SW 1/4 of Section 1, Township 20 South, Range 6 West, Willamette Meridian. The site itself is within the confines of Siuslaw Falls County Park, which is administered by Lane County. The elevation of the river at the falls is about 555 feet above sea level.

The greater part of the cultural debris visible on the surface is on a rise overlooking the falls. The rise has a rather flat top, about 10 meters higher than the rocks over which the waters of the river cascade, and may be an ancient river terrace. Below the rise is a rather steeply sloping bank, at the bottom of which is a narrow shelf, inundated at high water. Cultural debris can also be found on the bank and on the narrow shelf.

Siuslaw Falls is approximately 90 miles upstream from the mouth of the Siuslaw River where it empties into the Pacific Ocean near Florence, and represents the greatest obstacle to the progress of migrating anadromous fishes on this river. While there are many rapids downstream from the falls, none of them are large enough to even slow down these fishes, but the falls, while passable, impede the fish to such an extent that the State of Oregon in 1972 constructed a small fish ladder to assist them. Thus it seems that the falls are, and would have been in the past, one of the best places on the entire river to take anadromous fish. Four species of salmonids can be found in the Siuslaw: Chinook (Oncorhynchus tshawytscha), silver (O. kisutch), chum salmon (O. keta), and steelhead trout (Salmo gairdneri).

Strictly speaking, Siuslaw Falls is located on the west slope of the Coast Range. However, the area is 40 miles, as the crow flies, from the ocean and shielded from the greater part of the precipitation common to the west slope by the most massive and highest part of the Coast Range, which is west of Siuslaw Falls. Thus the area may be considered transitional between the Tsuga heterophylla Forested Zone, associated with the Coast Range, and the Interior Valleys Zone, in which the Douglas fir (Pseudotsuga menziesii), is the most common tree (Franklin and Dyrness 1973:116) species. The site itself is covered by a canopy of Douglas fir, and in uncleared areas of the vicinity the understory is dominated by hazel (Corylus cornuta var. californica). Adjacent to the site, vine maple (Acer circinatum) and bigleaf maple (A. macrophyllum) are common, and occasional specimens of western hemlock (Tsuga heterophylla) and western red cedar (Thuja plicata) are visible. The banks of the Siuslaw River adjacent to the site are dominated by red alder (Alnus rubra).
In addition to the fact of its transitional environment, the site may have been transitional also in terms of aboriginal cultural territories. The site could have been utilized by any of three cultural groups: the Calapuya of the Willamette Valley to the north and east, the Upper Umpqua Athabascans of the upper Umpqua River to the south, and the Siuslaw of the lower Siuslaw River and adjacent coastline to the west.

One might suppose it most likely that the site would be considered the territory of the coastal group, since the river would be a natural corridor between the lower Siuslaw and this very desirable fishing spot. To test the validity of this assumption, the author, in April of 1974, set off in a canoe from Siuslaw Falls with the intention of travelling the 90 miles to Florence. After two days of very difficult canoeing over log jams, ever and under large fallen trees, and through a multitude of tricky rapids, the canoe had only moved about 30 miles downstream and the project was abandoned as impractical. Faster progress would have been made on foot. The river is in many places very shallow, almost too shallow for canoes in April and certainly too shallow in the lower water of the later months of the year. Based on this experience, it would seem that Siuslaw Falls should properly belong within the territories of either the Calapuya or the Upper Umpqua, more likely the Calapuya because of their closer propinquity (streams of the Willamette River drainage head within 7 miles of Siuslaw Falls).

Four one-meter squares were excavated, all in the main portion of the site at the top of the rise or terrace (Fig. 5). Only two zones were defined: Zone A, a dark greyish-brown loam rich in humus, roots and aboriginal cultural debris; and Zone B, a yellowish-orange clayey silt with no humus or cultural debris. Excavation proceeded in arbitrary 20 cm. levels.

Unit A was dug into a shallow depression (ca. 4 m. in diameter) that was suggested in the original survey report to be a possible house pit. The unit was placed directly in the center of the depression, and it was expected that if this was indeed the remnant of a house structure, a house floor and/or a hearth would be encountered. Neither was found. Zone B was encountered only 10-15 cm. below the surface, and the interface between the two zones was obscured by some intermixing. Very little cultural debris was collected. It is suggested that this depression, as well as the others present at the site, were left by large trees which either fell over or were dug when the Siuslaw Falls County Park was first developed.

The Zone A fill in unit B was considerably darker than that in Unit A, though of the same consistency. Cultural debris was very dense in this unit. The interface between Zones A and B was very irregular.
Fig. 5. Sketch Map of 1972 Excavation at the Siuslaw Falls Site.
The deepest Zone A fill reached 87 cm, below the surface, while the shallowest reached only 40 cm. There were many holes and pits intruding into Zone B, filled with Zone A material. While all of these holes and pits contained numerous bits of charcoal, obsidian flecks and bits of bone, they were not judged distinct enough, nor were they well enough patterned, to be called cultural features. More likely, they were caused by the intrusion of large tree roots and rodent burrows into Zone B.

In Unit B, 20 cm. levels were adhered to rigidly for the first two levels, but in level 3, in which the irregular bottom of Zone A was encountered, we lumped all of the material found below 40 cm. into level 3, including material found as deep as 87 cm. Most of the cultural debris found, however, was above 60 cm. with only the fill of the largest pit falling below that level.

Unit C was the most nearly sterile of the four excavated squares, and here, as in Unit A, Zone B was encountered in level 2. Scattered charcoal chunks in the first level were denser than average for the site, but this phenomenon was not associated with a similar density of cultural debris. The second 20 cm. level was dug only in the western half of the square. The northwest quarter of the square in this level was very clayey for Stratum A fill, and it was mixed with fired earth and charcoal. The southwest quarter of the square in level 2 was not as clayey, and was mixed with large pieces of charcoal. Because no cultural debris was associated with this firing, it was judged to be the result of a natural phenomenon such as a forest fire. Zone B in Unit C was of a slightly different color than in the other units: not as reddish, and more gray. The interface between the two zones sloped down from south to north, sloping from 25 cm. below surface in the southwest corner to 60 cm. in the center of the western half of the square. The southwest quarter was dug to this interface, but the northwest quarter was dug only to a uniform 30 cm.

Unit D had the densest deposit of cultural debris of any excavated square. The first two levels were excavated completely, and level 3 was 90% complete before lack of time forced us to backfill the square and abandon the excavation. Zone B was not reached in this unit, although near the bottom of level 3 the soil color changed from dark grayish-brown to a yellowish-brown.
ARTIFACTS

Flake Tools

Bifacially Flaked Projectile Points

The projectile points from Siuslaw Falls were classified according to the typology of White (this volume). There are 12 specimens, 9 of which fit easily into White's typology.

Type 2a: specimen B-2-5 (Fig. 3k). Obsidian. Length approx. 1.4 cm., width 1.5 cm., thickness 0.3 cm. Neck width 0.5 cm. The stem is broken, and since type 2a points are defined as having straight stems, placement in type 2a is tentative.

Type 7a included 4 specimens, with dimensions as follows:
Specimen D-1-11 (Fig. 31): CCS. Length 1.7 cm., width approx. 1.8 cm., thickness 0.3 cm. Neck width 0.5 cm.
Specimen D-2-12 (Fig. 3m): Obsidian. Length 1.9 cm., width approx. 1.8 cm., thickness 0.3 cm. Neck width 0.5 cm.
Specimen D-1-10 (Fig. 3n): Obsidian. Length 1.4 cm., width approx. 1.3 cm., thickness 0.2 cm. Neck width 0.4 cm.
Specimen B-1-8 (Fig. 3o): CCS. Serrated. Length approx. 2.0 cm., width approx. 1.2 cm., thickness 0.3 cm. Neck width 0.4 cm.

Type 8a included 2 specimens, with dimensions as follows:
Specimen C-2-3 (Fig. 3p): Obsidian. Serrated. Length 1.8 cm., width approx. 1.3 cm., thickness 0.2 cm. Neck width 0.5 cm.
Specimen B-1-6 (Fig. 3q): CCS. Length 2.3 cm., width 1.4 cm., thickness 0.4 cm. Neck width 0.5 cm.

Type 8b: specimen A-1-4 (Fig. 3r): Basalt. Serrated. Length 2.1 cm., width 1.2 cm., thickness 0.4 cm. Neck width 0.5 cm.

Type 10: specimen A-1-10 (Fig. 3s): Obsidian. Serrated. Length 2.2 cm., width approx. 1.4 cm., thickness 0.4 cm. Neck width 0.4 cm.

There are three projectile points which do not easily fit White's typology:

Specimen D-1-9 (Fig. 3t): This would be White's Type 8, but its length of approx. 3.6 cm. is greater than the upper limit for Type 8 of 3.4 cm. Obsidian. Width 1.7 cm., thickness 0.4 cm. Neck width 0.8 cm.
Specimen D-2-11 (Fig. 3u): This would be White's Type 12, but its stem is contracting rather than rectangular. Obsidian. Length 4.5 cm., width 2.1 cm., thickness 0.7 cm. Neck width 1.2 cm.

Specimen B-3-5 (Fig. 3v): This would be White's Type 14a, but its stem is straight rather than diverging. CCS. Length 3.1 cm., width 1.5 cm., thickness 0.6 cm. Neck width 0.9 cm.

Other Bifacially Flaked Tools

Only one bifacially flaked tool other than projectile points is complete. This specimen, B-1-11 (Fig. 3w), consists of a bifacially flaked triangular projection made on the distal end of an obsidian flake and resembles a drill or graver. The dimensions of the flaked projection are as follows: length 0.7 cm., width 0.8 cm., thickness 0.2 cm. The flake itself is 2.2 cm. long, 1.6 cm. wide and 0.4 cm. thick.

In addition to this there are 7 fragments of bifaces. Four of these are biface tips, three of which are of obsidian and one of CCS. Their thickness varies from 0.5 cm. to just over 0.8 cm. Three biface fragments are edge portions, all made of CCS. One of these consists of an excurvate bifacially flaked edge on the distal end of a broad flake. The width of the flaked edge is 2.9 cm.

Unifacially Flaked Tools

The 17 artifacts which fit into this category are described in Table 4 according to the edge typology defined above. The table also gives chord length measurements for those specimens with Type 5 edges. 'Chord length' refers to the direct distance between the extreme right and left ends of the flaked edge.

Cobble Tools

Cores

There are 4 core specimens, all made of CCS. One specimen, B-2-3, has only one platform, and its dimensions are: length 4.0 cm., width 3.5 cm., thickness 1.8 cm. Three specimens, B-3-6, B-3-7, and D-2-8, have three platforms. Their dimensions range as follows: length 2.1-2.9 cm., width 1.5-2.6 cm., thickness 0.9-2.0 cm.
Hammerstones

Two specimens are classified as hammerstones because they show use as hard percussors. Specimen D-2-3 is a large basalt flake (length 10.4 cm., width 4.9 cm., thickness 3.0 cm.) struck off a rounded cobble. At one edge of the flake (the original face of the cobble tool) is a flat polished facet. At the proximal end of the flake (the base or edge of the cobble) is a battered end surface. The flake was struck off the battered end by hard percussion. The other specimen, D-2-4, is a chunk of hard basalt, with some cortex from the original cobble showing that it was subangular and that at one end or corner it was used as a percussor. There is heavy battering wear present on one portion of the cortex. The dimensions are: length 6.5 cm., width 3.8 cm. and thickness 3.7 cm.

Pieces Esquilles

One specimen, D-1-14, fits into this category as described by MacDonald (1968:85-90). It differs from most such specimens, however, in that the secondary edge is pointed rather than straight, so the specimen takes the form of a triangle instead of a rectangle in plan view (Fig. 3x). This specimen has another bipolar direction perpendicular to the first one described, with the primary and secondary edges running at an angle to each other rather than parallel. The specimen is 3.2 cm. long, 2.6 cm. wide, and 0.7 cm. thick. It is made of CCS. This is the first specimen of this artifact class described for Western Oregon. However, it is suspected that other specimens exist, so far unnoticed, in other Western Oregon collections.

Flake Detritus

A total of 465 pieces of detritus, both flakes and chunks of flaked stone, were collected. Their distribution by excavation unit and level is shown in Table 5, which also includes a count of non-obsidian and obsidian specimens. The detritus count gives a measure of the density of cultural debris in any unit and level, and may be used as a measure of the intensity of aboriginal activity.

FAUNAL AND FLORAL REMAINS

In all excavated squares bits and pieces of bone was found, most of which was charred. The vast majority of the specimens which
<table>
<thead>
<tr>
<th>Specimen Number</th>
<th>Edge Type</th>
<th>Material</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface-la</td>
<td>1</td>
<td>CCS</td>
<td></td>
</tr>
<tr>
<td>D-3-5</td>
<td>2</td>
<td>CCS</td>
<td></td>
</tr>
<tr>
<td>D-1-5</td>
<td>3</td>
<td>CCS</td>
<td>Fragmentary. Serrated edge.</td>
</tr>
<tr>
<td>D-3-7</td>
<td>3</td>
<td>CCS</td>
<td>Fragmentary.</td>
</tr>
<tr>
<td>Surface-l</td>
<td>4</td>
<td>Obsidian</td>
<td></td>
</tr>
<tr>
<td>C-2-2</td>
<td>4</td>
<td>CCS</td>
<td></td>
</tr>
<tr>
<td>B-3-3</td>
<td>5</td>
<td>CCS</td>
<td>Chord length 1.6 cm.</td>
</tr>
<tr>
<td>B-3-4</td>
<td>5</td>
<td>CCS</td>
<td>Chord length 1.4 cm.</td>
</tr>
<tr>
<td>D-1-7</td>
<td>5</td>
<td>CCS</td>
<td>Chord length 1.7 cm. Fragmentary.</td>
</tr>
<tr>
<td>D-3-2</td>
<td>5</td>
<td>CCS</td>
<td>Chord length 2.9 cm.</td>
</tr>
<tr>
<td>D-3-3</td>
<td>6</td>
<td>CCS</td>
<td></td>
</tr>
<tr>
<td>D-1-12</td>
<td>8</td>
<td>CCS</td>
<td></td>
</tr>
<tr>
<td>D-2-6</td>
<td>8</td>
<td>CCS</td>
<td></td>
</tr>
<tr>
<td>B-3-8</td>
<td>3,6</td>
<td>CCS</td>
<td></td>
</tr>
<tr>
<td>D-2-10</td>
<td>6,6,7</td>
<td>Obsidian</td>
<td></td>
</tr>
<tr>
<td>D-1-8</td>
<td>1,2,4,6</td>
<td>CCS</td>
<td>Made on lamellar flake. Both edges flaked, and burinated at termination of one edge.</td>
</tr>
<tr>
<td>A-1-3</td>
<td>1,2,6,7,7</td>
<td>CCS</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Unifacially Flaked Flake Tools from Siuslaw Falls by Specimen Number, Edge Type and Raw Material.
<table>
<thead>
<tr>
<th>Excavation Unit</th>
<th>Level</th>
<th>Non-obsidian</th>
<th>Obsidian</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>69</td>
<td>13</td>
<td>82</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>50</td>
<td>5</td>
<td>55</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
<td>32</td>
<td>6</td>
<td>38</td>
</tr>
<tr>
<td>B</td>
<td>Total</td>
<td>151</td>
<td>24</td>
<td>175</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>C</td>
<td>Total</td>
<td>6</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
<td>83</td>
<td>1</td>
<td>84</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td>90</td>
<td>15</td>
<td>105</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>67</td>
<td>10</td>
<td>77</td>
</tr>
<tr>
<td>D</td>
<td>Total</td>
<td>240</td>
<td>26</td>
<td>266</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>407</td>
<td>52</td>
<td>459</td>
</tr>
<tr>
<td>Surface</td>
<td></td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>411</td>
<td>52</td>
<td>465</td>
</tr>
</tbody>
</table>

Table 5. Flake Detritus Count, Siuslaw Falls Site, by Excavation Unit, Level and Raw Material.
were large enough to be recognizable were mammal bone. Only one specimen was diagnostic, and it was a fragment of a deer cannon bone.

Only one certain fish bone was found, a vertebra which is large enough to be that of a salmonid, although that ascription is uncertain. It occurred in Unit B, level 2.

The only floral material recovered was one carbonized fragment of a hazelnut (*Corylus cornuta* var. *californica*), found in Unit D, level 3.

CONCLUSION

The Simons and Siuslaw Falls Sites are clearly different in terms of their artifact assemblages (see Fig. 6) as well as in their ecological and geographical situations. A comparison of the two sites, however, need not be based on the assumption that the inhabitants of the two sites were culturally distinct. In fact, a very good case can be made for the assertion that both sites were utilized by Willamette Valley (presumably Calapuyan) groups.

As Figure 6 shows, there is little similarity between the two assemblages in terms of the percentages of major artifact categories. In both sites flake unifaces are the most frequent artifact category, but a $\chi^2$ comparison of the total assemblages of both sites gives a value of $P$=less than 0.01, showing that the two are very significantly different.

Notwithstanding the overall dissimilarity of the two assemblages, stylistic data from the two sites suggest that the difference between them is ecological rather than cultural. For this kind of evidence we rely on the projectile points. Not only is White's (1974) typology generally adequate to describe the points from both sites, but their distribution by type (Table 6) is not sufficiently different to support a hypothesis that the two collections are culturally distinct. A $\chi^2$ comparison test gives a $P$ value between 0.30 and 0.50, indicating that the two point collections are not significantly different, hence could represent the same cultural tradition.

<table>
<thead>
<tr>
<th>Type</th>
<th>Simons</th>
<th>Siuslaw Falls</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 6. Projectile Point Frequency by Type, Simons and Siuslaw Falls Sites.
<table>
<thead>
<tr>
<th>Category</th>
<th>Simons Site</th>
<th>Siuolaw Falls Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projectile Points</td>
<td>5.3</td>
<td>27.9</td>
</tr>
<tr>
<td>Other Flake Bifaces</td>
<td>3.5</td>
<td>18.6</td>
</tr>
<tr>
<td>Flake Unifaces</td>
<td>54.9</td>
<td>39.5</td>
</tr>
<tr>
<td>Flake Cobblees</td>
<td>10.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Hammerstones</td>
<td>0.0</td>
<td>4.7</td>
</tr>
<tr>
<td>Cores</td>
<td>25.7</td>
<td>9.3</td>
</tr>
</tbody>
</table>

Fig. 6. Histogram Comparison of Artifact Assemblages from the Simons and Siuolaw Falls Sites, excluding Clay Chunks, Concretions, and Pieces Esquillees.
Fig. 7. Histogram Comparison of Uniface Edge Type Percentages, Siuslaw Falls Sites, and Simons Falls Sites.
Assuming, then that the two sites differ primarily in terms of their functions rather than culturally, what do the assemblages tell us about these functions? Here the differences between the two tool assemblages are very illuminating, for the contrast between the two supports the hypotheses one would develop by considering only the ecological settings of the two sites.

The setting of the Simons Site, with its access to large bodies of water, woodland and prairie would provide opportunities for the exploitation of a wide variety of resources, and would allow the site to be used for many different purposes, such as hunting of land animals and waterfowl, fishing, the collection of vegetable foods and raw materials, and maintenance activities. The setting of the Siuslaw Falls Site, by contrast, suggests more limited exploitation. The Siuslaw Falls environment, basically a humid forest, has considerably less biotic diversity than that of the Simons Site, and the availability of waterfowl and vegetable foods and raw materials is thus much less. The environmental advantages of the Siuslaw Falls area are clearly the presence in fair quantity of large land mammals, particularly elk and deer, and of salmonid fishes. The remains of both cervids and salmonids were found at the site. One would think, then, that the site should have been used as a seasonal hunting and fishing camp.

The data presented in Figure 7 support this hypothesis. While at both sites flake unifaces represent the most frequent artifact class, projectile points take on far more relative importance at Siuslaw Falls than at the Simons Site. At the former site they are the second most frequent artifact class, while at the latter they are only a distant fourth. A similar difference is seen in the category "other flake bifaces," which are most often considered to be cutting implements. Also to be noted is the difference in the 'flaked cobble' category. There are no flaked cobbles at Siuslaw Falls, but they are third in frequency at the Simons Site. It would appear that whatever activity is associated with the flaked cobbles (preparation of vegetable fibers?) was not being carried on at Siuslaw Falls.

The high frequency of both projectile points and cutting tools at Siuslaw Falls supports the hypothesis that the site was used as a hunting and fishing camp, and the presence of flaked cobbles at the Simons Site supports the hypothesis that it was used for a broader range of activities than was the Siuslaw Falls Site. Beyond this, there is a notable difference between the two sites in the relative frequency of cores. This suggests that stone flaking was a more important activity at Simons than at Siuslaw Falls and that, while flaked stone tools may have been made at Simons, they were more often carried in to Siuslaw Falls after manufacture elsewhere. This hypothesis is further supported by a difference in the relative frequency of flaked stone detritus at the two sites. The density of detritus from the excavated squares at Siuslaw Falls was 286 pieces per cubic meter excavated, while at the Simons Site, the density was 561 pieces per cubic meter. Even more
revealing in this connection is the fact that the ratio of detritus to flaked stone artifacts at the Simons Site is 15.8 to 1, whereas at Siuslaw Falls it is only 10.6 to 1.

Further support for the hypothesis that Siuslaw Falls was a site specialized at least in part for hunting is found in the difference between the two sites in the configuration of uniface edge type frequencies, shown in Figure 7. Here it can be seen that the two sites display different patterns; a $X^2$ comparison test gives a value of $P=0.10$, which suggests that the two collections are significantly different. The greatest percentage difference between the two sites is in the type 5 edge category (Fig. 3y), often given the name 'end scraper.' A $X^2$ comparison test of the type 5 edge frequencies yields a value of $P<0.01$, showing that there is a significant difference between the two collections in the proportion of Type 5 edges. End scrapers are generally considered to be tools used in hide scraping, an activity preparatory to hide tanning, and an activity one would expect to be carried on frequently at a hunting camp.

The hypothesis receives yet additional support from the presence at Siuslaw Falls of a specimen of pieces esquillees. According to MacDonald (1960:88-90), the most likely function of these tools is to split, slot or groove bone and/or wood. If this is the case, then it would be expected that these tools would be relatively more common at hunting camps, where the working of bone and antler would especially be carried on, than at sites used for other purposes. While the presence of one specimen at Siuslaw Falls is hardly a large enough sample upon which to base much of a case, it nonetheless fits with the hypotheses described above.

Since no radiocarbon analysis has been done on the charcoal samples collected from either of the two sites, there is little upon which to base estimates of chronology. The projectile point samples taken are not large enough to permit seriation, but the types of points collected suggest that the major occupation of both sites took place before about 500 years ago and after about 3000 years ago. The first limit is based upon the absence of what are considered to be very late points, such as the small side-notched types, and the second limit upon the absence of earlier points such as the Cascade and large side-notched types.

**SUMMARY**

The Simons and Siuslaw Falls Sites were sampled by a University of Oregon crew. The former site is located on the floodplain of the Willamette River and the latter at the major falls of the Siuslaw River, in a zone intermediate between the Willamette Valley and the Coast Range.
The recovered data support the following hypotheses concerning the use and relationship of the two sites:

1. Both sites were utilized by groups culturally affiliated with the Willamette Valley, presumably the ancestors of the ethnographic Calapuya.

2. The two sites were used for distinctly different purposes in an annual round of economic activity:

   a. The Simons Site was probably used for many different activities, including the hunting of land animals and waterfowl, fishing, the collection of vegetable foods and raw materials, and maintenance activities.

   b. The Siuslaw Falls Site was used more specifically as a camp for fishing, especially for salmonid fishes, and for hunting, especially for deer and elk.

REFERENCES

Franklin, Jerry F. and C.T. Dyrness

MacDonald, George F.

White, John R.
THE INDIAN RIDGE SITE, LANE COUNTY, OREGON

BY

WINFIELD HENN
The Indian Ridge Site lies within the McKenzie River drainage of the Western Cascades, approximately 45 miles east of Eugene, Oregon. Located approximately two miles north-northwest of Indian Ridge Lookout (SE 1/4 of SE 1/4 of Section 1, Township 18, Range 4 East of Willamette Meridian), site 35 La 194 is situated at the headwaters of Penny Creek—a spring fed stream that flows into the south fork of the McKenzie River. The site lies at an elevation of about 4800 feet on a shelf of land a few hundred feet east of and below the northern end of Indian Ridge.

According to Walter Wentz of Eugene, Oregon, who reported the site in 1971, long-time residents of the nearby town of Blue River say that the site was in use as late as the 1920's by Indians from Warm Springs Reservation in eastern Oregon. Apparently, the area was used in the autumn for collecting huckleberries and hunting deer. Aboriginally, site use was likely seasonal also, since snow is deep in the winter; local logging roads are open only after early July and closed after September.

In the general vicinity of the Indian Ridge site the vegetation is that characteristic of the Mountain Hemlock Forest zone. The co-dominant trees are mountain hemlock and the Pacific silver fir. Also present are the white fir and Alaska cedar. On the western side of the ridge, Douglas fir becomes dominant at the same elevation. The most common shrub at the site is thinleaf huckleberry. Also abundant is beargrass. Both of these plants were apparently used aboriginally.

The site was investigated as part of a program of research on Upper Willamette Valley prehistory. Specifically, Indian Ridge was tested because it might provide data on seasonal use of high altitude resources. The work was done by a crew of three from the University of Oregon, consisting of Winfield Henn, Richard Pettigrew, and Al Williams. The dates of excavation were July 24 to July 27 and July 29 to August 4, 1972.

**EXCAVATIONS**

Eight test pits were placed in the site, scattered so as to avoid trees and to sample apparent midden concentrations (Fig. 1). Six of the test pits were one meter square, and two—Units F and H—were two meters on a side. Excavation was conducted by arbitrary 20 cm. levels, and proceeded to bedrock which varied from 20 cm. to 130 cm. in depth. Midden was removed with shovel and trowel and passed through one-quarter-inch mesh screen. In addition to artifacts, all bone and debitage were collected, as well as soil and pollen samples.

Generally speaking, the stratification revealed in all units was similar. The artifact bearing stratum was light to dark brown
friable soil, with scattered flakes and charcoal. In units A, C, D, F, and G, this deposit was relatively shallow—less than 40 cm. in thickness. In these units the basal—and sterile—stratum consisted of a weathered bedrock or large boulders. In most of the units with a deeper midden deposit—units B, E, and H—the basal stratum differed. Here at the base of the midden at a depth of about 70-80 cm., was a deposit of clay ranging in color from reddish brown to light brown or yellow. Within the midden deposit itself there was no apparent stratification.

No evidence was encountered of any substantial dwelling or structure. However, in Unit G (Fig. 1), two apparent post-holes were exposed, approximately 8 cm. and 13 cm. in diameter respectively. Both were about 20 cm. deep and covered by a layer of charcoal. No house floor was observed in association with the post-holes, nor were any concentrations of artifacts or debitage found. The holes suggest the construction of a temporary, perhaps brush, shelter.

In Unit B (Fig. 1) at a depth of about 10 cm. below the surface, there was evidence for a historic period campfire, as suggested by burned earth, charcoal, burned bone, and numerous historic artifacts.

SPECIMENS

PROJECTILE POINTS

Type I (n=9; Fig. 4a-4b)

Exclusively made of obsidian, points of this type have a teardrop-shaped outline. They are predominately pressure flaked, often showing a finely serrated edge. Average length is 43 mm. (range 40-45 mm.); average width is 24 mm. (range 22-26 mm.); and average thickness is 5 mm. Vertical distribution of the type is shown in Fig. 2.

Type II (n=2; Fig. 4c)

Represented by only one fragmentary specimen, this type is characterized by a corner-notched base and expanding stem. It is made of obsidian. Also diagnostic is its small size. Estimated width is 16 mm.; length 18 mm.; and thickness 3 mm. It was found in level 1.
Figure 1. Indian Ridge site excavation units.
Type III \((n=1; \text{Fig. } 4d)\)

Also represented by only one point, this type has wide side-notches and a slightly convex base. It is made of grey chert. Length is 40 mm., width 25 mm., and thickness 6 mm. It was found in level 2.

Type IV \((n=2; \text{Fig. } 4e)\)

These small, rather stubby points have slightly sloping tips, both of which are broken. The form of the tips suggests that these artifacts may have functioned as drills or gravers rather than projectile points. Both are obsidian. The two are 23 and 25 mm. in length respectively; both are 14 mm. wide and 7 mm. thick.

Type V \((n=3; \text{Fig. } 4f)\)

This type is composed of one complete and two fragmentary specimens. The form is ovate with a tapering butt. Two specimens are obsidian; one is red jasper. The length of the one complete specimen is 35 mm. The average width is 22 mm., and the average thickness is 7 mm. (range 6-8 mm.).

Type VI \((n=1; \text{Fig. } 4g)\)

This type is represented by a single broken specimen. Diagnostic attributes are its square base, ground edges, and ribbon flaking. Estimated length is 45 mm.; width is 20 mm., and thickness 5 mm.

Type VII \((n=2; \text{Fig. } 4h)\)

Both specimens of this type are reddish-brown chert. Triangular in shape and small, the bases are slightly convex. Lengths are 23 mm., widths 18 mm., and thicknesses 5 mm.

Unclassified Point Fragments \((n=22; \text{not figured})\)

Of these point fragments, 5 are of chert and 17 are of obsidian. Three are basal fragments, 4 are medial fragments, 6 are tip fragments and 8 are edge spalls.
Figure 2. Distribution of Projectile Points. Types indicated by Roman numerals.

<table>
<thead>
<tr>
<th>Level</th>
<th>Unit A</th>
<th>Unit B</th>
<th>Unit C</th>
<th>Unit D</th>
<th>Unit E</th>
<th>Unit F</th>
<th>Unit G</th>
<th>Unit H</th>
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<tbody>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>II</td>
<td>IV</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>0-20 cm.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I</td>
<td></td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>2</td>
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<td></td>
<td></td>
<td></td>
<td>III</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-40 cm.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VII</td>
<td></td>
<td></td>
<td>I</td>
</tr>
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<td>80-100 cm.</td>
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Figure 3. Distribution of Debitage. ch=chert; ob=obsidian; ba=basalt

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Unit A</th>
<th>Unit B</th>
<th>Unit C</th>
<th>Unit D</th>
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<td>0-20 cm</td>
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<td>ch 2</td>
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<td>ch 64</td>
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<td>ob 122</td>
<td>ob 1</td>
<td>ob 75</td>
<td>ob 274</td>
<td>ob 51</td>
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<tr>
<td></td>
<td>ba 3</td>
<td>ba 6</td>
<td>ba 19</td>
<td>ba 6</td>
<td>ba 3</td>
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<td>ba 1</td>
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</table>

| Level 2 |        |        |        |        |        |        |        |        |
| 20-40 cm | ch 9   | ch 5   | ch 4   | ch 2   | ch 23  |        |        |        |
|         | ob 186 | ob 22  | ob 82  | ob 152 | ob 28  | ob 549 |        |        |
|         | ba 6   | ba 2   | ba 2   | ba 1   | ba 3   |        |        | ba 8   |

| Level 3 |        |        |        |        |        |        |        |        |
| 40-60 cm | ch 1   | ch 2   | ch 9   |        | ch 22  |        |        |        |
|         | ob 42  | ob 21  | ob 329 |        | ob 822 |        |        |        |
|         | ba 1   |        | ba 7   |        | ba 15  |        |        |        |

| Level 4 |        |        |        |        |        |        |        |        |
| 60-80 cm | ch 6   |        | ch 3   |        | ob 74  |        |        |        |
|         | ob 3   |        | ob 74  |        |        |        |        | ba 22  |

| Level 5 |        |        |        |        |        |        |        |        |
| 80-100 cm |        |        | ob 1   |        | ob 741 |        |        |        |
|         |        |        | ba 1   |        |        |        |        |        |

| Level 6 |        |        |        |        |        |        |        |        |
| 100-120 cm |        |        | ob 1   |        | ob 153 |        |        |        |
|         |        |        | ba 1   |        | ba 4   |        |        |        |
BIFACE, FLAKE AND CORE TOOLS

Bifacial Knives (n=9; Fig. 4i-k)

These bifacial tools are leaf-shaped, percussion flaked and large in size. The two complete specimens are both made of basalt; the seven fragmentary specimens are made of obsidian. The average length is 60 mm. (range 56-65 mm.), average thickness is 8 mm. (range 5-11 mm.), and average width is 30 mm. (range 28-32 mm.).

Unifacial Flake Scrapers (n=6; Fig. 5a-i)

These uniface tools are characterized by steep flaking on one or more edges. Three specimens are of obsidian and three are of chert. Two are end scrapers and four are side scrapers. Average width is 27 mm. (range 18-36 mm.), average length is 38 mm. (range 27-65 mm.), and average thickness is 7 mm. (range 5-9 mm.).

Flake Spokeshaves (n=5; Fig. 5j-l)

These five flake tools all exhibit a carefully flaked notch on one edge. The notches are between 12 and 13 mm. in width. Two specimens are made of chert and three are of obsidian.

Worked Flakes (n=98; not figured)

This group includes 11 chert and 88 obsidian flakes, all worked on one or more edges. Flaking is confined to the edge of the tool and the shape has not been modified. The size range is from 5 mm. to 30 mm.

Blades (n=4; not figured)

Four specimens, all of obsidian, appear to have been struck

Fig. 4 (opposite page). Projectile Points and Bifacial Knives. a, b, Type I; c, Type II; d, Type III; e, Type IV; f, Type V; g, Type VI; h, Type VII; i-k, bifacial knives.
off a blade core, or struck in such a fashion that a blade-like flake was formed. Three of the blades have been used on one edge.

Cores (n=3; not figured)

Three small, cobble-sized stones appear to have served as rather haphazard cores. One is of chert, one is of basalt and one is of siltstone. Diameter ranges from 5 to 10 mm. The siltstone specimen might, also, be categorized as a unifacially flaked pebble tool.

Handstones (n=3; not figured)

Three fist-sized cobbles have at least one flat surface on which there is evidence of wear, as if they had been used as manos. The original cobble shape of these handstones has been retained. One specimen was apparently used to grind red ochre or hematite.

CONCLUSIONS

Although the assemblage from Indian Ridge is small in total size and has a limited variety of artifact forms, it is possible to draw from it a number of conclusions about human use of the site. The altitude of the site and the absence of any substantial cultural features suggests that occupation was seasonal and sporadic—probably occurring during the late spring, summer, or early fall.

The projectile points, flake scrapers and handstones suggest activities of the same kind known for the site historically—deer hunting and plant collecting. The abundance of obsidian in the deposit (Fig. 3) is in distinct contrast to the situation in sites on the floor of the Willamette Valley to the west, where obsidian is scarce and is derived from small stream pebbles. Although this is not very compelling evidence, it is at least suggestive of a human population derived from the obsidian-rich country east of the Cascades rather than from the Willamette Valley. Further, the predominant point type at Indian Ridge, Type 1, is not present in Willamette Valley sites (see various papers, this volume). Nor is Type 3 present in the

Fig. 5 (opposite page). Flake Tools. a-i, Unifacial scrapers; j-l, Spokeshaves.
valley sites. Both the predominance of obsidian debitage, as well as some point types, then, are congruent with the historic account that Indian Ridge was used by peoples from east of the Cascades rather than from the Willamette Valley to the west.
BABY ROCK SHELTER

BY

THOMAS L. OLSEN
Fig. 1. Map of Willamette Valley - Western Cascades Region, showing location of Baby Rock Shelter.
Baby Rock Shelter (35 LA 53) is one of the oldest upland sites now known from western Oregon. It was excavated during the fall of 1970 by volunteers from the University of Oregon, Department of Anthropology, under the direction of C. Melvin Aikens. Donald K. Grayson was field supervisor. The excavation was conducted to gain information about upland site occupation in the Willamette River drainage as a part of the Willamette Valley Prehistory Project, and to salvage archeological data from a rich site already damaged by collectors.

SITE DESCRIPTION

Baby Rock is a lithic formation located approximately five miles east of the community of Oakridge, in the hills that define the western flank of the Cascade Range (Fig. 1). Situated at an elevation of approximately 2400 feet above the sea level (USGS quadrangle contour elevation), the archeologic site is in an east-facing shelter formed by a basalt outcropping at the base of Baby Rock (Fig. 2). The site was located by Grayson (1969) during an archeological survey of the western Cascades.

The terrain around the site is steep and rather difficult to negotiate. Salt Creek, a large tributary of the Willamette River, flows west approximately one-half mile below and to the southeast of the shelter, constituting the site's closest year-round source of water. A somewhat more convenient water source, during rainy seasons, is provided by an unnamed intermittent stream which flows south towards Salt Creek approximately one thousand meters to the west of the shelter.

Surrounding flora consists of Douglas fir climax forest and associations. Some scattered oak and alder are found in the area, along with a variety of edible plants and berries. The most numerous large animal is the western black-tailed deer (Odocoileus cf. hemionus). Rocky Mountain elk (Cervus canadensis) are also found, as are small numbers of black bear (Ursus americanus) and mountain lion (Felis concolor).

The rock overhang that forms the shelter protects an area of approximately 85 square meters, of which approximately 50 square meters appeared to the excavators to constitute feasible habitational area, because of the relative levelness of the ground surface. The center of the shelter floor, from drip line to back wall, was badly disturbed by two irregular collector's pits that had been dug through much of the cultural deposit. The rock wall at the rear of the shelter contained a series of red ochre pictographs depicting a variety of designs, including men on horseback. A number of the rock paintings were partially destroyed and undefinable due to exfoliation.
Fig. 2. Views of Baby Rock Shelter. Upper left, the woodland setting; upper right, vandal's excavation and undisturbed deposit in foreground; lower, pictographs of horse and rider on back wall of shelter.
of the surface on which they were painted.

Surface collection at the site added numerous waste flakes and bones to the small collection made by Grayson during his 1968 survey. A few finished artifacts, mostly fragmentary, were recovered from tailings left by collectors.

Three two-meter square test pits, designated units A, B, and C, were placed in areas that showed the least signs of disturbance: unit A was located within and at the south edge of the collector's disturbance; units B and C were located in an apparently undug area on the northern periphery of the collector's pit (Fig. 3).

Excavation was carried out in arbitrary 20 cm. levels which, for the purpose of describing artifact provenience more accurately, have been combined in this report so as to correspond to the natural depositional layers noted at the site. Work in test pits A and C was quickly terminated, because both units showed evidence of considerable and deep disturbance. All efforts were concentrated in test pit B, as disturbance by collectors appeared to be minimal there. A profile was cut along the side-walls of the collector's pit, in an attempt to correlate strata noted in unit A with those identified in unit B, and to construct a stratigraphic profile of the site.

STRAITGRAPHY AND DATING

Four natural layers identified in test pit B were given alphabetic designations A through D, from top to bottom (Fig. 4). At first, it appeared possible to identify three additional strata at the top of the site, but mixing between those layers was extensive, and it was concluded that they were, in fact, nothing more than back-dirt dug by collectors from their pit, and subsequently redeposited in the area of test pit B. All artifacts recovered from those levels have, therefore, been placed in the "provenience unknown" category in tables 1 and 2. Strata A, B, and the upper levels of Stratum C showed evidence of minimal disturbance; the lower level of Stratum C and all of Stratum D appeared to be undisturbed.

Stratum A was a light brown organic deposit that evidenced a slight amount of mixing with the disturbed upper level. Much of the organic material was unidentifiable due to decomposition; however, traces of a fibrous plant material remained. Stratum A contained the largest number of artifacts and waste flakes of any of the deposits, and a considerable amount of faunal material.

Stratum B showed a small amount of mixing with Stratum A. The deposit was light brown in color, and contained little visible organic
material. The general texture of the soil was rather rich and crumbly, indicating that the deposit was probably an organic layer in which decomposition was complete. Artifact totals from Stratum B were less than those of Stratum A; however, the amount of faunal material increased slightly.

Stratum C was a non-organic deposit of light greyish-tan material, interspersed in its lower level with bands of pumice identified as originating from the eruption of Mount Mazama some 7000 years ago (L.R. Kittleman, personal communication; Kittleman, 1973). A minimal amount of mixing with both Stratum A and Stratum B was discernable in the upper levels of Stratum C; the lower level appeared undisturbed due to the well-defined bedding of the pumice bands. Artifacts occurred throughout the layer in numbers approximately equal to those of Stratum B; however, Stratum C contained by far the largest amount of faunal material of the four cultural deposits.

Stratum D was a deposit of undisturbed non-organic aeolean silt, ranging in color from light tan to yellowish. Flecks of pumice occurred throughout the layer, interspersed with considerable amounts of roof fall. Although artifacts, flakes and faunal material were scarce in Stratum D, they are evidence of a pre-Mazama occupation at Baby Rock Shelter.

In seeking to corroborate the stratigraphy of the cultural deposits by establishing an independent means of relatively dating the layers, samples of obsidian waste flakes from strata A, B, C, and D were thin-sectioned and the thickness of their hydration rinds was measured by Fagan, whose procedures and results are detailed elsewhere in this volume.

The results of the obsidian hydration analysis (Table 1) indicate that some mixing probably did exist in strata A, B and the upper levels of Stratum C, confirming observations made during excavation, but show that Stratum D was undisturbed. The hydration rinds of the Stratum D samples were more uniform, and are among the thickest currently recorded for Oregon obsidian samples (Fagan, personal communication). This is consistent with a pre-Mazama date for Stratum D.

It appears that the initial occupation of Baby Rock Shelter was contemporaneous with that of the only other rockshelter site reported from the western Cascades, Cascadia Cave. Newman (1966) reports a radiocarbon date from the initial cultural level at Cascadia of 7910 ± 280 B.P. The Mazama pumice at Baby Rock Shelter was contained in Stratum C, overlying the initial occupation level, Stratum D; thus, the cultural sequence began before 7000 B.P. How many years before is not known, but a difference of over one micron in mean hydration rind thickness between Stratum C and Stratum D indicates a significant span of time.
Fig. 3. Map of Baby Rock Shelter.
Fig. 4. Stratigraphic cross-section of excavation at Baby Rock Shelter.
ARTIFACTS

The artifacts recovered in excavation at Baby Rock Shelter, with the exception of a single shell bead and two pieces of badly rusted tin, were made of lithic materials. Obsidian was most frequently used; other materials included jasper, chert, and basalt.

Due to the extent of collector disturbance at the site, the artifact assemblage is quite small. For purposes of description, the specimens have been grouped into categories based on morphological similarities. The categories have been delimited to specific types when possible. Fragmentary specimens have been included in the total artifact count, but not included in the range of dimensions, with the exception of projectile point fragments which retain a diagnostic basal end.

PROJECTILE POINTS

Corner-Notched

6 specimens: 2 whole, 4 fragmentary (Table 2; Fig. 5, a-c). Range of dimensions: basal width 1.1 cm. to 2.2 cm.; length, 2.2 cm. to 3.7 cm.

The specimens are small and medium-sized corner-notched projectile points. Blade shape is triangular, ranging in cross-section from bi-convex to lenticular. Retouch is bifacial on all specimens with the exception of one very small, thin point, which has been unifacially flaked.

Side-Notched

6 specimens: 2 whole, 4 fragmentary (Table 2; Fig. 5, d-f). Range of dimensions: basal width 1.4 cm. to 1.7 cm.; length, 2.1 cm. to 3.7 cm.

The specimens are medium-sized side-notched projectile points. Blade shape ranges from broad to narrowly triangular; shape in cross-section ranges from lenticular to bi-convex. Retouch is bifacial. One of the whole specimens was broken and subsequently retouched at the basal end.
Desert Side-Notched

3 specimens: all fragmentary (Table 2; Fig. 5, g-i).
Range of dimensions: basal width, 1.1 cm. to 1.4 cm.

Specimens are basal fragments of small projectile points, and appear to be of the Desert-Side notched type (Baumhoff and Byrne 1959). Two of the specimens have small side-notches and a basal notch; the third is side-notched, but is missing the basal notch. Retouch on all specimens is bifacial.

Cottonwood Triangular

3 specimens: 2 of which are fragmentary (Table 2; Fig. 5, j).
Range of dimensions: basal width, 1.1 cm. to 1.8 cm.; length, 2.0 cm.

Similar specimens have been classified by Heizer and Baumhoff (1958) as Cottonwood Triangular. Two specimens have a slight concavity of the basal end; the third is straight-based. The one complete specimen has a triangular blade shape and is plano-convex in cross-section. All are bifacially retouched.

Unidentifiable Fragments of Projectile Points

Eleven artifacts placed in this category appear to be projectile point fragments. All are missing a diagnostic basal end (Table 2).

BIFACES

40 specimens: 7 whole, 33 fragmentary (Table 3; Fig. 5, k-o).
Range of dimensions, complete specimens: thickness, 0.3 to 1.1 cm.; length, 2.2 to 8.2 cm.; width, 1.0 to 2.2 cm.

The complete specimens are bifacially-worked flake tools, ranging from ovate to leaf-shaped in outline, bi-convex to lenticular in cross-section. In plan view, the artifacts have a generally sinuous edge, formed by primary flaking techniques, with secondary retouch

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Fig. 5 (opposite page). Projectile points and bifaces. a-c, Corner-notched; d-f, Side-notched; g-i, Desert Side-notched; j, Cottonwood Triangular; k-o, Biface foliates.
occurring within the broad primary scars. The category includes some specimens which fall within the range of variation of the Cascade Point as described by Butler (1961: 28). The fragmentary specimens are nondescript flakes showing varying amounts of bifacial retouch.

**FLAKE SCRAPERS**

**End Scrapers**

14 specimens: 9 whole, 5 fragmentary (Table 3, Fig. 6, a-e). Range of dimensions: thickness, 0.3 to 0.6 cm.; length, 1.4 to 2.7 cm.; width, 1.5 to 2.3 cm.

The specimens are unifacially-worked flake tools, ranging in outline from irregular to ovate, and being plano-convex to concave-convex in cross-section. The flaking technique is primarily secondary pressure retouch concentrated on the end of the flake. Four specimens appear to have been broken and subsequently retouched for further use.

**Side Scrapers**

5 specimens: 1 whole, 4 fragmentary (Table 3, Fig. 6, f, g). Dimensions of complete specimen: thickness, 1.0 cm.; length, 3.2 cm.; width, 2.0 cm.

The specimens are unifacially worked flake tools, ranging from ovate to irregular in outline, plano-convex to concave-convex in cross-section. The flaking technique is primarily secondary pressure retouch, concentrated on the lateral edges of the flakes.

**GRAVERS**

3 specimens (Table 3; Fig. 6, h-j). Range in dimensions: thickness, 0.2 cm. to 0.7 cm; length, 1.8 cm. to 2.2 cm.; width, 1.0 cm. to 2.0 cm.

The specimens are irregular in outline, plano-convex to triangular in cross-section. All have primarily unifacial retouch and an identifiable trihedral graver bit at one end. One specimen has a small amount of bifacial retouch.

Fig. 6 (opposite page). Assorted tools. a-e, End scrapers; f, g, Side scrapers; h-j, Gravers; k, l, Perforators; m, Spokeshave; n, o, Casual flake tools.
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Table 1. Obsidian Hydration Measurements from Baby Rock Shelter.
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<td>6</td>
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<td>Desert side-notched</td>
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<td>Cottonwood triangular</td>
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<td>Fragmentary specimens</td>
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<td></td>
<td>6</td>
<td>11</td>
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Table 2. Stratigraphic Distribution of Projectile Points.
PERFORATORS

2 specimens (Table 3; Fig. 6, k, l).
Range of dimensions: thickness, 0.2 cm. to 0.3 cm.; width, 0.9 cm. to 1.5 cm.

Specimens are ridged flakes, triangular in outline and cross-section. Both have alternate flaking of lateral edges extending from the point toward the base, such as would occur from rotational use in boring.

SPOKESHAVE

1 specimen (Table 3; Fig. 6, m).
Range of dimensions: thickness, 0.6 cm.; length, 3.2 cm.; width, 2.5 cm.

Specimen is an irregularly-shaped lamellar flake, unifacially worked, concave-convex in cross-section. The greatest concentration of flaking occurs in a concavity on one lateral edge, such as would occur from use in smoothing rounded objects like arrow shafts.

CASUAL Flake Tools

66 specimens (Table 3, Fig. 6, n, o).

Specimens are irregularly-shaped flakes which have a minimal amount of flaking or usage scars. Retouch on all artifacts is unifacial. These are apparently waste flakes that were used once or twice and then discarded.

HAMMERSTONES

2 specimens (Table 3; Fig. 7, a, b).
Dimensions: thickness, 6.5 cm.; length, 9.3 cm.; width, 8.3 cm.

One whole specimen is an irregularly-shaped rounded stone that

Fig. 7 (opposite page). Ground stone artifacts. a, b, hammerstones; c, abraded oval stone; d, e, fragmentary and complete manos; f, pestle fragment; g, h, two views of polished bowl fragment.
shows signs of abrasion along a lateral edge. One fragmentary specimen has signs of abrasion on what appears to be the tip end, such as might result from use in grinding rather than pounding. This artifact may be a pestle, rather than a hammerstone.

**ABRADED OVAL STONE**

One specimen (Table 3; Fig. 7, c).
Range of dimensions: thickness, 6.1 cm.; length, 21.5 cm.; width, 18.7 cm.

The specimen is a large, flat stone, generally ovate in outline and oval in cross-section. The dorsal surface has some evidence of abrasion and pecking, such as would occur if the artifact had been used as an anvil. One lateral edge also appears slightly battered.

**MANOS**

4 specimens (Table 3; Fig. 7, d, e).
Range of dimensions: thickness, 3.2 to 4.0 cm.; length (whole specimen) 9.5 cm.; width, 6.0 to 8.0 cm.

One whole specimen is a vesicular basalt stream cobble with an abraded and flattened surface. Two of the fragmentary specimens are also abraded cobbles, while the third is made on an apparently quarried stone.

**PESTLE FRAGMENT**

One specimen (Table 3; Fig. 7, f).

One fragment of a basalt cobble exhibits heavy abrasion and flattening on its narrow end, suggesting that it was used as a pestle.

**STONE BOWL FRAGMENT**

One specimen (Table 3; Fig. 7, g, h).

The artifact is a small fragment of a ground stone bowl, highly Fig. 8 (opposite page). Artifacts recovered from Baby Rock Shelter by Private Collectors.
<table>
<thead>
<tr>
<th>Item</th>
<th>Stratum A</th>
<th>Stratum B</th>
<th>Stratum C</th>
<th>Stratum D</th>
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<th>Totals</th>
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<tbody>
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<td>Bifaces</td>
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<td>3</td>
<td>3</td>
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<td>39</td>
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<td>1</td>
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<td>3</td>
<td>5</td>
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</tr>
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<td>End scrapers</td>
<td>3</td>
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<td>Casual flake tools</td>
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<td>3</td>
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<td>Waste flakes</td>
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<td></td>
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<td></td>
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<tr>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Olivella shell bead</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Table 3. Stratigraphic Distribution of Artifacts.
polished along the lip and inner surface.

GROUND STONE FRAGMENTS

Four unidentifiable basalt fragments exhibit evidence of battering or abrasion (Table 3).

HISTORIC ARTIFACTS

Two pieces of badly rusted metal are of uncertain provenience. One appears to be the top of a can, the other is unidentifiable.

Artifacts Recovered by Collectors

The artifacts pictured in Fig. 8 were recovered from Baby Rock Shelter by private collectors. The photographs were made available for inclusion in this report through the efforts of Steve Allely of Springfield, Oregon. Provenience of the artifacts within the site is unknown. The specimens generally duplicate the materials found in the controlled excavations. The points in the middle right of Fig. 8 fall within the range of the type described by Butler (1961: 28) as Cascade points:

...generally long, narrow leaf-shaped or bipointed items which tend to be quite thick in proportion to their width and are usually thickest above the butt end; none of the points shows evidence of basal thinning...Most of the points are diamond shaped in cross-section, particularly above the butt end...

In addition to the Cascade points in the photograph, I have been informed by collectors familiar with this point type that a number from Baby Rock Shelter exist in other collections which I was unable to obtain permission to see.

OLIVELLA SHELL BEAD

One specimen (Table 3)
Dimensions: diameter, 1.3 cm.; length, 2.5 cm.

The shell is identified as Olivella biplicata. The spire has been lopped off and a large hole drilled at about the mid-point of the
shell, probably to provide a means of suspending the artifact as part of a necklace or bracelet.

**BONE**

Five mammals and one avian species have been identified from Baby Rock Shelter (Grayson, personal communication). As indicated in Table 4, western black-tail deer (Odocoileus cf. hemionus) dominates the faunal sample and apparently formed the bulk of the meat diet of the shelter's occupants. The greatest percentage of the deer bone sample had been laterally split, and some charring of the bone was evident throughout the cultural deposits.

The appearance in Stratum C of Spermophilus beecheyi is of some interest, as it is a creature of the low grasslands (Hall and Kelson 1959:354). The indications are, since there are no grasslands in the area, that the occupants of the shelter must have transported the animal to the site.

**SUMMARY AND CONCLUSIONS**

The evidence indicates that Baby Rock Shelter was used by aboriginal populations as a temporary camp, with a period of occupation extending from before the eruption of Mt. Mazama, as indicated by pumice bands in the lower deposits, to fairly recent historical times, as indicated by pictograph figures of horsemen on the shelter's wall.

Although much of the site was badly disturbed by collectors and the artifact assemblage small, some tentative conclusions may be drawn about the human occupation of the shelter. The faunal evidence suggests that black-tail deer were extensively sought for food; the exploitation of this resource was probably one of the major reasons for occupation of the site. The abundance of skull parts among the skeletal material indicates that the hunters often brought their kill back to the shelter to be dressed.

The artifacts recovered support the hypothesis that Baby Rock Shelter was primarily a hunting camp. Almost without exception, the tools are of those types associated with the killing and processing of game animals (projectile points, scrapers, knives), and the manufacture and maintenance of hunting tools (gravers, spokeshaves, hammerstones). The presence of a stone bowl fragment, as well as several pestles recovered from the site by collectors, indicate that milling activities also occurred, probably on a limited basis.
Of some interest is the absence of cores from the artifact assemblage, and the abundance of waste flakes. This suggests that the hunters might have prepared new and replacement tools from blanks and preforms carried to the site, an explanation supported by the fact that there is no known obsidian source in the immediate area.

It has been suggested that in many sites, projectile point size is a function of time; that large points are associated with older sites, small points with more recent occupation. The excavations at Baby Rock Shelter, and at Cascadia Cave (Newman, 1966) as well, suggest that for the area of the Western Cascades, a more functionally-oriented interpretation of projectile point size is appropriate. In both sites, point size is consistently large through time. Small points do appear, but in no cultural level do they constitute a majority of the point types.

It is evident that the occupants of these two sites found it preferable to employ large points in their hunting activities. A possible explanation for this preference has emerged from conversations with modern-day bow hunters. Although their equipment is more powerful and accurate than that used by the aboriginal hunters, those who today hunt with bow and arrow for sport have found that in order to successfully kill large game animals in the dense cover of the Western Cascades, it is necessary to employ maximum size and surface area in projectile points. The larger the cutting surface of the point, the more internal damage is inflicted in the animal, thus hastening death by bleeding. In addition, the large entrance hole created permits copious external bleeding, an important factor in tracking and locating a wounded animal in thick foliage. Thus, for the purpose of most efficiently killing large game, the original occupants of Baby Rock Shelter and Cascadia Cave undoubtedly came to the same conclusion as their modern-day counterparts, and, through time, continued to utilize large projectile points in their hunting activities.

Data for upland sites in the Willamette drainage are scarce, but it may be possible to relate such sites to those of the valley floor, making use of this inferred correlation between projectile point size and the exploitation of woodland sites. The projectile points found at Baby Rock Shelter are, as noted above, noticeably larger in size than those common to the Willamette Valley floor. The occasional large points found in valley floor sites and the occasional small points recovered from upland sites are taken to suggest that the same peoples may have occupied both kinds of sites, according to the season and their needs.

It may also be suggested, due to the occurrence of the Olivella shell bead and the Desert Side-notched and Cottonwood Triangular points, that the groups occupying the site might have had some contact with Great Basin and coastal cultures, or that such people may have used Baby Rock Shelter as a stop-over in trans-mountain journeys.
<table>
<thead>
<tr>
<th>Species</th>
<th>Stratum A</th>
<th>Stratum B</th>
<th>Stratum C</th>
<th>Stratum D</th>
<th>Provenience Unknown</th>
<th>Totals</th>
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</thead>
<tbody>
<tr>
<td><em>Odocoileus cf. hemionus</em></td>
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<td><em>Microtus spp.</em></td>
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<td><em>Cervus canadensis</em></td>
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<td><em>Felis concolor</em></td>
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<tr>
<td><em>Spermophilus beechyi</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
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<tr>
<td>Bird, species unknown</td>
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<td></td>
<td></td>
<td></td>
<td>1</td>
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<tr>
<td>Unidentified bones</td>
<td>82</td>
<td>114</td>
<td>710</td>
<td>47</td>
<td>973</td>
<td>1926</td>
</tr>
</tbody>
</table>

Table 4. Stratigraphic Distribution of Faunal Material. (minimum number of individuals by stratum)
The cultural sequence, as it can be inferred from the limited data, appears to have begun more than seven thousand years before the present, with a period of fairly light occupation represented by the small artifact and faunal totals from Stratum D. The period immediately following, represented by Stratum C, seems to have been one of extensive usage of the shelter as a hunting camp, indicated by increased amounts of faunal material. Stratum B with moderate amounts of both artifacts and fauna, represents either a briefer period or a period of generally decreased occupation. During the deposition of Stratum A, usage of Baby Rock Shelter again appears to have increased, continuing up to historic times.

ACKNOWLEDGEMENTS

I wish to acknowledge the assistance of the following persons: Michael D. Southard, who prepared site and profile maps; Richard M. Pettigrew, who did the photography; Laurence R. Kittleman and John L. Fagan for obsidian and mineralogical analysis; Steven Allely for liaison between the University and private collectors; and C. Melvin Aikens and Floyd W. Sharrock for criticism and advice. My thanks especially to Donald K. Grayson, field supervisor of the Baby Rock excavation, for faunal identification and for allowing me the use of his field notes in the preparation of this report.

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Kittleman, Laurence R.

Newman, Thomas
RECENT ARCHAEOLOGICAL SURVEYS IN THE WESTERN CASCADES:
PREHISTORY AND CONSERVATION ARCHAEOLOGY

BY

DONALD K. GRAYSON
The Western Cascade Range lies east of the low hills and intervening alluvial flats of the Willamette Valley and west of the rugged peaks and late Tertiary lava flows of the High Cascades. Composed primarily of Oligocene and Miocene flows and tuffs and marked by accordant main ridges with elevations of approximately 5,000 feet, the Western Cascade Range has been divided into ten sections by Baldwin (1964). The heavily forested Willamette Valley Section of this range lies above the Middle Fork of the Willamette River, and falls within the Tsuga heterophylla (western hemlock) zone of Franklin and Dyrness (1973). Today, the area supports an extremely productive timber industry, with timber harvest activities conducted primarily on federal lands.

As opposed to the situation in the Willamette Valley, which has been the scene of several archaeological surveys and excavation programs, the archaeological resources of the Willamette Valley Section of the Western Cascades are virtually unknown. In fact, archaeological work in the Western Cascades as a whole has been so limited that federal officials have argued that compliance with the protective stipulations of federal cultural resource legislation is not necessary here, since significant archaeological sites are not to be found in the area.

Between 1969 and 1971, two archaeological surveys of the Willamette Valley Section of the Western Cascades were conducted by individuals associated with the University of Oregon. These surveys, directed by myself in 1969 and by Mr. T. Olsen, then an undergraduate in anthropology, in 1971, were brief, judgmental, and relied heavily upon local informants for information concerning archaeological site location. The value of these surveys seems twofold. First, they demonstrate that numerous archaeological sites exist within the survey area, even though they almost certainly have not provided representative samples of prehistoric occupations here. Second, these surveys also provide indications of the extent of the damage being done to archaeological resources in the Western Cascades by archaeological site looters, and as a result of the lack of compliance by federal agencies with federal cultural resource legislation.

RESULTS OF THE SURVEYS

Twenty archaeological sites were discovered in the Willamette Valley Section of the Western Cascades during four weeks of survey divided equally between the 1969 and 1971 field seasons. These sites may be classified, and examples discussed, as follows:

I. Open sites with relatively high numbers of artifacts, in small forest openings near small lakes or streams.

A. The Winchester Lake Site (35La52) is located near a small lake deep within the Western Cascades at an elevation of approximately
5,000 feet. The entire site may spread across two acres, the artifacts being concentrated in small, adjacent openings within the forest. Scattered about the surface of these clearings are whole and fragmentary obsidian projectile points, knives, flakes and cores, as well as rock clusters whose distribution is confined entirely to the clearings. These rock clusters may have originally been arranged in circular patterns some ten feet in diameter and may represent dwelling and hearth remains. Beyond their mutual occurrence within the clearings, no structured spatial relationships between artifacts and rock clusters were noted.

B. The Unit 1 Site (35La51), also at an elevation of about 5,000 feet, and also near a small lake, shows internal patterning much like that seen at Winchester Lake. This site contains obsidian flakes and core fragments concentrated in two oval openings in dense forest, the largest of which measured approximately 10 by 30 feet. Chipping debris is scattered between these openings, across a zone some 150 to 200 feet in diameter.

C. The Unit 4 Site (35La50) may also belong in this class. Located deep within the Western Cascades east of Oakridge, several hundred feet from a small, intermittent stream at an elevation of about 4,400 feet, this site yielded obsidian and chert flakes scattered over an area of about ten acres. It seems clear, however, that the occupation which produced these remains did not involve such a large area. The site had been logged using heavy machinery, and the surface of the ground greatly disturbed as a result. The dispersed nature of the artifacts is certainly a function of this disturbance. Small concentrations of chipping debris may reflect initial concentrations of artifacts within forest clearings, but the effects of timber harvesting here are such that it is not possible to reconstruct the pre-harvest setting of the site.

II. Open sites near or adjacent to streams, with relatively low numbers of artifacts.

A. The Warner Creek Site (35La47) is located at an elevation of approximately 2400 feet, some 1/2 mile above the junction of Warner and Salt Creeks, the latter a major tributary to the Middle Fork of the Willamette River. This site is marked by obsidian flakes sparsely scattered over an area about 100 feet long, above and adjacent to the east bank of Warner Creek.

B. Sites 35La46, 35La48, and 35La189 are also open sites, near or adjacent to streams, with relatively few artifacts compared to those found at "Class I" sites. Most or all of the artifacts represent chipping debris. Information concerning 35La48 was provided by Mr. Orm Doty of the Oakridge Ranger District of the United States Forest Service,
III. Rockshelters.

A. Baby Rock Shelter No. 2 (35La53) is located about five miles east of Oakridge on the side of a moderately steep hill which slopes to meet the floodplain of a large, intermittent stream. The shelter itself is some 40 feet long and 20 feet high, with an overhang of about 15 feet. In one important way, this site is characteristic of most rockshelters known from the survey area: it has been greatly disturbed by the activities of looters, with only those deposits peripheral to the center of the shelter untouched. Artifacts were scattered across the surface of the site, as well as through the large pile of screened backdirt at the mouth of the shelter. Material collected from the surface, and by rescreening the backdirt, included numerous steeply retouched "thumbnail" end scrapers, knife fragments, fragments of Desert Side-notched projectile points, and possible mano and metate fragments. The back wall of the shelter was decorated with ten possible, and eight definite, pictographs of equestrians excuted in red paint, one of which included an individual wearing a wide-brimmed, Western style hat. These drawings varied in length from 7.1 to 11.4 inches, and in height from 5.1 to 11.8 inches. It is my understanding that at least some of these pictographs have now been destroyed by the activities of vandals, though I have not returned to the site to verify this report. Further information concerning 35La53 is provided by Olsen elsewhere in this volume.

B. Baby Rock Shelter No. 1 (35La54) is located approximately 500 feet above 35La53, and west of the same intermittent stream which runs by the lower site. This shelter is quite large—some 150 feet long, and at a maximum, 20 feet deep and 50 feet high. The floor is nearly covered by rockfall exfoliated from the roof and walls. Although no artifacts were discovered on the few visible areas of the shelter floor, this may mean little given the massive rockfall which covers that floor. On the back wall of the shelter were three equestrian pictographs, excuted in red paint. They varied from 3.9 to 10.2 inches in length, and from 3.9 to 9.1 inches in height. These pictographs are nearly identical to those from nearby 35La53; this similarity provides hope that beneath the rockfall covering the floor of 35La54, there may exist undisturbed archaeological deposits similar to those destroyed by looters at 35La53.

C. Nine other rockshelters with evidence of aboriginal occupation were discovered within the survey area (35La49, 35La174-176, 35La180, 35La182, and 35La190-192). Of these, seven had been looted, some of them extensively. All were located near or adjacent to streams, and all contained chert, basalt, or, most commonly, obsidian chipping debris. A single Desert Side-notched projectile point found at 35La192, east of Hampton and not far from the Middle Fork of the Willamette River, is the only item found at these shelters with known chronological meaning.
Of the two remaining, unclassified sites, 35La178 was reported by T. Olsen to consist of scattered chert, obsidian, and basalt flakes disturbed by logging road construction north of the Fall Creek Guard Station. According to Olsen, this site, which covered perhaps 1/4 acre of wooded area, also contained stone bowl fragments. Site 35La55 consists of a single pictograph of unknown theme on the rimrock at the summit of Huckleberry Mountain. This was reported to me by Mr. Doty; I did not visit this site. Finally, I might note that Moolac Mountain is reported to have been the scene of elk drives in historic times. Mr. Wilbur Council of the Oakridge Ranger station reports having been told by a member of the Klamath Indian Tribe that elk were driven up one side of this mountain and forced over the rimrock on the other side. I present this information here because of the proximity of Moolac Mountain to the Winchester Lake Site, and because Mr. Council has been an accurate source of archaeological information.

IMPLICATIONS OF THE SURVEYS: PREHISTORY AND CONSERVATION ARCHAEOLOGY

In my initial report on the 1969 archaeological survey of the Willamette River Section of the Western Cascades (Grayson 1970), I recorded my impression that the stylistic similarities of the artifacts recovered during the survey were not to materials from the nearby and easily accessible Willamette Valley, but instead to artifacts from the rugged and narrow Umpqua River Valley 40 miles to the south (Marchiando 1964), to artifacts discovered during salvage excavations in the Fall Creek area near Lowell (Cole 1968), and to materials uncovered from the later levels of Cascadia Cave 50 miles to the north (Newman 1966). In other words, I noted that artifact similarities, primarily involving projectile point morphology, seemed to run north and south in the Western Cascades for relatively great distances, but not west out of the foothills zone. On this basis, I inferred that the Western Cascades formed a cultural subarea extending from at least Cascadia Cave on the north to the Umpqua River on the south, and that interplay between the peoples of this physiographic region and the peoples of the Willamette Valley had not been great. From the presence at several sites within the survey area, of obsidian macroscopically similar to that from the Glass Buttes quarry in eastern Oregon, I also inferred that at least economic ties were maintained between the peoples of the Great Basin and those of a hypothesized Western Cascades cultural subarea.

In practical sense, though these are testable inferences concerning the prehistory of the Western Cascades, they are of less immediate importance than the simple demonstration that at least the Willamette Valley Section of the Western Cascades contains numerous archaeological sites. Since much of the Western Cascades is federally owned and is intensively managed for timber production, this knowledge underscores the need for compliance here with the National Historic Preservation Act.
of 1966 (80 State. 915, 16 U.S.C. 470) and Executive Order 11593, as stated in the Code of Federal Regulations (36 CFR Part 800). As I noted above, it is the attitude of a number of federal officials with managerial responsibilities for lands within the Western Cascades that significant archaeological resources do not exist in this area. The results of the brief surveys presented above demonstrate both that this argument is fallacious and that many archaeological sites in the Western Cascades are extremely vulnerable to timber harvest activities (for instance, 35La51, 35La52, 35La178, and the destroyed 35La50).

It is, then, imperative that federal agencies responsible for land-disturbing activities conducted in the Western Cascades bring these activities into full compliance with 36 CFR Part 800 procedures. It is clear that a program of cultural resource surveys is needed to provide knowledge of the locations of archaeological sites within areas to be adversely affected by timber harvest activities, while allowing timber harvesting to proceed as smoothly as possible. For smaller tracts of land, this can be accomplished by intensive surveys in which much or all of the surface of the land to be disturbed is examined. For larger tracts, sampling approaches such as those used in conjunction with the Bureau of Land Management's geothermal energy program in eastern Oregon seem acceptable. In these approaches, reconnaissance-level surveys are performed, in which samples of the larger tracts of land to be affected by the proposed undertaking are surveyed, and generalizations from these samples as to the nature and expectable locations of the archaeological resources within the larger tracts are made. Recognizing the highly varied backgrounds and approaches of contract archaeologists likely to be working in these areas, latitude is permitted in the sampling procedures to be employed. Specifically, these samples are permitted to be either judgmental ("those areas felt most likely to contain archaeological sites will be examined") or probabilistic, involving, for instance, random or stratified random sampling procedures. It is extremely likely that within the Western Cascades, it will rapidly become possible to predict archaeological site locations on the basis of very few environmental variables, and that as a result, archaeological surveys here will become brief, inexpensive, and productive.

In order for this point to be reached, however, it is necessary that a full program of cultural resource inventorying begin. While the United States Forest Service has recently taken steps towards initiating such a program, the Bureau of Land Management is far from compliance with federal antiquities legislation. Such lack of compliance suggests that the archaeological community should give serious thought to taking legal action which would halt timber harvesting on federal lands that have not been adequately inventoried for cultural resources.

Unfortunately, it is clear that compliance by federal agencies with cultural resource legislation will solve only part of the problem related to archaeological site preservation in the Western Cascades.
It is a source of deep concern that eight of the 11 rockshelters discovered during the course of the surveys had been looted. It would seem that while the activities of timber harvesters are destroying open sites, the activities of looters are destroying the rest. Here, of course, the problem lies not only with the federal government, but also with the archaeological community as a whole. It is certainly true that the United States Attorney is not attempting to prosecute possible Antiquities Act violations in Oregon (Grayson n.d.), and that neither the Forest Service nor the Bureau of Land Management have programs which are designed to discourage the public from destroying archaeological sites. Yet it is also true, as has been pointed out countless times (for instance, McGimsey 1972), that the failure of the professional archaeological community to become involved in local educational programs designed to convince the public of the value of cultural resource sites is equally to blame.

In sum, recent archaeological surveys of primarily federally-owned properties within the Willamette Valley Section of the Western Cascades imply that the Western Cascades as a whole contains a sizeable archaeological resource base. Protective laws notwithstanding, these resources are being destroyed by the activities of both timber harvesters and looters. If the archaeological community of Oregon does not act quickly—through educational programs, political pressure, and legal action if necessary—it may be predicted that the archaeological resources of the Western Cascades will have been destroyed before archaeologists become fully aware of their existence.

ACKNOWLEDGEMENTS

I thank Mr. Orm Doty and Mr. Wilbur Council, both employees of the Oakridge Ranger District of the United States Forest Service, for invaluable help provided during the course of the 1969 survey, and Dr. C. Melvin Aikens for comments on earlier drafts of this paper.

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Marchiando, P.J.

McGimsey, C.

Newman, T.M.
OBSIDIAN HYDRATION ANALYSIS
OF THREE SITES IN WESTERN OREGON

BY

JOHN L. FAGAN
Obsidian, a form of natural glass, has an affinity for water and over time absorbs molecular water through a process of diffusion. This produces a hydrated surface which can be seen and measured in thin-section with the aid of a microscope. The laboratory methods and techniques for preparing specimens and measuring the hydration layer have been detailed by Friedman and Smith (1960:478-481) and Michels (1967:206-279). Since time (along with temperature) is the major factor controlling hydration, the thickness of the hydrated layer on obsidian artifacts is an indicator of time elapsed since the artifacts were fashioned and began to absorb water into their freshly flaked surfaces.

This paper deals with obsidian specimens from three sites in western Oregon. It has not been possible to establish a dated obsidian hydration rate from the data available, but comparison of obsidian hydration thicknesses does allow evaluation of the stratigraphic sequence and amount of mixture between levels at each site, and a temporal seriation of the three sites considered.

THE HURD SITE (35 LA 44)

An average of ten readings made at three different loci were taken for each of 62 specimens from the Hurd Site, and from these the mean thickness of the hydration band of each artifact was calculated (Table 1). It is the basic assumption of the method that older specimens will have thicker hydration rinds than younger ones. It was therefore assumed that the Hurd Site provenience data would associate specimens with thicker hydration rims with older cultural strata, with older C-14 dates, and with greater depth in the site. However, these contexts did not group the hydration data as expected.

In the ordering of mean obsidian reading by Cultural Strata (Table 2) inconsistencies were noted. Cultural Stratum I is the earliest of the three strata in each excavation area within the site and is expected to include the oldest specimens within the given area, but this was not the case. Cultural Stratum I of Area 3, the only area for which data from more than one Cultural Stratum are available, has a mean of 1.9 microns. It thus appears to be younger than Cultural Stratum II in the same area, which has a mean of 2.4 microns. This contradicts the ordering established by the excavator (White, this volume).

A second method of ordering the obsidian hydration data was to examine hydration rinds of obsidian samples associated with radiocarbon determinations (Table 2). The same inconsistencies were noted. A mean thickness of 1.9 microns is associated with C-14 dates of 330 ± 110 B.P. and 940 ± 90 B.P., while a mean thickness of 2.2
Fig. 1. Location of sites discussed in text. Upper, Lynch Site; middle, Hurd Site; lower, Baby Rock Shelter.
### Table 1. Obsidian Hydration Data for the Hurd Site (35 LA 44)

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<th>Sample No.</th>
<th>Thickness of hydration rim in microns</th>
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Table 2. Provenience of obsidian samples from the Hurd Site. Hydration figures given are means of all readings on all objects measured from a given Field Specimen (provenience) Lot.
microns is associated with dates of 460 ± 90 B.P., and 1120 ± 140 B.P. The thickest mean reading (2.9 microns) is associated with a date of 460 ± 90 B.P., while a mean of 2.1 microns is associated with an older date of 1120 ± 140 B.P. Such inconsistencies suggest that the archaeological deposits are mixed and that the obsidian specimens were not in original association with the carbon samples.

A final arrangement of the obsidian hydration data was tried. Specimens were ordered by excavation area, excavation unit, and depth (Table 2). It was reasoned that by comparing specimens from the same excavation area and excavation unit, the apparent mixing could be further tested. Area 3 was the only excavation area with individual excavation units having two or more suites of obsidian hydration readings that could be compared with each other. Test pit F, with 4 clusters of obsidian hydration readings, and test pit J, with 2 clusters of readings, are significant here. As can be seen in Table 2, with the exception of the artifacts from the surface level of test pit F (FS 454), the obsidian hydration readings are consistent within each separate test pit. However, they suggest that the contents of pit F are younger than those of pit J, which is not in keeping with the C-14 dates from the two pits.

In summary, discrepancies in the obsidian hydration data for the Hurd Site include a wide range of readings for each Field Specimen Lot (Table 1), and inconsistent distributions of obsidian hydration thicknesses which do not correspond to the cultural stratigraphy or the C-14 dates (Table 2). Various forms of mixing may account for some of the discrepancies noted. Rodents and roots are notorious for altering archaeologic deposits. However, at the Hurd Site the aboriginal occupants themselves were most likely responsible for a good deal of mixing. Deep camas ovens, storage pits, burial pits and even a large housepit were found at the site. The digging required for these features undoubtedly mixed considerable portions of the deposit. Recently, plowing has thoroughly mixed the top 20 centimeters, and excavations below the plow zone in 20 cm. levels, in a site where so much earth moving was done aboriginally, may have only tended to lump specimens from different ages and associations.

Another factor which may be contributing to the discrepancies in the obsidian hydration data is the chemical composition of the specimens. Since no spectographic analyses or trace element studies were conducted we do not know if the obsidian came from one or several sources. Different sources produce obsidians with different chemical compositions which theoretically could affect hydration rates. Seventy-three percent of the Hurd Site specimens had cortex visible on their surfaces and were most likely obtained from the river gravels. These water worn pebbles may have been washed from various sources in the Cascade Mountains. Further research is needed to solve the problems of obsidian hydration analysis in relation to differential chemistry of obsidians from different sources and their effects on
hydration rates.

THE LYNCH SITE (35 LIN 36)

Fifty-six obsidian specimens from the Lynch Site were analyzed. An average of ten readings made at three different loci were taken for each specimen, and from these the mean hydration thickness was calculated (Tables 3 and 4). These data were then ordered by depth and by associated radiocarbon determinations (Table 4).

For the most part the obsidian hydration data are consistent. This is evident in the narrow range of readings for specimens in each lot (Table 3) and in the progression of thicker mean hydration rinds with greater depth in the site (Table 4). The few inconsistencies may be accounted for by aboriginal mixing, since several camas ovens, storage pits, and burial pits had been dug by the occupants (Sanford, this volume). Excavation levels generally were thin and stratigraphic divisions were recognized and followed by the excavators in most cases. Differential exposure on the site surface of some specimens may account for some aberrant readings. Likewise, the possibility of varying chemical composition of obsidian possibly from different sources may account for some discrepancies.

The rather continuous distribution of hydration readings suggests continuous visitation of the site, and the preponderance of thin hydration rinds, ranging from 0 to 2.4 microns, suggests rather recent occupation. The obsidian hydration data are corroborated by the C-14 dates, which range from 0 ± 80 B.P. to 1280 ± 90 B.P. However, inconsistencies between the obsidian hydration data and the associated C-14 determinations make the establishment of a hydration rate for the Lynch Site impossible at this time.

THE BABY ROCK SHELTER (35 LA 53)

Thirty-seven obsidian specimens from the Baby Rock Shelter were analyzed (Table 5). Laboratory preparation and measuring techniques were the same as those described for the Hurd and Lynch sites. An average of ten readings were taken at three different loci and these were used to calculate the mean hydration rim thickness for each specimen (Table 5).

A layer of pumice, located in Stratum C of the site, was identified by Dr. Laurence R. Kettleman of the University of Oregon Museum of Natural History as originating from Mount Mazama (personal communication 1971). The Mazama eruption which was responsible for this deposition of pumice occurred about 7,000 years ago (Kettleman
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Table 4. Provenience of obsidian specimens from the Lynch Site. Hydration figures given are means of all readings on all objects measured from a given Field Specimen (provenience) Lot.
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Table 5. Obsidian Hydration Data for the Baby Rock Shelter (35 LA 53)

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<tr>
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<td>C</td>
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<tr>
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<td>D</td>
<td>2.9</td>
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<tr>
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<td>E</td>
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Table 6. Provenience of obsidian hydration specimens from the Baby Rock Shelter. Hydration figures given are means of all readings on all objects measured from a given Field Specimen (provenience) Lot.
1973). Thus, cultural debris associated with and below this pumice layer represents some of the oldest evidence of human occupation in western Oregon. Since the site had been disturbed by collectors it was thought that the obsidian hydration analysis could be used to determine if the excavated sample had been mixed.

The stratigraphic distribution of the obsidian samples and their mean hydration rim thicknesses are presented in Table 6. These data are consistent for the most part, with only a few minor aberrations. Specimens from beneath the pumice layer have thicker and more consistent readings than specimens from above this layer. The inconsistencies that do occur are in strata B and C above the pumice and may be attributable to mixing by collectors. The looter's pits were shallow, and most of them did not penetrate the pumice layer. Slight inconsistencies in the data for specimens from the pumice layer and below may be due to mixing by rodents and perhaps to different rates of hydration of chemically different obsidians.

The overall consistency of the hydration rims especially those for specimens from beneath the pumice layer demonstrates that relatively little stratigraphic mixture occurred in the excavated sample despite the depredations of looters. The total range of readings suggests that the site was used on a more or less regular basis until quite recently. Diagnostic projectile point types and pictographs of horses and riders present at the site also suggest that it was occupied in historic times (Olsen, this volume).

CONCLUSIONS

Frequency distributions of mean hydration rim thicknesses from each of the three sites provide a basis for dating them in relation to each other. Three arbitrary ranges of hydration rim thicknesses are distinguished in Fig. 2. Range III has hydration rims from 0.0 to 2.0 microns; Range II has rims from 2.1 to 4.0 microns; and Range I has rims from 4.1 to 6.0 microns in thickness.

Baby Rock Shelter is clearly the earliest of the three sites to have been occupied. It was inhabited prior to the Mazama ash fall of 7000 years ago, and was in use throughout the periods represented by all three obsidian hydration thickness ranges. It seems likely that its relatively poor representation in Range III may be due to the removal of much of the post-pumice deposit at the site by collectors prior to the excavations upon which this study is based (see Olsen, this volume).

The Hurd Site was occupied during the time represented by Ranges II and III, and the Lynch Site was occupied primarily during the
Fig. 2. Frequency distribution of hydration thicknesses (in microns) at the Lynch, Hurd and Baby Rock Shelter sites.
time of Range III. The apparent overlap of the Hurd and Baby Rock sites in Range I must be evaluated with caution. First, the thickest of the Hurd readings are quite aberrant when compared to all others from the site, which diminishes their credibility. Second, Baby Rock Shelter is situated about 2000 feet higher than the valley floor on which the Hurd and Lynch sites rest, subjecting it to lower annual temperatures and presumably therefore a slower obsidian hydration rate (Friedman and Smith 1960). Thus, even if the readings in the 4 to 5 micron range at the Hurd Site are not discounted as aberrations, they don't necessarily have the same chronological implications as readings in the same range from Baby Rock Shelter. They are certainly not grounds for attributing the Hurd Site an age comparable to that of the pre-Mazama levels of Baby Rock, even though hydration rims of similar thickness occurred there.

In summary, obsidian hydration analysis has been used as a check on intra-site mixing and as a means of relatively dating three sites in western Oregon. Several inconsistencies in the data for the Hurd Site were attributed largely to mixing of the archaeologic deposits. Fewer inconsistencies were evident in the data for the Lynch Site and the Baby Rock Shelter, suggesting that stratigraphic mixing was not a major problem at these sites. Three arbitrary periods were defined on the basis of hydration thickness readings, and the sites ordered in relation to them. Baby Rock Shelter was occupied throughout the early, middle and late periods; the Hurd Site was occupied during the middle and late periods; and the Lynch site almost exclusively during the late period.

REFERENCES

Friedman, I., and R.L. Smith

Michels, J.W.

Kittleman, Laurence R.
CHRONOLOGICAL ORDERING
OF SELECTED PROJECTILE POINT ASSEMBLAGES
FROM THE WILLAMETTE VALLEY.

BY

WINFIELD HENN, JOANNE M. MACK AND PATRICIA R. SANFORD
More than twenty archaeological sites have been excavated thus far in the Willamette Valley. Carbon-14 dates are available for some sites, but not all. Therefore, artifact-manipulative (i.e. "hocus pocus") techniques must be employed in addition to absolute dating, in order to derive a cultural chronology. This paper employs Ford's seriation, Craytor and Johnson's Program SERIATE, a Q-Mode cluster analysis, and a R-Mode cluster analysis to build a relative chronology for a selected sample of the projectile point assemblages available from the Valley.

Eleven assemblages from eight sites were used. The sites included the Lynch Site (35 Lin 36), the Hurd Site (35 La 44), the Lingo Site (35 La 29), the Beebe Site (35 La 216), the Benjamin Sites (35 La 41 and La 42), the Fanning Mound and the Fuller Mound (all reported in other papers, this volume). These particular sites were chosen because the projectile point sample from each was large, and immediately available for study. All can be classed as habitation sites, and the available carbon-14 dates indicated that collectively they span the last 3000 years of Willamette Valley prehistory.

Because of its relatively larger size, the assemblage from the Lynch Site was divided in two, to prevent it from overshadowing the other assemblages. The two subdivisions were designated Lynch X (all artifacts collected from a depth of 0 to 25 cm.) and Lynch Y (all artifacts collected from a depth of 25 to 60 cm.). Preliminary work indicated that the Hurd Site assemblage should also be subdivided. At the Hurd Site there were three distinct areas of excavation, and on this basis the collection was divided into three assemblages designated Hurd 1, Hurd 2, and Hurd 3.

As the first step in the analysis, a typology inclusive of all projectile points from all 8 sites was constructed. Then attempts were made to seriate the assemblages by means of several different manipulative techniques. This paper is divided into sections, each of which deals with specific successful manipulative techniques and the results derived from application of those techniques. In order to test which techniques give the most accurate chronological ordering, the results are then compared to the known carbon-14 dates.

**TYPOLOGY**

A total of 38 types were defined (Fig. 1 and Table 1). The points of each type were counted and percentages determined for each type from each collection (Table II).

Most types are represented in all eleven assemblages, but their percentages vary a great deal. Because of their peripheral locations in relation to other sites, the lack of several types in the Beebe Site,
Fig. 1. Projectile point types used in chronological ordering. Numbers refer to types described in Table 1.
Fig. 1 (continued). Projectile point types used in chronological ordering. Numbers refer to types described in Table 1.
<table>
<thead>
<tr>
<th>Type</th>
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| **Type 1** Small Side-notched | Side notched  
Concave base  
Short ≤ 20 mm.  
Triangular blade |
| **Type 2** Christmas Tree | Unstemmed  
Deeply serrated  
Flat serration  
Short ≤ 20 mm. |
| **Type 3** Large Side-notched | Side notched  
Long ≥ 25 mm.  
Percussion flaked |
| **Type 4** Bi-pointed | Bipointed  
Leaf-shaped  
Pressure flaked  
Unstemmed |
| **Type 5** Basal-notched | Two basal notches  
Concave sides  
Long bars |
| **Type 6** Large Lanceolate | Unstemmed  
Lanceolate  
Long ≥ 35 mm.  
Non-concave base |
| **Type 7** Pear-shaped | Strangulated tip  
Unstemmed  
Thick ≥ 3 mm. |
| **Type 8** Unstemmed Triangular | Unstemmed  
Triangular  
Short ≤ 25 mm. |
| **Type 9** Convex Sided | Convex sides  
Contracting stem  
Short barb  
Two basal notches |
| **Type 10** Rocket-shaped | Concave sides  
Short barbs  
Long ≥ 24 mm. |
| **Type 11** Recurved Barbs | Barbs recurved  
Non-expanding stem  
Serrated |
| **Type 12** Rat-tailed | Contracting, long stem  
Stem pointed  
Short or no barbs |
| **Type 13** Small, Contracting Stem | No bars  
Contracting stem  
≤ 25 mm. in length |
| **Type 14** Large Proto-stem | Lanceolate  
Thick ≥ 4 mm.  
Long ≥ 30 mm.  
Proto-stem  
Contracting stem |
| **Type 15** Cortexed | Cortex present  
Convex sides  
Partially bifacial or unifacially flaked  
Contracting stem |
| **Type 16** Large, Contracting Stem | Long ≥ 30 mm.  
Contracting stem  
Obsidian only |
| **Type 17** Small, Stemmed Serrated | Serrated  
Non-expanding stem  
Obsidian only  
Short ≤ 24 mm.  
Corner notched |
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<th>Type 18 Contracting-stemmed Barbed</th>
<th>Type 19 Large, Non-contracting Stem</th>
<th>Type 20 Expanding Stem, No Barb</th>
<th>Type 21 Expanding Stem, Barbed</th>
<th>Type 22 Rectangular Stem, No Barb</th>
<th>Type 23 Rectangular Stem, Barbed</th>
<th>Type 24 Single-shouldered</th>
<th>Type 25 Gunther Barbed</th>
<th>Type 26 Triangular Stemless</th>
<th>Type 27 Side-notched</th>
<th>Type 28 Assymetric Barbed</th>
<th>Type 29 Large, Corner-notched</th>
<th>Type 30 Equilateral Triangular</th>
<th>Type 31 Concave Base, Triangular</th>
<th>Type 32 Fishhook</th>
<th>Type 33 Large, Expanding Base</th>
<th>Type 34 Proto-stem, Serrate</th>
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<td>Expanding stem No barbs Short ≤ 24 mm.</td>
<td>Expanding stem Barbed Short ≤ 24 mm.</td>
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<td>Single-shoulder Corner notched Non-contracting stem</td>
<td>Triangular Contracting stem Barb longer than stem</td>
<td>Concave base Obsidian only Unstemmed Triangular Short ≤ 20 mm.</td>
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Table 1 (cont.)

Type 35 Long Serrated
   Serrated
   Obsidian
   Long \( \geq 30 \) mm.
   Side notched

Type 36 S-shaped Blade
   Chert only
   S-shaped blade
   Non-contracting stem
   Long barbs

Type 37 Large, Diagonal-notched
   Large, diagonal notch
   Short \( \leq 25 \) mm.
   Short or no barbs
   Expanding stem

Type 38 Rectangular Stem, Serrated
   Serrated
   Long \( \geq 30 \) mm.
   Chert only
   Rectangular stem
   Narrow in width
   No barbs
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the Fanning Mound and the Fuller Mound is not totally unexpected. The Fanning and Fuller Mounds are approximately a hundred miles north of the other sites, and the Beebe Site is located in the Coburg Hills, not on the floor of the Willamette Valley as are the other sites. The spatial dispersion may be slightly more than Dunnell (1970) would think appropriate, but the basic similarity of types seemed to indicate that spatial differences were not too great for the attempted analysis.

From the first examination of the projectile point collections, it was evident that they exhibited enough variability as well as enough similarity to make possible a useful seriation. After studying all 11 collections and establishing 38 types, it became apparent that some of the types would be of limited usefulness, because they occurred in only one or two collections or else occurred in very small frequencies (less than 3%). These types (Types 1, 3, 6, 7, 10, 14-17, and 24-38) were not used in the Ford seriation but were used in all other manipulations.

FORD'S SERIATION

Having established a working typology, the next step was a seriation of the collections (sites) using the procedure recommended by J.A. Ford (1962). The assumption underlying this method is that artifact types exhibit a popularity cycle. As Ford (1962:39) puts it, "a sharply defined type will first appear in small frequencies... with the passage of time it will achieve a peak of popularity and then fade away." Thus, when archaeological sites in which occur a number of overlapping artifact types are arranged according to the above assumption, a chronological pattern will emerge.

To achieve a reliable seriation the following criteria must be met: 1) the materials must be from a limited geographical region; 2) the size of the artifact sample from each site should be not less than about fifty; 3) each collection should represent a short duration of time; 4) the collections should account for the total duration of the time represented by the various sites (Ford 1962:41). We attempted to meet all of these criteria by carefully choosing our collections from those available from the Willamette Valley.

While attempting to seriate the collections it became apparent that some of the types were relatively useless for this purpose because of their restricted distributions. As noted above, we chose to eliminate those types from our analysis which represented less than three percent of the collections in which they occurred, or which were not present in the majority of the site collections. These modifications do not appear to violate the guidelines set down by Ford.
The most satisfying arrangement of sites using Ford's methods is presented in Fig. 2. Some of the discrepancies that resulted using this method are probably traceable to sampling error. The absences of certain types in the seriation (i.e., Type 23 at Lingo, Type 20 at Benjamin 41) may be a reflection of the small samples obtained from these sites. It may also be noted that the two sites which have most of the type absences (Fuller and Fanning Mounds) are geographically distant from the other sites. Other inconsistencies in the seriation—particularly in the Hurd and Lynch collections—may be the result of within-site mixing, both during and after occupation.

PROGRAM SERIATE

Devised by Craytor and Johnson (1968), the SERIATE program performs a series of computerized re-orderings of an unordered matrix of Robinson's indices of agreement (Robinson 1951). In addition to re-ordering the rows and columns (sites) of the matrix so that the highest values are along the diagonal, the program calculates a statistic—Matrix Coefficient C—for each re-ordering generated. The higher the "C" value the closer the ordering is to a perfect seriation of assemblages on the basis of their similarity to one another. As input for this program we used a matrix of Robinson's indices calculated with the aid of a Robinson Index program on an IBM-360.

The SERIATE program generated four different orderings, presented in Table III in descending level of their "C" values. There is a general similarity to the seriation arrived at using Ford's methods. Comparing orderings #1 and #3 produced by Program SERIATE with Ford's seriation in Figure 2, it can be seen that in both cases the Beebe Site is placed at one end of the scale, with the Benjamin and Lingo Sites and the Hurd collections at the other end, and the Lynch collections in the middle.

Q-MODE CLUSTER PROGRAM

As a test of the orderings achieved by the above seriation techniques, we used the unordered Robinson's matrix as input for a Q-mode cluster computer program. The program, in Fortran IV language, was designed by Bonham-Carter (1967). According to Bonham-Carter, using this method, "a measure of...similarity is computed between all possible pairs of objects being classified...the objects are (then) linked progressively to form groups, by the criterion that the average similarity between members of the same group is greater than the average similarity between members of different groups" (Bonham-Carter 1967:1). In our case the similarity scores had already been computed for the previous manipulations, and
Fig. 2. Ford's seriation, based upon fourteen selected types from eleven collections. Scale 1 mm. = 2%
we merely used the computer program to cluster the collections (groups) based upon the scores (objects).

The results are reproduced as a dendrogram in Figure 3. A level of association of 100 was used as the demarcation line for establishing clusters of collections from the orderings provided by the computer program. At the 100 level there are four clusters: a) the Lynch X, Lynch Y, Hurd 2 and Beebe collections; b) the Hurd 1 and Hurd 3 collections; c) Benjamin and Lingo collections; and d) the Fanning and Fuller collections.

In significant ways this clustering is similar to the results arrived at by the other techniques. For instance, the collections found in clusters A and B usually occur in adjacent positions in the other orderings as well, while adjacent pairs in clusters C and D also tend to occur together in the other orderings. Put another way, if one were to use the order of the dendrogram from left to right as a seriation— which is perfectly legitimate since the ordering is one of decreasing similarity—one would find that it is rather similar to the seriation achieved using Ford's method.

Two plausible interpretations of the clustering results may be offered. It might be suggested that Clusters A, B, C and D are separate from one another because of temporal differences between them. Another interpretation is that perhaps the clusters represent different geographic units, and that time differential is not the principal cause of the separation. If we were to lower the level of association to 90 on the dendrogram, we would have three major clusters: one for the eastern edge of the Upper Willamette Valley (Clusters A, B) one for the western edge (Cluster C), and one for the Lower Willamette Valley (Cluster D).

R-MODE ANALYSIS

The final operation performed on the point collections was an R-Mode analysis, using the Bonham-Carter (1967) cluster analysis computer program. This technique, using the percentages of each type in each site, gives values for the relationships between types. The results of the analysis were used to make a dendrogram showing the levels of relationship between the types (Fig. 4). From this, clusters of projectile point types were determined, by comparing the frequencies of the types from each site. The 100 level of agreement was used as the cut-off point for inclusion in a cluster. This resulted in eight clusters, which ranged in size from two types to seven types. Two types, numbers 37 and 38, were not included in any of the eight clusters. We thought the clusters might be useful as temporal indicators.
The next step in the analysis was to examine the clusters in a contingency table, which tested for possible effect of sample size. The sites were grouped into small, medium and large classes for these calculations. The results summarized in Table IV indicate that most of the clusters can not be explained away as artifacts of small sample size, the possible exceptions being clusters 7 and 8.

Table V shows the relationship between any one cluster of point types and a particular site or sites. If relationships between clusters and sites are due to time, given clusters might align with sites of certain time periods. A comparison of each type with each site is included in Table II.

Cluster 4 is very prominent in all sites and may be the most important factor in creating a high degree of similarity between them. It also seems to be most strongly related to those sites shown by carbon-14 dates to be younger. Cluster 1 seems to be most strongly related to those sites shown by carbon-14 dates to be older. The highest frequencies of cluster 5 are from the Fanning and Fuller Mounds. This cluster's strong association with these Lower Willamette Valley sites indicates that its distribution is probably controlled by spatial factors more than by temporal ones. There is no site in which the percentage of occurrence of clusters 7 and 8 is over 5%, and therefore they have no usefulness for drawing conclusions.

Several conclusions may be drawn from the R-Mode analysis. The Fanning and Fuller Mounds separate off from the others in the frequencies of a few types, but they are close enough spatially and apparently temporally to the other sites to have many types in common. The Beebe site seems most strongly related to the nearby Lynch Site and the Hurd 2 collection. Though there are no carbon-14 dates for the Beebe Site, its strong relationship to the Lynch and Hurd 2 collections, which are dated approximately A.D. 100 to 1200 and A.D. 1200 to 1800, suggests that it is fairly recent. The differences it expresses may be due to the relatively small sample size, or perhaps its environmental setting may be a variable separating it somewhat from the valley sites.

The Lingo and two Benjamin sites along the Long Tom River (on the western side of the upper valley) hang together in the R-Mode analysis, but the very high frequency of cluster 1 at Lingo and the lack of clusters 6 and 7 there, separate it from the two Benjamin sites. Both temporal and spatial variables may be invoked to explain these differences: Lingo may be older and cover a longer time span than the Benjamin sites, and it is separated from them by about 15 miles, while they themselves face each other across a small creek. In view of their close proximity, a high degree of similarity between them is not unexpected.
Fig. 3. Q-Mode Cluster Dendrogram of Eleven Collections Based Upon Thirty-Eight Types.
Fig. 4. R-Mode Dendrogram Showing Relationships Between Types.
Table IV  
Contingency Table  
Numbers in parenthesis are expected values

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Medium

Fuller

Fanning | 212 | 109 | 22 | 375 | 290 | 12 | 8  | 9  | 1037   |
Lingo    | (164)| (123)| (29)| (434)| (241)| (19)| (6)| (7)|        |
Hurd 3,  
Benjamin| 41  |
Lynch Y |

Small

Hurd 2

Benjamin | 46 | 43 | 17 | 146| 48 | 12 | 1  | 1  | 314   |
(42) 
Beebe    | (54)| (40)| (9)| (140)| (77)| (6)| (1)| (2)|       |
Hurd 1 |

Total | 265 | 199 | 47 | 700| 388| 31 | 9  | 11 | 1650   |

Cluster 1=Types 2, 8, 14, 16, 29  
Cluster 2=Types 3, 4, 5, 11, 19, 27  
Cluster 3=Types 6, 24, 26, 35  
Cluster 4=Types 7, 9, 18, 21, 23, 28, 30  
Cluster 5=Types 10, 12, 13, 17, 20, 22  
Cluster 6=Types 1, 25, 36  
Cluster 7=Types 33, 34  
Cluster 8=Types 15, 31, 32
### Table V

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Hurd 1 (an early assemblage according to previous manipulations) and Hurd 3 display more complex relationships. The relatively high frequency of cluster 1 (the cluster associated with older sites) in Hurd 3, and the higher frequency of cluster 4 (the cluster associated with recent sites) in Hurd 1 may be the result of mixing. The area represented by the Hurd 1 collection contained both an early and a late stratigraphic component, and since the Hurd 1 and 3 collections came from areas in close proximity to each other, both of which have been repeatedly plowed, it is not inconceivable that these unexpected results are due simply to mixing.

CONCLUSIONS

Seriation and cluster methods for chronologically ordering sites are normally used when adequate carbon-14 or stratigraphic data are lacking or are inconsistent. However, in the case of most of the Willamette Valley sites used in this study, we do have such data. They were intentionally suppressed during the statistical analyses to avoid bias, though occasional reference has been made to them in the preceding report. The carbon-14 dates are as follows (White, Cordell, Miller, Sanford, this volume):

Lingo: 4130 ± 110 B.P. (no associated artifacts); 2040 ± 120 B.P.
Benjamin (41): 2320 ± 80 B.P.; 1640 ± ? B.P.
Hurd 1: 2800 ± 110 B.P.; 2780 ± 280 B.P.; 0 ± 200 B.P.
Hurd 2: 670 ± 90 B.P.; 330 ± 110 B.P.; 150 ± 90 B.P.
Hurd 3: 1120 ± 140 B.P.; 1050 ± 180 B.P.; 1050 ± 110 B.P.;
          940 ± 90 B.P.; 850 ± 90 B.P.; 510 ± 90 B.P.; 460 ± 90 B.P.
Lynch X: 0 ± 90 B.P.; 0 ± 80 B.P.
Lynch Y: 1280 ± 90 B.P.; 800 ± 90 B.P.

The date of 4130 ± 110 B.P. from the Lingo Site will not be further considered because of its lack of artifactual associations. Table VI compares the best result from each statistical exercise with the carbon-14 dates. In this comparison the Fanning Mound, Fuller Mound, Beebe Site, and Benjamin (42) are ignored, for they have no dates. It can immediately be seen that Ford's seriation best fits the carbon-14 dates. The Q-Mode ordering is also quite close.

Table VII compares the best results from each statistical technique, with all assemblages included. Using the two figures, we may draw several conclusions. The Beebe site consistently ordered next to the two Lynch assemblages and to Hurd 2 and Hurd 3. Therefore, it is reasonable to conclude that the Beebe Site was occupied, as the others were, some time between 0 and 1400 B.P. The fact that the Beebe Site also has 56% of Cluster 4 from the R-Mode analysis confirms its recent date. Benjamin (42) is always adjacent in the orderings to Benjamin (41) and hence probably was occupied between 1600 and 2000 B.P. The fact that it shows a higher percentage of Cluster 4, and a
<table>
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<tr>
<th>Radiocarbon Chronology</th>
<th>Ford's Seriation</th>
<th>Craytor and Johnson's Seriation #1</th>
<th>Craytor and Johnson's Seriation #3</th>
<th>Q-Mode Ordering</th>
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<tr>
<td>(0-90 B.P.)</td>
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<td>Hurd 3</td>
<td>Lynch X</td>
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<td>(60-760 B.P.)</td>
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<td>Lynch X</td>
<td>Hurd 1</td>
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<td>Lynch Y</td>
<td>Hurd 2</td>
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Table VII. Seriations and Orderings from Eleven Willamette Valley Collections

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<th><strong>Ford's Seriation</strong></th>
<th><strong>Craytor and Johnson's Seriation #1</strong></th>
<th><strong>Craytor and Johnson's Seriation #3</strong></th>
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<td>Fanning Site</td>
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</table>
lower percentage of Cluster 1, than does Benjamin (41) indicates it is probably the more recent of the two.

It is more difficult to determine the probable date of the Fanning and Fuller Mounds. They perhaps should not have been included in this seriation attempt. Their fluctuating position in the orderings is no doubt at least partially a reflection of their distance from the other sites—some 80 miles. However, the results of the R-Mode analysis do allow an educated guess as to their relative age. The best-represented cluster from Fuller and Fanning is Cluster 5, which is apparently controlled spatially; second is Cluster 4, the one associated with more recent sites in the Upper Valley. Therefore, we may conclude that these two sites are probably relatively recent.

The other major problem encountered in this ordering attempt is the constant association of Hurd 1 and Hurd 3. This problem could likely be eliminated by splitting Hurd 1 into the two assemblages indicated stratigraphically, and supported by the carbon-14 dates (White, this volume). The C-14 dates explain the high incidence of Cluster 4 from the R-Mode analysis in Hurd 1. It would not be surprising to find that the majority of the projectile points from Hurd 1 which belong to Cluster 4 are located in the upper twenty centimeters of the mound.

In conclusion, we can say with some assurance that of the techniques used, Ford's seriation method works best, with the Q-Mode Cluster analysis a close second. Also, clearly it is worthwhile to use an R-Mode Cluster analysis in conjunction with the other ordering techniques, in order to identify the types most influential in the seriation.
REFERENCES

Bonham-Carter, G.F.  

Craytor, William B. and LeRoy Johnson, Jr.  

Dunnell, Robert C.  

Ford, James A  

Johnson, LeRoy  

Robinson, W.S.  
A CLOVIS POINT FROM THE
MOHAWK RIVER VALLEY, WESTERN OREGON

BY

STEVEN ALLELY
SPORES CLOVIS POINT - MOHAWK RIVER
FOUND APROX. 1959

HEIGHT: 35.78 UDAM

THICKNESS 8MM

WIDTH AT HIGHEST POINT

38MM

TIP TO BASE 44MM

2MM FLUTE

44MM

THICKNESS 8MM

28MM

RASP GUARD LENGTHS

BLACK OBISIAN

X

3.5MM

127 FLUTE

27MM

4

NEB. BLAD DEFORM PRESENT, ABSENT IN SHORT FLUTE
A well preserved, classic Clovis fluted point was recovered by Mr. Marvin Spores in 1959 from the surface of gravels deposited by the Mohawk River (a tributary of the McKenzie) approximately five miles northeast of Springfield, Oregon. Since its recovery the point has been only briefly mentioned in two amateur articles (Gerity 1960, Strong 1969). What follows, then, is a more detailed description of this first Clovis point found in Oregon west of the Cascades.

Both the point's form and its measurements are well within the range of those previously described for Clovis points (Gorman, 1969). The specimen is a lanceolate biface with well defined fluting scars and basal grinding. Its measurements are: length, 10.1 cm.; width 3.5 cm.; thickness (above flutes), .9 cm.; and basal width, 2.8 cm. Basal grinding extends from the base up one side of the point for 3.1 cm. and up the other side for 2.7 cm. The point weighs 35.78 grams and is made from a black, opaque obsidian, a kind commonly found as cobbles in McKenzie River gravels and used in historic times by local Indians.

Definite, well made fluting scars occur on both sides of the point. These scars were made by the removal of one long flute from each side rather than by the removal of a series of smaller flakes. The longest flute (56mm.) was the last removed, as is indicated by the presence of a negative bulb of percussion at its base, a trait absent from the shorter flute. It cannot be said whether the fluting was accomplished by a direct or an indirect percussion method.

Somewhat regular, parallel pressure flaking scars, and percussion flaking scars are present above the flutes on both sides of the point. The percussion flaking scars are likely remnants of a stage of manufacture completed prior to fluting. The pressure flaking scars, however, were made after the fluting, as is shown by the extension of many pressure flaking scars on both sides of the point a short distance out onto the surface of the fluting scars.

This description of the probable sequence of the Clovis point's flaking is supported by my own experiments with the fluting of obsidian points. Because of the material's brittle nature, I have found it necessary to 'seat' or firmly rest the preform's tip on a padded surface that will absorb shock and help to prevent otherwise almost inevitable breakage. Use of the seating technique requires that fluting be done before the final edge pressure retouching. Also, the point's tip must be left dull and rounded when seated for fluting, the final sharpening to be completed after the flutes are successfully removed.

Micro-wear analysis of the Clovis point was precluded by its battered nature, the result of tumbling and water abrasion while it was carried in the Mohawk River. The blade edge above the basally ground area has been blunted by numerous small, random nicks, although the basal grinding itself remains well defined. Surprisingly, the point was found intact in the river. Two breakages near the top of the point have occurred since its removal from the river.
REFERENCES

Gerity, Thomas

Gorman, Fredrick

Strong, Emory