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During the summer of 1981, Oregon State University archaeologically tested three prehistoric sites on the William L. Finley National Wildlife Refuge. Among the sites tested were typical Willamette Valley floodplain and adjacent upland sites. Most settlement-subsistence pattern models proposed for the Willamette Valley have been generated with data from the eastern valley floor, western Cascade Range foothills. The work at Wm. L. Finley National Wildlife Refuge provides one of the first opportunities to view similar settings along the western margins of the Willamette Valley.

Subsistence Variability in the Willamette Valley

by

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Chapter 1. Introduction

The William L. Finley Refuge is located in south-central Benton County, about ten miles south of Corvallis, Oregon (Figure 1). The 5,325 acres of this refuge is perhaps the largest land parcel in federal ownership on the floor of the Willamette Valley. The Refuge was established in 1964 and named for William L. Finley, an early naturalist who persuaded President Theodore Roosevelt to create the first national wildlife refuges.

The evaluation of cultural resources in the Finley Refuge began in 1980 with an archaeological survey conducted by Oregon State University. In accordance with various federal legislation (National Environmental Policy Act of 1969, National Historic Preservation Act of 1966, and Executive Order 11593), the U.S. Fish and Wildlife Service was obliged "to inventory, protect, and enhance the cultural environment on the lands they manage" (Wildeson 1977:i). The cultural resource inventory (Peterson, Bell, Brauner 1980) was a preliminary step in

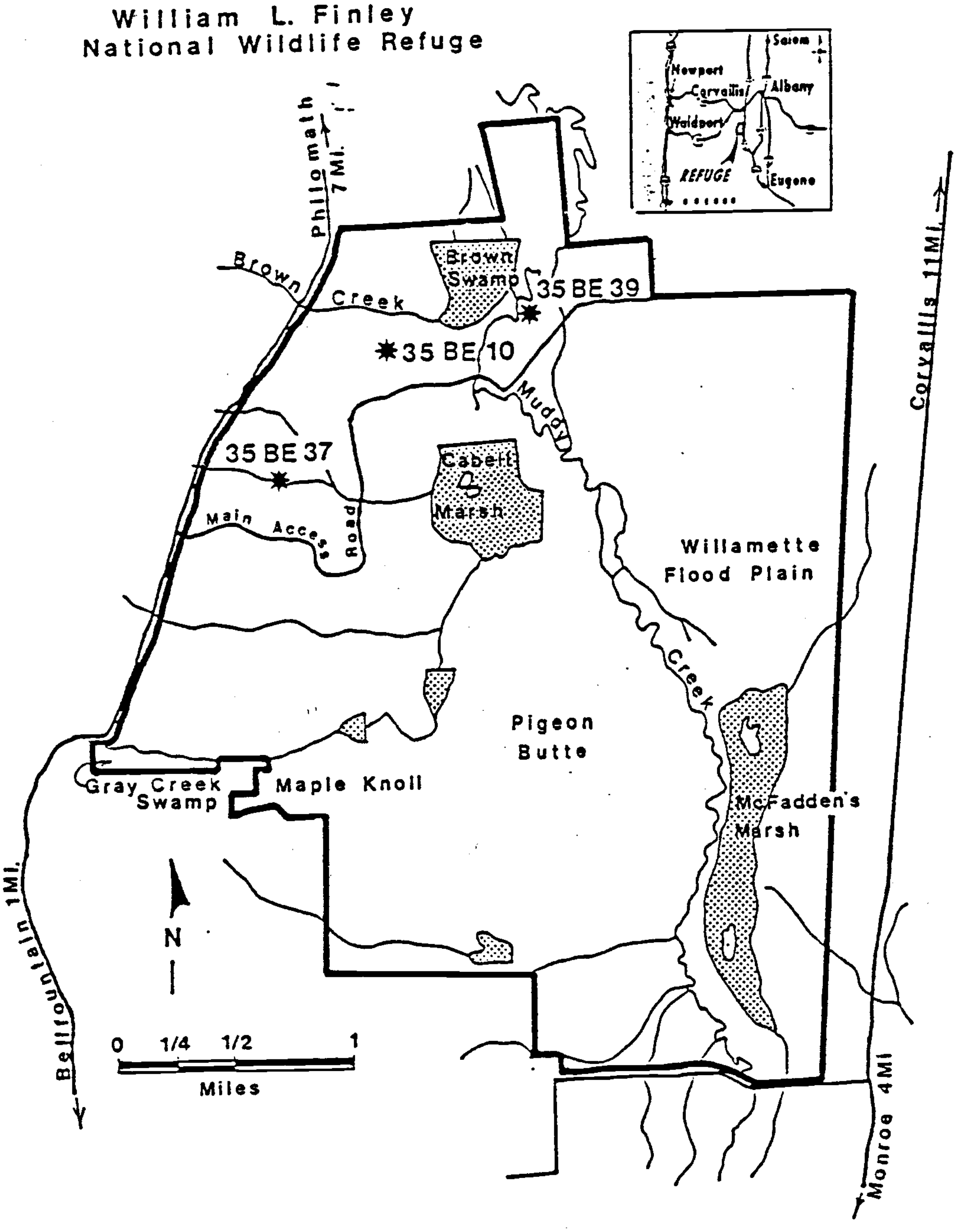

Figure 1. Location of the Wm. L. Finley National Wildlife Refuge.

an effort to meet the cultural resource management requirements. The results of the survey are summarized as follow:

> The area encompassed by the boundaries of the William L. Finley National Wildlife Refuge contains landforms and vegetation types that would have provided year-round subsistence for the Kalapuya. Valley edge, alluvial valley plains, flood plain, and riparian ecozones are all located in the study area. As ethnographic data reveals, there was probably a specific band of Kalapuya who centered their seasonal habitations on Muddy Creek (Muddy Creek band).
>
> Seven prehistoric sites have been located in the study area, and it is very probable that numerous other prehistoric sites are present. The Regional Archeological survey system analyses has predicted the location of known and unknown prehistoric sites based on polythetic settlement criteria. The study area would have been desirable for habitation by hunting/gathering societies. It is probable that the study area could have been inhabited during the late Pleistocene by hunting/gathering cultures other than the Kalapuyans (12,000 to 8,000 years Before Present). The only reliable method of determining the real significance of the prehistoric archeological sites on the Finley National Wildlife Refuge is to undertake excavation and analysis of artifacts. This method is expensive and is not presently required under existing federal laws and budget restraints. In the future, it may be feasible to undertake excavation of prehistoric sites in the study area and refine the understandng of their significance (Peterson, Bell, Brauner 1980:75-76).

Archaeological test excavations were conducted in July and August of 1981 under the direction of Dr. David Brauner, Oregon State University. The field work was accomplished by Department of Anthropology Archaeology Field School students. This work presents the results of the investigation of three prehistoric sites, namely, 35BE37, 35BE39, and 35BE10. The results of the historic sites test investigations, supervised by Judith Sanders-Chapman, is on file at Oregon State University Department of Anthropology.

In accordance with the Federal Antiquities Permit (U.S.D.I. Permit FIN-81-9) and the U.S.D.I., U.S. Fish and Wildlife Service, Western Oregon Refuges Order No. 13590-0042-H, I have formulated five overlapping research objectives for the analysis of three prehistoric site collections from Finley National Wildlife Refuge.

1. A presentation of a model for the Kalapuya subsistence patterns proposed for the western margins of the central Willamette Valley,
2. The establishment of artifact production stages indicative of past behavioral systems,
3. Interpretation and assessment of functional characteristics of the artifact assemblages from each archaeological site based on the use-wear observations, the production stage analysis, and site context information,

4. The construction of an artifact typology which is sensitive to previously established classification systems but which also reflects the variability inherent in schemes, and
5. The discussion and conclusions of the information base in terms of the applicability to both regional research and future research endeavors on Finley National Wildlife Refuge lands.

Chapter 2. Environmental Setting

Geography

The large, broad floodplain of the Willamette Valley lies between the Cascade Range on the east and the Coast Range on the west. The valley extends from the Columbia River south to a point near Cottage Grove, Oregon, where the two mountain ranges converge with the small Calapuya Range. The entire valley is about 210 kilometers long (110 miles) and averages 40 kilometers wide (25 miles). The Salem-Eola Hills, a range of rather low hills, traverse the valley and thus form a natural boundary between the northern and southern Willamette Valley (Balster and Parsons 1969:116). The southern division of the Willamette Valley Physiographic Province is characterized by low relief and slightly incised valleys (Baldwin 1976:53). The north-facing slope of the valley floor gradually increases in elevation from 50 meters at Salem, 129 meters at Eugene, to 130 kilometers above sea level at the Calapuya Range on the southern boundary. Consequently, the Willamette River, the dominant feature of the valley, is a rather large, sluggish stream (Franklin and Dyrness 1973:16). The Willamette River has cut a number of channels through the valley, subsequently changing its course and filling the old channels with silts from seasonal floods. Several tributary streams have deposited enormous quantities of sediments, transforming the valley into an alluvial plain dissected by several sub-basins.

Geology

The Willamette Valley is the southern extension of the Puget-Willamette Trough, a broad structural depression with a rather young geologic history. All of the rock formations underlying the valley have been laid down within the last fifty million years (Willamette Basin Task Force 1969:13). Sedimentary and volcanic rocks of the Eocene Age border the western edge of the valley and extend east under the valley fill material to the Cascade Range. These rocks are mainly submarine pillow basalts, conglomerates and tuffaceous sandstones and siltstones (Franklin and Dyrness 1973:16). Miocene Age rocks, primarily basalts, outcrop along the eastern boundaries of the valley.

The early deposits have been worn by erosion during the valley formation and later covered by thick Quaternary alluvium deposits to a depth of about thirty meters; these Quaternary deposits are poorly understood apart from the uppermost sediments (Franklin and Dyrness 1973:16). Silt, sand, and some gravels were carried by the floodwater from the lower channel of the Columbia River down the entire valley as far south as Eugene, Oregon. There may have been several floods caused by the glacial melt in the late Wisconsin period, but the Spokane Flood, about 20,000 years ago, was probably the largest. Another period of inundation, occurring about 10,000 to 14,000 years ago, deposited a thin cover of silt and ice-rafted erratics to points as far south as Harrisburg, Oregon (Franklin and Dyrness 1973:16). This final retreat of the continental glacier created a backwash of melt water in the Willamette Valley to a depth of 122 meters (400 feet) (Allison 1935:621). The materials deposited from this period of inundation now form sand and gravel terraces on the margins of the major rivers and streams (Parsons, et al. 1970:486).

By the end of the Wisconsin glaciation, the rivers had been reduced and carved into a floodplain bounded by low cliffs formed in the Pleistocene lakebeds. A partially cemented coarse gravel layer found near the top of the alluvial fill is the present level of the Willamette River. The sediments which serve as material for soil formation lie directly on the coarse gravel layers and have been named the Willamette Silts by I. S. Allison (Allison 1953:1-18).

Soils

The general soil associations found on the Wm. L. Finley Refuge include: 1) Waldo-Bashaw Association; 2) Woodburn-Willamette Association; 3) Dayton-Amity Association; and 4) Jory-Bellpine Association. The following description of the soils association and general landscape are derived from Balster and Parsons (1968:5-15) and Knezevich (1975:2, 4, 8).

The Waldo-Bashaw Association is classified as a Typic Pelloxevert. It consists of a deep, fine-textured soil, excessively-drained to poorly-drained, developed on nearly level or slightly concave flood plains, fans, and terraces. Slopes are 0 to 3 percent and elevation ranges from 200 to 450 feet. This association, characterized by poorly-drained, silty clay loams and clays formed in recent alluvium, is found along Muddy Creek.

The grasslands occupy a mosaic of Woodburn and Dayton silt loams. Both the Woodburn-Willamette Association and the Dayton-Amity Association occur in areas dominated by deep, well-drained to poorly-drained soils of the Willamette Valley terraces and higher knolls. The Woodburn-Willamette Association are moderately well-drained silt loams formed in mixed alluvium and are classified as Argixerolls. Slope gradients are 0 to 2 percent and may range up to 20 percent along terrace scarps. Elevation range estimates are from 200 to 300 feet.

The Jory-Bellpine Association soils are found in areas dominated by shallow to deep, well-drained to somewhat poorly-drained soil of the foothills. This association consists of a moderately deep silty clay loam surface soil over clay and is typically formed in colluvium from sedimentary rocks. Slopes are 2 to 50 percent. The association is common to broad ridgetops and relatively stable landscapes that probably have been developing since middle or early Pleistocene times. The soils, therefore, may be considered old and probably have been subjected to several changes in vegetation and climate. Small, historic home sites are common in this association (Peterson, Bell, Brauner 1980:9).

The reconstruction of the postglacial history of the alluvial flood plains in the Willamette Valley (Balster and Parsons 1968) identify nine major and four minor geomorphic surfaces. Because geomorphology and soil formation are often directly related, an understanding of soil types is supplemented by a study of landform units. The four major geomorphic units dominating the surface of the Wm. L. Finley Refuge are included here for the purpose of providing approximate dates for land surfaces found on the refuge. According to Balster and Parsons (1968:5-9), the geomorphic surfaces in order of their age from oldest to youngest are : Dolph Unit; Winkle Unit; and Ingram Unit. The age of the Dolph Unit surface is considered to be Middle Pleistocene. Sedimentation beneath the Winkle Unit began at least 12,000 years ago and may have begun as long as 34,000 years ago. The abandonment of the Winkle Unit as a flood plain probably occurred between 3,000 and 5,000 years before present. The Ingram Unit ceased to serve as a flood plain sometime between 500 and 3,200 years ago. The Ingram and Winkle Units predominately occur west of the present course of the Willamette River between Albany and Eugene, Oregon.

Climate

Since the Willamette Valley is located between the Coast and Cascade Ranges, it is subject to a warm and dry climate typical of interior western Oregon valleys. Atmospheric circulation is generally from the west, resulting in mild weather conditions due to the moderate ocean temperatures being transported inland by the strong westerly flow (Loy 1976:128). Precipitation in the valley increases rapidly with the elevation rise, ranging from an average of 102 cm. (40 inches) on the valley bottom to 254 cm. (100 inches) in the higher mountain ranges (Balster and Parsons 1969:116). The less frequent continental interludes occur when the atmospheric circulation originates with an inflow of air from the north. This pattern results in the infrequent bitterly cold days of winter and the sweltering conditions with convection summer thunderstorms. Representative climatic data from the Corvallis, Oregon weather station, located about 16 km (10 miles) north of the William L. Finley National Wildlife Refuge, are presented in Table 1 (U. S. Weather Bureau 1965).

Table 1. Climatic data, Corvallis, Oregon Weather Station.

Mean Annual Temperature	11.6°C	(53.0°F)
Mean January Temperature	4.1°C	(39.4°F)
Mean July Temperature	19.2°C	(66.6°F)
Mean January Minimum Temperature	0.6°C	(33.1°F)
Mean July Maximum Temperature	27.1°C	(80.8°F)
Average Annual Precipitation	957mm	(37.67 in)
June-August Precipitation	49mm	(1.93 in)

Flora

The vegetation of the Willamette Valley has long been subjected to extensive alteration resulting from human activity. Most natural grasslands found in the valley are believed to have been maintained by periodic burning. Man, both aboriginal hunter-gatherer and historic farmer, modified the natural vegetation by clearing brush and inhibiting woodland succession. The burning of prairies by the Kalapuya formed an integral part of the annual subsistence activities. This annual activity promoted the native grass seeds, aided in harvesting plant seeds (primarily tarweed and sunflower), wild honey, and insects (caterpillar and grasshopper). Ethnographic references to the use of fire in communal hunting of deer and elk has been recorded in the Mary's River myths (Jacobs 1945:228). Woodland areas were confined to the more active floodplains adjacent to the Willamette River, the major tributaries, and to the higher and steeper slopes of the Cascades, foothills, and Coast Range. Several early accounts of the valley mention the fires and comment on the large areas affected. In the fall of 1826, David Douglas, an English botanist, noted that the valley was so thoroughly burned that he could find no fodder for his horse except in swales or other wet areas (Johannessen, Davenport, Millet, McWilliams 1971:390). The Euroamerican farmers maintained the prairies to promote pasture and develop agricultural land. Tree ring growth studies have since established continuous burning patterns in the Willamette Valley from 1647 to at least 1848. The latter date substantiates the historic farming activities of fire control (Habeck 1961:67). Today, field burning is still an honored practice across the entire Willamette Valley. The long-term activity of prairie burning, combined with the development of farm lands, cities, and industry, has greatly altered the nature and distribution of the original vegetation.

From early written accounts and the 1850 survey records compiled by the Federal Land Survey Office, James Habeck (1961) has composed a general picture of the Willamette Valley vegetation at the time of Euroamerican settlement. The vegetation of the Wm. L. Finley Refuge; presented in Figure 2, depicts the present vegetation division used by Habeck. Five major types of plant communities were present in the valley: bottomland forest; prairie grasslands; oak savannas, oak forests; and Douglas fir forest (Habeck 1961:69-74).

Bottomland forest communities occupied the floodplains of the Willamette River and areas adjacent to the main tributaries. Common to this community were white ash (*Fraxinus americana*), black cottonwood (*Populus trichocarpa*), Douglas fir (*Pseudotsuga menziesii*), and bigleaf maple (*Acer macrophyllum*). Occasionally noted were willow (*Salix* spp.), Oregon white oak (*Quercus garryana*, California laurel (*Umbellularia*), red alder (*Alnus rubra*), and cherry (*Prunus* spp.). This environment includes many secondary species, all of which were important food plants to the Kalapuya: tall and dwarf Oregon-grape (*Berberis aquifolium* and *B. neryosa*), salmonberry (*Rubus spectabilis*), elderberry (*Sambucus*

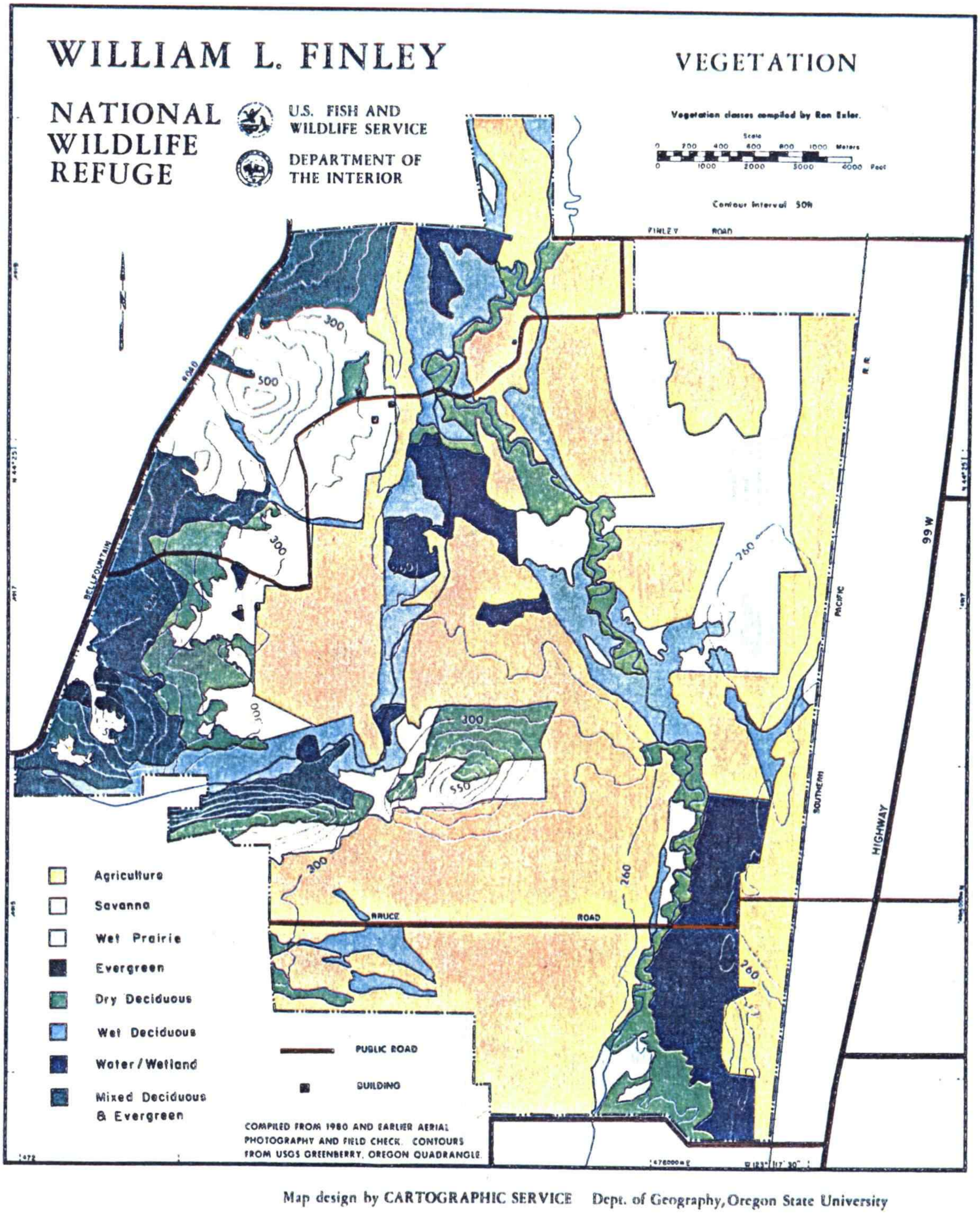

Figure 2. Vegetation in the Wm. L. Finley National Wildlife Refuge.

spp.), rose (Rosa spp.), hardback (Spirea douglasii), ninebark (Physocarpus capitatus), and cascara buckthorn (Rhamnus porshiana) (Ross 1978:10).

Prairie grasslands occupied a large portion of the central Willamette Valley. A small portion of this area was low, wet prairie; the remainder was upland prairie. Two community types of primary species has been presented by Ross (1978:10) and are as follows. Species common to upland prairie include: spika bentgrass (Agrostis exarata), shortawn foxtail (Alopercuscus aequalis), American sloughgrass (Beckmannia syziganchne), tufted hairgrass (Deschampsia danthoniodes), creeping lovegrass (Eragrostis hypnoides), blue grass (Poa triflora), nodding trisetum (Trisetum ceruum), Hall's bentgrass (Agrostis halli), wheatgrass (Agropyron pauciflorum), California brome (Bromus carinatus), Columbia brome (Bromus vulgaria), California danthonia (Danthonia californica), western fescue (Festuca occidentalis), bearded fescue (Festuca sublata), fall trisetum (Trisetum canescens), and annual hairgrass (Deschampsia danthoniodes). Common to the low, wet prairies are: spika bentgrass, shortawn foxtail, tufted hairgrass, annual hairgrass, slender spike managrass (Glyceria leptostachya), western managrass (Glyceria occidentalis), weak managrass (Glyceria pauciflora), rice cutgrass (Leersia oryzoides); and camas

(*Camassia quamash*). The relative importance of grass seeds for the Kalapuya is not ethnographically reported by species; however, camas was a significant aboriginal food source.

Early surveyors recorded "oak openings" in nearly all of the townships mapped in 1850. The term refers to the open oak savannas consisting of thinly scattered Oregon white oaks (*Quercus garryana*), occasionally mixed with Douglas fir. The understory was a mixture of grasses, forbes, and scrubs; however, specific mention of the understory in the survey notes is limited to the terms "grass" and weeds." Secondary species in the oak openings mentioned in the notes and of importance to the Kalapuya were California hazel (*Coryles cornuta californica*) young oaks, and "ferns" (Ross 1978:10).

Oak forests dominated only a small percentage of the Willamette Valley. The white oak was common; Douglas fir, red alder, and laurel were occasionally represented. Secondary species include bigleaf maple and herbaceous flora of "ferns" and "weeds."

Douglas fir forests dominated both the western and eastern edges of the valley at distinctly higher elevations. Associated with this forest setting, the following trees are occasionally noted: western hemlock (*Tsuga heterophylla*), bigleaf maple, Pacific dogwood

(*Cornus natallii*), vine maple (*Acer circinatum*), white oak, laurel, and western red cedar (*Thuja plicata*).

Fauna

The William L. Finley National Wildlife Refuge encompasses a variety of habitats within the 5,325 acre parcel (see Figure 2). Oregon oak and maple woodlands, Oregon ash thickets, second growth Douglas fir, brushy hedgerows, marshes, meandering creeks, open meadows, pastures, and cultivated fields provide sanctuary for many forms of wildlife (U.S.D.I. Fish and Wildlife Service 1983). Nearly all species of animals found in the Willamette Valley are represented in the inventory of the refuge. An extensive list of all the mammals, birds, fishes, amphibians, and reptiles has been compiled from records kept since the establishment of the refuge in 1964 and are presented in Appendix A.

Aboriginal settlement patterns and subsistence practices in the Willamette Valley are tied to the abundance and distribution of the natural resources. Those species that may have been economically important to the original inhabitants are discussed in Chapter 3. Food preparation and collection techniques, as well as seasonality, are reflected in the traditional tool assemblages. Settlement patterns in the central

Willamette Valley from the times of aboriginal occupation throughout the period of Euroamerican settlement are constrained by the physical features of the territory. The Kalapuya social structure was shaped by and provided the mechanism for successful exploitative possibilities of the environment. A wide dispersal of the population and the frequent movements of subgroups occurred during the harvest season in the early spring into fall. The small micro-bands served to most efficiently exploit the selective areas for plant, fish, and game resources dispersed across the floodplains and marsh lands. During the late fall, the population moved into more permanent settlements located above the active floodplains. The mountains, rivers, and prairie bottomlands played an important part in the traditional Kalapuya life cycle. Rivers provided food, transportation, and cobbles for stone tools. Mountains provided prime hunting grounds, supplemental vegetal foods, and places for spiritual retreat. The marshy bottomlands were abundant in edible roots, small game, and waterfowl.

Chapter 3. Ethnographic Setting

The archaeological record from Finley National Wildlife Refuge provides a means of inferring past cultural patterns and reconstructing environments. The ethnographic and historical records describing the Kalapuya are fundamental in ascertaining the most accurate interpretation of the archaeological record. Comparisons are made between the historic information of known cultural patterns and the prehistoric cultural remains. This method, known as ethnographic analogy or the direct historical approach, is essential to the functional interpretation of cultural remains and inference of past lifeways of the aboriginal inhabitants.

Linguistic Identity and Distribution

In historic times, the entire Willamette Valley, from about the Willamette Falls at present day Oregon City and extending south to the middle course of the Upper Umpqua River River region, was occupied by a population known as the Kalapuya. The Kalapuya are identified as a group speaking a series of closely related languages broadly affiliated with the Penutian Stock. The general area, however, is characterized by great linguistic variability. The second largest group to inhabit portions of the valley were the Upper Chinooks. Chinookan-speaking peoples occupied the area from the Willamette Falls to the confluence of the Willamette River with the Columbia River (Hodge 1912:274). A small portion of the northwest section was represented by the Athabascan-speaking Clatskanie, inhabiting the area along the Upper Nehalem and Clatskanie Rivers. From the summit of the Coast Range to the Pacific Ocean and along the northern coastal rivers were the Salish-speaking bands of the Tillamooks. The central coast was occupied by the Penutian-speaking Yaquina, Alsea, Siuslaw, Lower Umpqua, Hanis Coos, and Miluk Coos. A separate group of Athabascan-speakers, including the Upper Umpqua, the Upper Coquille, and Shasta Costa, neighbored the Kalapuya on the southernmost boundary (Figure 3).

The term "Kalapuya" is used in a variety of ways in the ethnographic and ethnohistoric sources. In a general sense, it is used to refer to speakers of a group of closely related, but distinct, languages. In a particular sense, it denotes a small group residing in the upper reaches of the Willamette Valley. Within this broad linguistic grouping, three different language groups and at least eleven distinct dialect/settlement communities are further differentiated.

It is reported that the term "Kalapuya" received its origin from the Chinookan term for the Willamette Valley

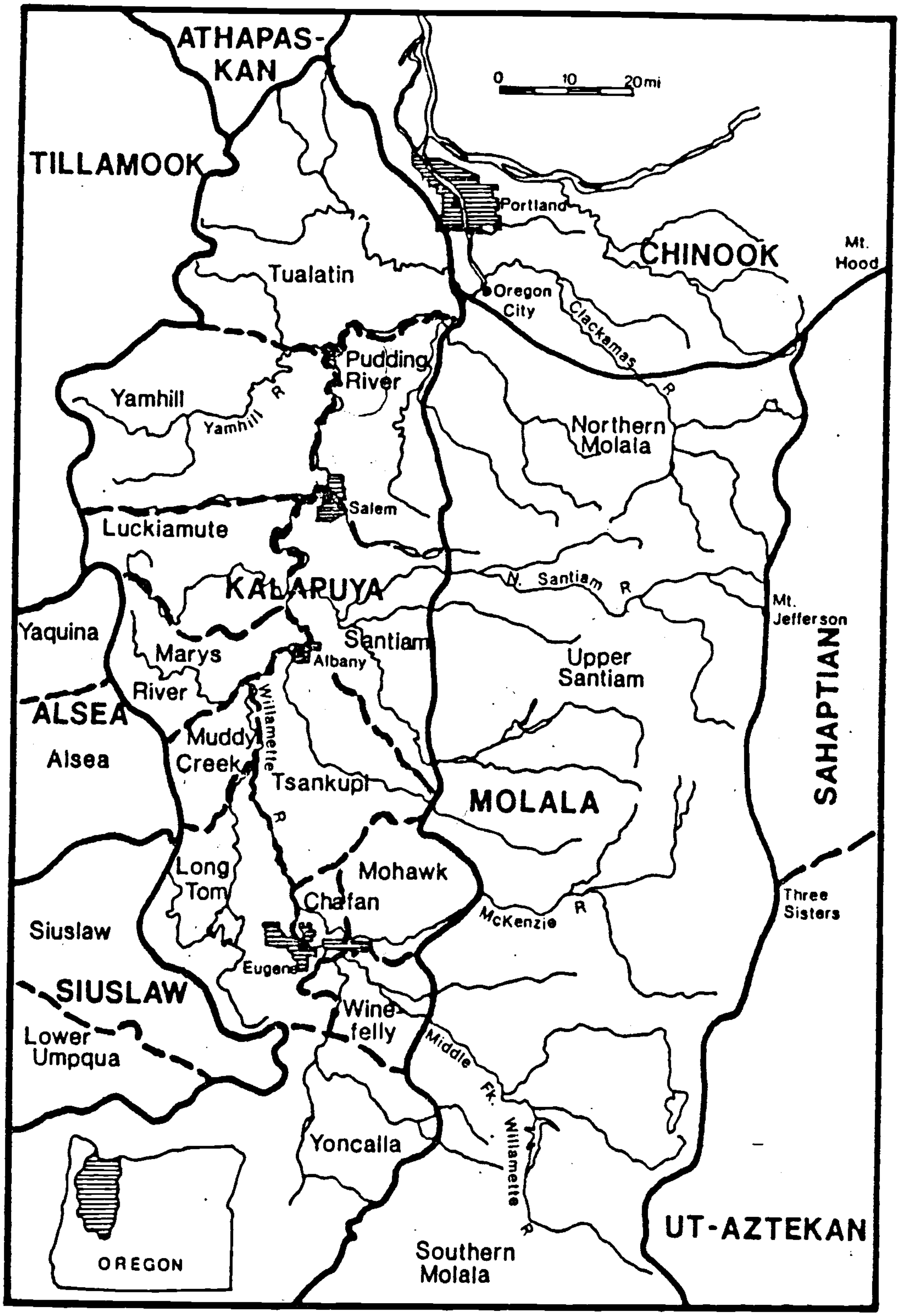

Figure 3. Oregon Indian Distribution in 1850
(Beckham 1976:17).

people, *it-galapu* *ywi-yu-ks* (Zenk n.d.:13-14). Explorers, early settlers, and other Euroamericans reported more than all imaginable variations to the spelling of Kalapuya. Based on the work of Hodge (1907:187-188, 646), Zenk (n.d.:14), and a compilation from the literature review, the variations are presented in Table 2. Kalapuya is the standard term used by linguists and anthropologists.

Table 2. Variations for the Term Kalapuya.

Calapooa	Kait-ka (Umpqua name)
Calapooah	Kalapooiah
Calapooias	Kalapooyahs
Calapoosas	Kalapua'yuks
Calapooya	*Ka'lapu'.ya
Calapuaya	Kallapooya
Calapuyas	*it-galapu'ywi-uy-ks (Wasco-Wishram and Cascades name)
Calipoa	*itkalapu'yawayks (Clackamas name)
Calipooias	Tsanh-alokual ami'm (Luckiamute name)
Calipoyas	Vule Pugas
Calipuyowes	Vule Puyas
Cal-iah-po-e-ouah	
Callapipas	
Callapohyeaass	
Callapootos	
Cal-lar-po-e-wah	
Callipooyas	
Call-law-poh-yea-as	

Linguistically, the Kalapuya Family, a member of the Penutian Phylum, has been divided into three subgroups or dialects (Figure 4): 1) Tualatin-Yamhill, the northern groups in the Lower Willamette Valley; 2) Santiam, the central Willamette Valley groups that consisted of eight

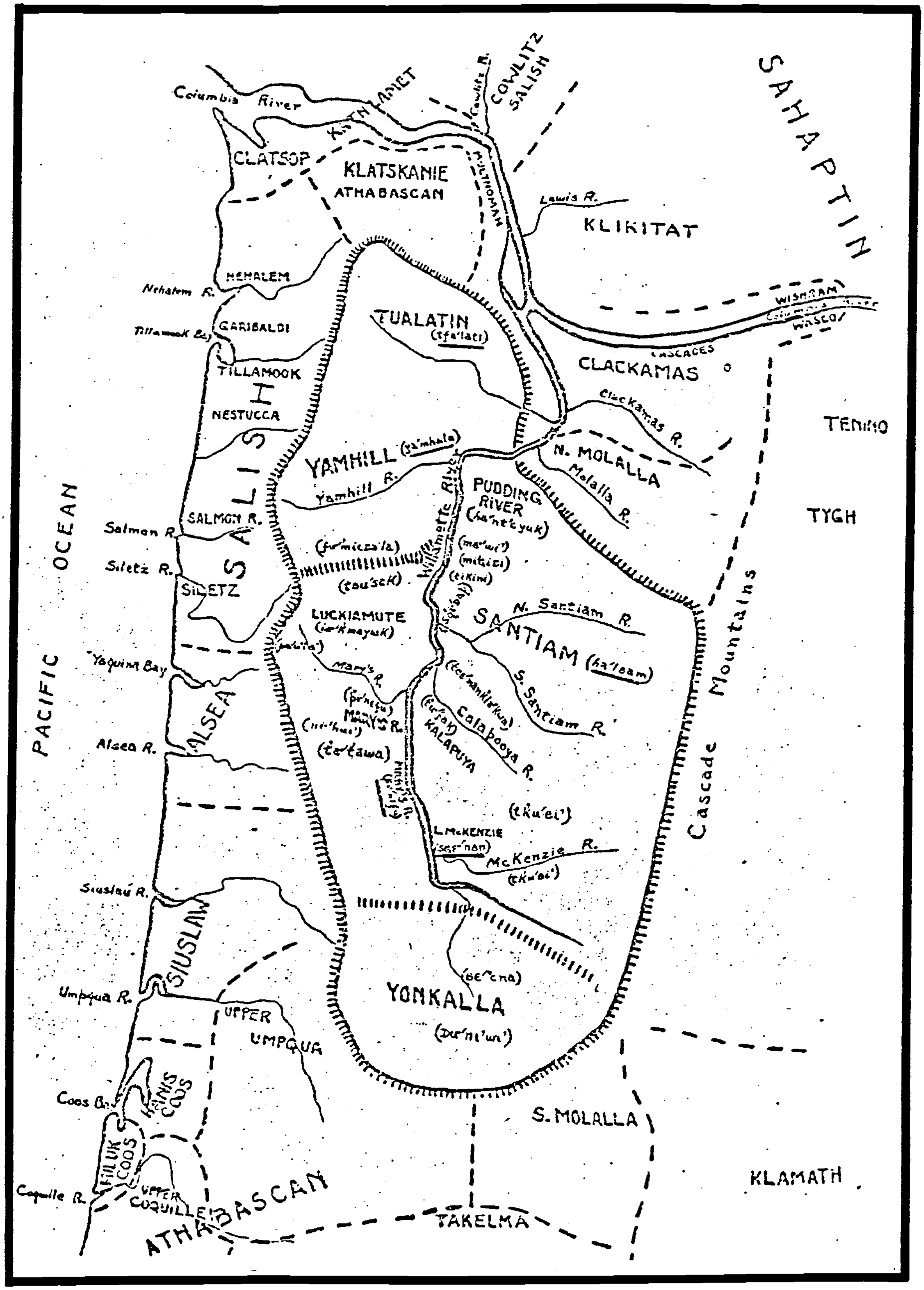

Figure 4. The Kalapuya communities (Jacobs 1945).

to a dozen or more dialects; and 3) Yonkala, the southern group situated in the Upper Umpqua drainage basin (Frachtenburg 1918:181-182, Jacobs et al. 1945:145-146, 154).

Linguists have determined that by the nineteenth century, the Kalapuya sub-groups of the Willamette Valley had differentiated into the three nearly distinct languages; furthermore, Jacobs (1937:66) states that "the surprising divergence of the three mutually unintelligible Kalapuya languages suggests a long antiquity of residence in the valley." Based on glottochronological estimates, Swadesh (1956:17-41) indicates that the Kalapuyan speakers had been in the Willamette Valley for at least 1000 to 2000 years. Nevertheless, by 1915 or 1920, Jacobs (1945:8) reports the Kalapuya, "a dead language from the point of view of functioning in daily conversation."

While anthropologists agree that the Kalapuya occupied the greater portion of the Willamette Valley, there is disagreement as to the exact territorial boundaries claimed. Territoriality implies ownership in a private or corporate sense. These concepts require a high level of supralocal political organization not appropriate to the Kalapuya. It has been suggested that this was only where there were villages wherein the boundaries were well defined, and as the distance increased from the village, boundaries would begin to fade (Arneson 1980:398; Garth 1964:45). Territorial boundaries are best described as indistinct, consisting of "ill defined" marginal areas (Berreman 1937:9). A firmly demarcated nuclear territory is represented by the winter village site. Beyond the village site was a much wider area, perhaps best described as a resource sphere or peripheral area. The peripheral territory is often jointly exploited in common by adjacent groups. Although the boundaries might be vaguely defined or involve overlapping claims by adjacent groups, this should not be confused with a disregard for the land. An observation by Schoolcraft (1853:202) is appropriate:

> The extent of the territory claimed is usually bounded by rivers, mountains, preeminent rocks or trees; and although their landed possessions do not appear to cause them much solitude, I recollect upon one occasion a chief of the Callapuya camp to may camp, and after pointing out the tops of certain hills, and other natural objects, as the boundaries of his country, expressed a hope that this would not be taken from them by whites.

The northern Kalapuya divisions are better documented so it is not surprising to find consistent interpretations of the territorial divisions for the Tualatin, Yamhill, Pudding River, Santiam, Luckiamute, and Mary's River groups. Discrepancies arise over discerning the eastern and southern extent of the Kalapuya region. Admittedly, any attempt to delineate this boundary based on the available ethnographic data is confusing. While Jacobs and Berreman extend the central domain as far east as the crest of the Cascade Mountains, Beckham limits the region to the Willamette Valley edge. Jacob's interpretation extends the central Willamette Valley group, the Santiam, to the Cascade crest, separating the Molalla into a northern and southern group. Several anthropologists (Jacobs 1937, Murdock 1938, Ray 1938) offer one hypothesis. They suggest that the Molallas once occupied the Warm Springs Reservation area on the east side of the Cascade Mountains until the Tenino's took an interest in the productivity of the fishing sites. At about A.D. 1820, the Molallas purportedly pushed to the west side of the Cascades where they intruded on the Kalapuyas of the Willamette Valley. An accord was reached between the tribes with the Molallas obtaining possession of the valley slopes and the Kalapuya retaining control of the bottomlands (Garth 1964:45).

Within the larger Kalapuya group, the language divisions are further differentiated into small localized dialect/settlement communities. Each dialect group was localized in a cluster of villages situated on, along, or near the rivers and streams flowing into the Willamette River (Jacobs 1945:45). The central Willamette Valley area encompasses the Calapooya River, McKenzie River, Mary's River, Luckiamute River, and includes the area which comprises the Wm. L. Finley National Wildlife Refuge. These localized groups are characterized by Zenk (1976:18):

> ...each "tribe" or "band" elsewhere documented to have probably been a dialectal-ethnic entity seems to occupy its own valley or basin formed by one of the larger tributaries of the Willamette River; each such major valley offered a range of riverine, lowland, and upland types of habitat.

In other words, the small dialect communities were highly differentiated at the local subsistence level. A group defined a "nuclear" territory where villages were located, a subsistence range for the food-gatherers, as well as regulating a set of social relations. Each valley or basin settlement focused along the resource spheres, whereby each ecotone provided a wide range of foods. The "peripheral" territory, located on the outer margins, was less exploited and often shared with neighboring groups. For instance, the Tualatin described the general Coast Range as "halfway in the mountains" or a peripheral territory that "various neighboring groups of the area shared access to productive locales" (hunting, berry-gathering, fishing) (Zenk 1976:47).

According to William Hartless (1923), one of the last surviving Mary's River people, the Mary's River group was composed of three divisions: 1) Riverside, 2) Middle Mary's River, and 3) Mountain. Whether the divisions relate to areas of residence, subsistence territories or distinct kinship groups is unclear. However, Zenk's (1974:1677) extensive work with the northern-most Kalapuya, the Tualatin indicates that:

> ...each winter-village group held its own rights of access to certain subsistence resources in certain locales, but that the lot of these groups shared access to productive locales within a larger common territory.

Based on the field notes of Albert S. Gatschet (Hodge 1907, 1910), the treaty documents (Gibbs and Starling 1851, Belden ca. 1855), and various ethnographic and historic sources, Zenk (n.d.) has compiled the most complete listing to date of the Upper Willamette Valley Kalapuya groups. Additional research provides a complete list of the Kalapuya groups focusing on the central Willamette Valley (Table 3).

The territory encompassing what is now the Wm. L. Finley Wildlife Refuge was occupied by the Muddy Creek band of the Kalapuya. Berreman (1937:21-23) and Jacobs (1945:154) refer to this band as the Mary's River group. Berreman (1937:23) notes that sometimes the Mary's River band is included with the Luckiamute band; yet more often, he notes, they are separate. However, the most current

Table 3. Central Willamette Valley Kalapuya Groups in Various Sources.

Documented Groups (Zenk n.d.)	Dayton Treaty 1855	Gatschet (in Hodge 1907)	Others	Location (Beckham 1977)
Yamhill	Yamhill	Yamel	Si-Yahm-ill	South fork of Yamhill River and south to vicinity of Rickreau Creek
Pudding River	Unrecognized	Ahantchuyk		French Prairie between Pudding River and Willamette and south to Salem
Champpeg	Unrecognized	Mentioned village, little known	Pudding River (Berreman 1937)	East bank of Willamette opposite the mouth of Chehalem Creek
Santiam	Santiam	Ahelpam	Chehalpem (Gibbs 1851)	East side of Willamette between Salem and Albany and east of base of Cascades
Luckiamute	Chelukimauke[1]	Lakmiwt		Valey of Luckiamute River
Marys River	Chepenapho or Marysville	Chepenefa	Chapanafu (Berreman 1937)	Watershed of Marys River, near Corvallis
Incompletely Identified Kalapuya Groups				
Muddy Creek	"Maddy"[2], Muddy Creek Chemaphe	Chemapho	Apinefu, Pineifu (Swanton 1950)	Along Muddy Creek, south of Marys River
Tsankupi	Tekopa	Tsankupi	Calapuya (Berreman 1937)	Calapooia River, Brownsville area

Notes:

1. Tsan, Che, Cha, or Cham is a Kalapuya prefix indicating a place.
2. The name "Maddy," given in the Dayton Treaty, may be a mistake for "Muddy Creek." (Belden (ca. 1855) shows the latter (Gatschet, in Hodge 1907).

research by Beckham (1977:36) and Loy (1976:6) isolate the Muddy Creek band as a separate social-political entity from the Mary's River band.

The Reconstruction of Kalapuya Culture

The reconstruction of aboriginal subsistence and settlement patterns is complicated by the massive changes which occurred in response to Euro-American contact.

A series of events during the late eighteenth and early nineteenth centuries disrupted all aspects of the Kalapuya lifeway. Introduced diseases such as smallpox, influenza, measles, malaria, and venereal diseases resulted in the rapid decimation of the Kalapuya population. An estimated fifty percent of the population was decimated by the 1782-83 smallpox epidemic (Mackey 1974:21). Between 1830 and 1833 a malaria epidemic known as the "fever and ague" further reduced the population an additional seventy-five percent (Mackey 1974:21). The disease persisted, depopulating entire villages and forcing survivors to shift settlement into new political groups. During the winter of 1836-37 an official agent of the United States, William A. Slacum (1912:184) estimated: "Since 1829 the 'fever and ague' had killed from 5,000 to 6,000 Indians along the Willamette and that there were only 1,200 natives left in the valley." Lacking the antibodies to fight these diseases, the Kalapuya disappeared so quickly that little was recorded of their culture.

The Kalapuya cultural system was unable to survive the devastating effects of disease, as Ratcliff (1973:32) describes:

> The Kalapuyan economy of hunting, fishing, root digging, berry gathering, and intertribal trade seems to have been sufficiently depleted in the first thirty years of white contact to cause the natives considerable hunger and starvation. No record exists as to how many Kalapuya died from the disease as compared to starvation in the decade following the last great epidemic in 1830. However, continual hunger weakens resistance to disease, and therefore, the two may have worked together to cause the eventual extinction of the Kalapuya, as a people.

By 1846 the Willamette Valley, considered to be prime agricultural land in the Oregon Territory, was already fully claimed by Euroamerican immigrants. Treaties signed in 1854 and 1855 resulted in the removal of the remaining Kalapuya groups to the Grande Ronde Reservation near the Oregon coast.

Only a vague impression of the traditional Kalapuya lifeway remained when the first anthropological material was collected at the Grande Ronde Reservation and the Chemawa Indian Training School (Frachtenburg 1914, Gatschet 1877, Jacobs 1928-1936). The ethnographic information in the Kalapuya Text (Jacobs et al. 1945) is derived from the "memory culture" of the few remaining Kalapuyan speakers at the Grande Ronde Reservation. The informants had incomplete knowledge of the precontact way of life, hence there are large gaps in the cultural pattern derived from the remnant texts. In spite of these shortcomings, the reconstruction of settlement and subsistence patterns necessarily depends on these fragments. Though they are incomplete, it is possible to formulate a general model of aboriginal lifeways to use as a baseline for integrating archaeological sites in the Willamette Valley. A summary of the reconstructed pattern is presented below.

The largest socio-political unit among the central Willamette Valley Kalapuya was the small autonomous patrilineal band. The band was made up of extended families of related males, their wives, and children. The bands were exogamous, patrilocal groups, hence wives were necessarily taken from other groups. Money-dentalia and other valuables, constituting the marriage purchase offer, were considered compensation to the bride's family for the extra work they would have to do after their daughter's departure. Consequently, the man who had many daughters could become very wealthy (Jacobs 1945:46) After marriage, the wife became the property or "valuables" of the husband's family (Hartless 1923). Since the levirite was practiced, a man often had many wives.

Although "headmen" or "chiefs" are mentioned in a variety of ethnohistorical accounts, these were not chiefs in the political sense. The position of headman arose in response to the need for authoritative representation during the 1851 Champoeg Treaty conferences where territorial Governor Gaines requested each group choose three chiefs for representation at the treaty signing. Authority was very limited to giving advice and settling disputes with no power to enforce decisions as law. The headmen had no absolute power and were not formally elected but attained the position either through inheritance or the accumulation of wealth. Hartless (1923) reported that the Mary's River band elected three "chiefs" (or headmen) based on strength of honesty and acquaintance in the group, where: "two were nothing but go-betweens, while the third stayed in village." However, the "chief" served as go-between or spokesman in dealing with the Federal government. He still had insignificant absolute power with the actual social group. It is clear that in the precontact period, the headsman had very little real authority.

The most influential position of importance in Kala-puya society was that of the shaman or religious leader. Through a successful quest of a spirit power considered necessary for achievement in life, any person could obtain a guardian spirit. Due to the strong spiritual and healing powers from their personal guardian spirits, the shaman was not only respected and feared but was influential in all aspects of society. In theory, anyone through the attainment of spirit power could be come a shaman; however, few attained the powerful level of religious leader.

Compared with the other aboriginal groups in western Oregon, the Kalapuya social organization was relatively undifferentiated than the social systems for Coastal and Lower Columbia societies.

Slavery, as practiced among the Kalapuya, was motivated by the desire for the attainment of prestige more than economic gain (Zucker, Hommel, Hogfoss 1983:55):

> Slaves were uncommon in Oregon except for those kept in the lower Columbia area. Slavery sometimes was a temporary situation: people could purchase freedom or have their relatives do so. In most cases persons became slaves through capture, but some became slaves through debt or as punishment for a crime. The slave was usually treated as a poor relative.

As Zucker, Hommel, and Hogfoss go on to report, the central Kalapuya were more often victims of slave raids from groups to the north:

> Molalles and Tualatin Kalapuya, like the Columbia River Chinook speaking people, and

perhaps some others, indulged n profitable slave raids on the central Kalapuya (Santiam, Mary's River, McKenzie River, etc.) villages and other interior Oregon villages further to the south.

Subsistence and Settlement Pattern

Throughout the central Willamette Valley, the Kalapuya followed an annual subsistence round. The following discussion provides a model of the seasonal pattern. The pattern is summarized and presented in Figure 5. Emphasis in the reconstruction of the settlement-subsistence system, based on the ethnographic record, focuses on those aspects of the Kalapuya lifeway that are directly relevant to the interpretation of the archaeological record.

The Kalapuya adaptive strategies of settlement and subsistence were based on a hunting and gathering economy. Subsistence focused on gathering wild vegetables, a primary staple, hunting various indigenous fauna, and fishing. Although the resources within the nuclear territory were jointly shared by the band members, the exploitive options available during the winter months were limited. In winter, each household depended primarily on the preserved food materials procured, dried, and stored in buckets and baskets. Supplementing the food supply required occasional foraging trips to procure game, fish, and waterfowl. Trapping and hunting mammals not only

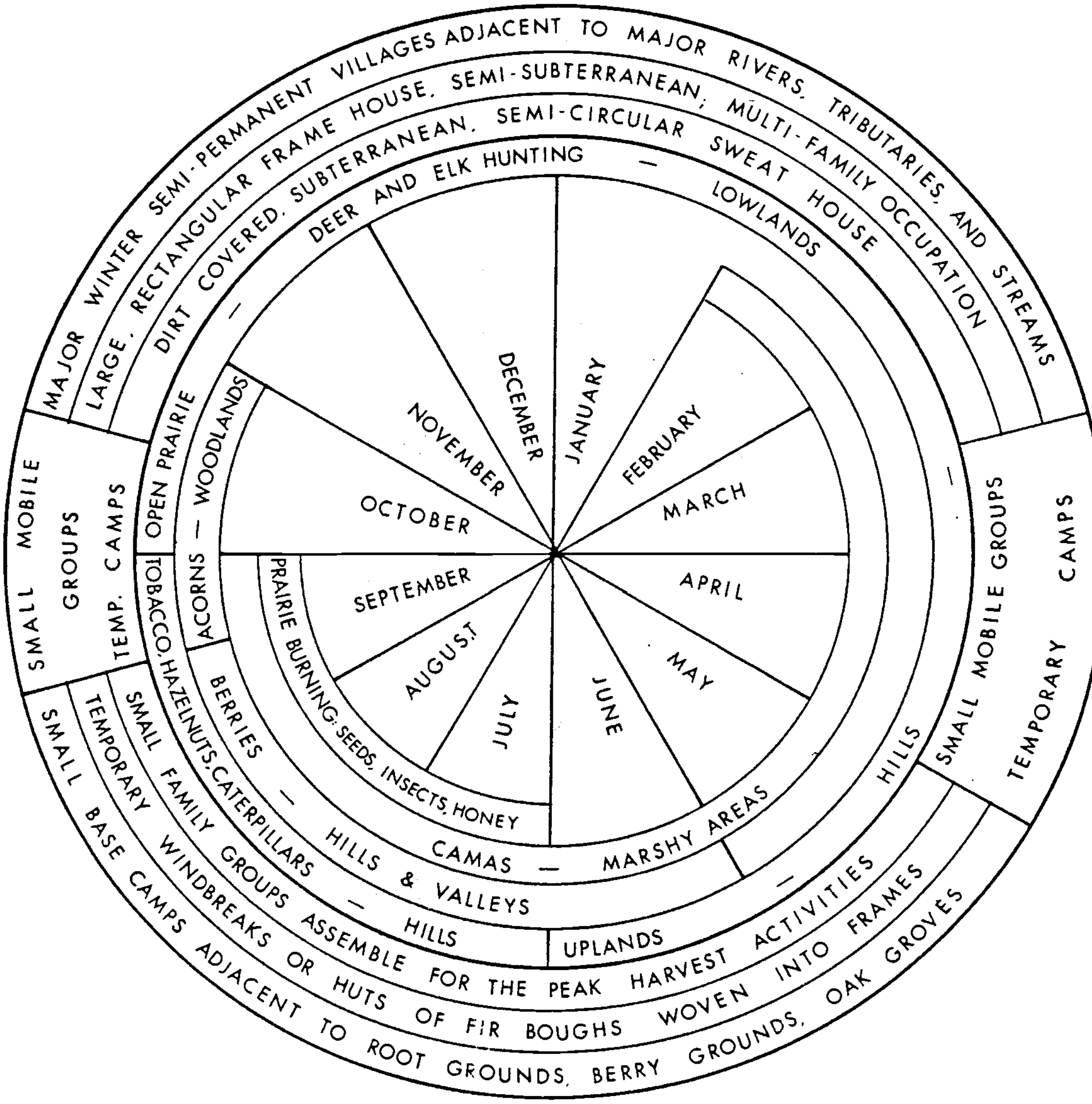

Figure 5. Reconstruction of Kalapuya subsistence pattern (adopted from Jacobs 1945, Hartless 1923, and Zenk 1976). The year-round subsistence activities include trapping small to medium-sized mammals, fishing for anadromous fish, and hunting waterfowl.

supplied food year-round but provided furs for garments and articles of trade. Although a wide variety of mammals were utilized, deer was most highly prized (Jacobs 1945:23, 78). Large herds of deer in the Willamette Valley were noted as late as 1813 by the explorer Alexander Henry (Coues 1897:814).

Riverine resources were significant components of aboriginal subsistence. Several species of non-anadromous fish (Jacobs 1945:17-18) were locally abundant; however, discrepancies in the literature arise over the availability of salmon above the Willamette Falls. After reexamination of the ethnohistorical, archaeological, and biological evidence, McKinney (1984:23-33) concludes that anadromous fish did pass the falls and were a potential food resource for the middle and upper Willamette Valley Kalapuya. However, the size of the spawning run was much more limited for downriver groups. Salmon was no doubt important, but its relative dietary significance for the upper Willamette Valley Kalapuya is not known.

The winter village social and economic organization was based on the communal efforts of the extended families. The families worked together procuring the basics of food, shelter, and clothing. The Kalapuya band's seasonal settlement patterns appear to be a primary response to ensure the procurement of subsistence and the prevention of starvation. Brauner (1976:5) states:

> The absence of dispersed resources, the need for substantial shelter, and a necessity for inter-group cooperation resulted in the aggregation of indigenous populations into semi-permanent winter villages.

During winter, the Kalapuya occupied multi-family houses at winter village sites. Villages were situated in sheltered areas along rivers or adjacent to tributary streams. Winter houses were occupied by several extended families. The houses were up to sixty feet long with as many as ten families occupying one structure.

The ethnographic accounts of the Santiam Kalapuya (Jacobs 1945:39) describe the winter house as follows:

> They had a large house. They dug down in the ground a short distance. And they placed fir bark on the top of it. And some threw dirt over their house. There in the center (of the roof) was a small hole, the smoke went out there. And they had one door for it. They lived in it there when it was wintertime.

Benches placed along the walls served as beds and shelves for storage (Hartless 1923). Subterranean sweathouses were also constructed near the winter village. When not in use, the sweathouse served as a communal center for men and provided a sleeping place for the children (Jacobs 1945:48).

Cemeteries were located near the winter villages. The Kalapuya believed that the soul of the dead journeyed to a new land across the ocean (Jacobs 1945:73). Hartless (1974:37) describes the Mary's River Kalapuya burial custom: "Corpse dressed in gala. All belongings with him, canoes, horses, etc. Buried in graves. Friends put things in grave."

Burial sites were often indicated with the cooking utensils and personal adornments of the deceased (Minto 1900:301). Ancestor burial sites were maintained yet feared by the Kalapuya (Jacobs 1945:40).

During the long winter months when the population was gathered together and subsistence activities were at a minimum, there was time for more esoteric activities. Myth recitations, singing, and spirit-power dancing took place around the fires in the multi-family house (Jacobs 1945:57). These activities were accompanied by several varieties of skin drums, large gongs, bells, and rattles (Hartless 1923).

Games of skill and chance were most popular. When large groups assembled, band members could play hoop and row, tug-of-war, Shinney, and varieties of stick and ball games (Hartless 1923, Jacobs 1945:49-51). Wrestling, target-shooting, and foot races were the other sports enjoyed.

All Kalapuya myths are filled with stories of gambling events. Gambling was the principle diversion any time of year. It was very popular and treated quite seriously. Prior to the games of chance, time was always spent in purification rites at the sweathouse (Jacobs 1945:69). Two games were common: dice and the hand game. Dice were originally made from beaver teeth (Jacobs 1945:191) and later were replaced by wood (Hartless 1923). The hand game implements were four carved flat sticks or black and white colored bone pieces (Hartless 1923). Trinkets, ornaments, clothing, wives, slaves, and money were bet. Great fortunes exchanged hands, often resulting in redistribution of wealth.

By early spring, the Kalapuya winter village population would break up into small extended family groups and disperse to isolated base camps within the Willamette Valley. From the first of spring until late summer, the Kalapuya occupied only a temporary shelter. There were no houses constructed during these months of high mobility. Instead, temporary windbreaks of boughs, brush, or grass were occasionally assembled (Hartless 1923). Alexander Henry observed that the Kalapuya lived in huts made of fir boughs woven into a frame during the summer months (Coues 1897:814).

A favorite pastime of the Kalapuya was to swallow smoke until they became dizzy (Hartless 1923, Jacobs 1945:35). Native tobacco was cultivated by the Kalapuya. The tobacco was mixed in with leaves of kinnikinnick, collected from the Coast Range, and smoked in pipes made of stone or a bowl of stone with a wooden stem (Jacobs 1945:35).

During the summer, the settlement-subsistence pattern was primarily dictated by the availability of resources found in the various Willamette Valley sub-basins. Several exploitive options were available to the Kalapuya throughout the spring and continuing until late fall. The subsistence resource groups are divided into five categories: 1) plant; 2) large game; 3) small and medium-sized game; 4) fisheries; and 5) insects. From the ethnographic and historical records an inventory of food resources for each of these categories are presented in Table 4. The annual settlement-subsistence model (see Figure 5) indicates the seasonality and habitat for each major food group. The adaptive strategy of the central Willamette Valley Kalapuya focused primarily on camas, acorns, hazelnuts, game, fish, and berries.

The temporary camp sites were first located in areas especially abundant in camas, wild carrot, and several varieties of berries. The plant resources were

Table 4. Inventory of Kalapuyan Food Resources.

Vegetables

1. Roots, Nuts, Berries, Plants

Camas	Camassia spp.	Strawberry	Fragaria spp
Tarweed	Madia ssp.	Blackberry	Rubus spp.
Acorns	Quercus garryana	Salalberry	Gaultheria shallon
Hazel Nuts	Corylus cornuta	Huckleberry	Vaccinium sp.
Sunflower	Balsamorhiza spp.	Serviceberry	Amelanchier spp.
		Thimbleberry	R. parviflorus
Tobacco	Nicotaina multivalvis	Salmonberry	Rubus spectabilis
Kinnikinnik	Arctostaphylos uva-ursi	Raspberry	Rubus leucodermis
		Wild cherry	Prunus sp.

2. Large Game

Black-tailed Deer	Ococoileus hemionus columbianus
White-tailed Deer	O. virginianus (leucurus?)
Elk	Cervus canadensis (roosevelti?)
Black Bear	Ursus americanus or Evarctos americanus
Grizzly Bear+	U. Klamathensis or Vros arctos horribilis

3. Small and Medium-Sized Game

Wild Goose	Branta Canadensis	"Squirrel"	Sciurus griseus
Grouse	Dendragapus obscurus	"Rabbit"	Lepus americanus
Quail	Oreortyx picta palmeri	Raccoon	Procyon lotor
"Duck"	Anatinae spp.	Beaver	Castor canadensis

+ Extinct in Willamette Basin

Table 4., Continued

"Pigeon"	*Columba fasciata*	Gopher	*Thomomys* ssp.
Robin	*Turdus migratorius*		
"Pheasant"*	*Bonasa Umbellus*		
4. **Fisheries**			
a. Non-anadromous fish			
Smelt	*Thaleichthys pacificus*	Crawfish	
Suckers	*F. catostomidea*	Whale	*O. cetacea*
Eels	*Entosphenus tridentatus*		
b. Anadromous fish			
Cutthroat Trout	*Salmo clarkii*		
Chinook	*Oncorhyncus tshawytscha*		
Steelhead	*Salmo gairdnerii*		
c. Fresh Water Molluscs			
5. **Insects**			
"Caterpillar"			
"Grasshopper"			

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* Probably ruffed grouse or "prairie chicken" (Zenk 1974:113)

distributed in wet areas adjacent to rivers and nearby floodplains.

Camas, the most important plant food for the central Willamette Valley Kalapuya, is widely distributed in the wet meadows of the Finley National Wildlife Refuge today. The camas roots were harvested by women and children with the aid of a digging stick. The best account of the camas harvest is provided by James Clyman, who, on May 31, 1845, travelled in the vicinity of the Luckiamute River (Clyman 1960:153). He commented:

> The Indians our neighbors ware out early digging roots this operation is performed by sinking a strong hard stick in the ground near the roots to be dug then taking pry on the outer extremity of the stick a portion of earth containing from 2 to six roots is taken up the roots being the size of a small onion and much resembling the onion in appearance. They are then washed and cleansed a hole of suitable size is dug in the earth filled with wood and stones after the earth and stones become well heated the fire is taken off and a layer of green grass laid over the roots then a thin layer of earth over the whole and a fire outside of all which is kept up some 24 hours when it is allowed to cool down and the roots are ready for use or for drying and putting away for future use when dry they keep for months or years.

The camas was carefully prepared and preserved in cakes that were described to be three inches thick, weighing up to ten pounds (Coves 1897:814-815). The preserved camas cakes were an important staple food and also served as articles of trade with adjacent groups.

Camas was harvested in the lowlands in early spring and in the upland meadows by late summer. The Kalapuya settlement shifts were well adapted for the maximum harvest of camas and several other root and berry crops that were as important in the Kalapuya diet; namely, wild carrot and wappato or wild potato. Hazel nuts and acorns were harvested in the late summer and fall. Large quantities of roots, berries, nuts, seeds, and meat were preserved and stored for winter use.

While the women and children gathered roots, nuts, seeds, and berries, the men ventured out from the base camps to hunt deer, elk, bear, or to fish in the nearby rivers and streams. The women and children occasionally participated in the group hunt or deer drives that required quite an organized communal effort (Ratcliff 1973:29).

By late summer, when the harvest activities subsided, emphasis was placed on social events. Dancing, gambling, and trade brought many of the Kalapuya together. Whether by foot or canoe, the Kalapuya travelled to trade centers at the Willamette Falls and possibly to sites near The Dalles and Celilo Falls, Oregon. Intertribal trade took on a social and ceremonial importance; stories, religious ideas, and political concepts were shared among all of the visitors. Games, races, gambling, dances, ceremonies, and marriages created a permanent network between the represented groups. The chief objects of trade for the central Willamette Valley Kalapuya were hides of various animals, fish, wives, and slaves for dentalium shells, bone and shell beads, dried salmon and eel, and historic goods including blankets, glass beads, guns, and horses (Jacobs 1945:175-178).

The Kalapuya material culture, as summarized in Table 5, provides the archaeologist with an inventory of specific items that comprise the technological base well-suited for procuring subsistence in the central Willamette Valley. Technologically, the Kalapuya were well adapted for procurement of riverine resources with use of nets, wiers, and spears. Transportation on the Willamette River and its tributaries was provided by means of a canoe. Hartless (1923) describes the canoe:

> Made of cedar, white fir, or cottonwood. Dug out by means of flint after it had been burned out. Whole tree used for that purpose. Canoes between 14-30 ft. long. Seating capacity 4-30 people. Driven by means of paddles and poles... Canoes and paddles decorated with features and hides. Some painted. Occasionally carvings representing animals.

In 1854, Gabriel Franchere noted the sophistication of workmanship on the canoes and the expertise of the occupants (Franchere 1854:327-329).

Table 5. Kalapuya Material Culture.

HUNTING

1. Snares of blackberry vine rope for grouse and quail
2. Club for killing trapped deer, beaver
3. Elk pitfal with sharpened stakes in the bottom
4. Deadfall trap
5. Deer's head decoy
6. Untipped arrows for bird hunting

FISHING

1. Rock dam and basket trap of willow
2. Fish spear
3. Fish hook of chub salmon neck bone
4. Fish line of rolled white wllow inner bark
5. Single- and multi-pronged detachable fish harpoon heads of deer bone attached with thong
6. Hair lure with grasshopper bait
7. Fish club

GATHERING

1. Digging stick of serviceberry or arrowwood, some with antler or wood digging stick handles
2. Hard, shallow basket platter with no handle for catching tarweed seeds as they are knocked off the stalk
3. Small pits (6-7 inches deep, two feet in diameter) under ash trees for gathering caterpillars
4. Soft skin bags for acorn gathering
5. Soft, finely-made, multi-purpose, conical basket of shredded maple bark, carried on back with pack strap by women for carrying wood, bark, tarweeds, camas, pussy-ears, and hazelnuts

FOOD PREPARATION AND STORAGE

1. Stone pestles (grinders) and mortars (stone bowls) for mashing seeds and roots
2. Earth oven for roasting camas and other root crops
3. Maple, cedar, and alder bark buckets
4. Rawhide bucket
5. Storage of food and other items in trees
6. Storage basket for dried salmon
7. Stiff storage basket of sticks
8. Camas and other food items stored in bags
13. Drying and smoking rack of forked-stick poles and cross poles for fish, eels, and meat
14. Ash bark bucket for boiling foods with hot stones, sewn with inner bark rope
15. Cache pits, sometimes line with grass or leaves for storing winter foods
16. Wooden troughs for serving plates
17. Spit roasting and roasting on coals
18. Stirring spoon or ladle of elkhorn

Table 5., Continued.

9. Baskets of cedar roots or hazel sprouts for carrying water or berries

10. Cattail or rush mats for drying acorns

11. Flattened log in hills for drying berries

12. Folded cedar bark vessel

or hardwood

19. Fire tongs of one piece of split wood or two fastened pieces

20. Long, loose, soft basket for soaking acorns

21. Wooden mortar and wooden pestle for berry mashing

22. Deer stomach water container

TOOLS, UTILITARIAN ITEMS AND WEAPONS

1. Rope of willow bark or twisted hazel sticks

2. Spear with 2-inch point of stone

3. Tule, cattail, and rush mats for lining house walls and for beds

4. Cedar dugout canoe and paddle or poling rod

5. Log rafts for lake travel

6. Bed of moss

7. Fire for hunting expeditions was carried as a coal embedded in rotted wood and lashed between two mussel shells

8. Arrow shafts and arrowheads of serviceberry wood

9. Stone and bone arrowheads

10. Needles and awls of serviceberry wood hardened by the fire

11. Twisted deer sinew as thread for sewing and for bow string

12. Stretching and scraing frames for skins

13. Quiver for arrows

14. Stone pipe (1 to 1-1/2 in.) with wood stem and 2-in. stone pipe with no wood stem for tobacco smoking

15. Chisel for woodworking

17. Hawk, pheasant, and turkey tail for arrow shafts

18. Pack sack with braided pack rope for carrying on forehead

19. Bows of yew and oak wood

20. Cradleboard

21. Sinew wrapped around arrowheads to attach to arrow shafts

22. Stone axes

23. Spears and stone knives

24. Mussel shell scraper (e.g., for smoothing bows)

25. Fire drill

26. Hammock

27. Bone needle for tatooing

28. Rounded, slanting post for rubbing and scraping hides

29. Pitchwood torch

30. Tobacco pouch

31. Small pigment mortar

32. Hammerstone

33. Horn wedge

Table 5., Continued.

16. Stone maul for pounding

34. Straight adze for woodworking

DRESS AND ADORNMENT

1. Beads of dentalia and clam shell discs
2. Trade and bone beads
3. Hair cordage for stringing beads
4. Combs
5. Quill, shell, and bone ornaments for pierced ears and noses and also for clothing
6. Cedar bark dress
7. Moccasins
8. Skin or grass apron or skirt
9. Skin sirts, short trousers, and leggings
10. Arm and wrist bands
11. Grizzly claws, tech, and feather ornaments
12. Face paint of charcoal and red ochre
13. Breech clout
14. Blankets of buffalo, coon, grey squirrel, gopher, seal, mountain sheep, wildcat, deer hide, rabbit skins
15. Basketwork caps
16. Fur caps and cloaks
17. Shaman's regalia (painted cane; otter-skin belt decorated with beads, feathers, woodpecker scalps; hollow rattles of rawhide)

GAMES AND MUSIC

1. Hardwood ball for shinny
2. Rattle of hollow rawhide
3. Beaver teeth dice
4. Bone gamble dice
5. Toy bow
6. Two split sticks for drumming
7. Skin drum
8. Plank drum
9. Split stick rattle for Ghost Dance
10. Deer hoof rattle for gambling
11. Bone and wooden whistles
12. Reed flute

Sources: Jacobs et al. 1945; Jacobs 1945; Zenk 1976, n.d. (after Beckham, Minor, Topel 1981).

The practice of annual burning of the prairies by the Kalapuya was a significant factor in the adaptive strategy in both ecology of the presettlement Willamette Valley and in the Kalapuya subsistence. Zenk (1974:24) states:

> ...it formed an integral part of specific subsistence activities, especially in the gathering of tarweed seeds; additionally, it maintained the existence of large tracts of prairie and oak savanna and probably increased the extent of ecotonal areas in the valley, consequences likely of great significance to the whole pattern of Kalapuya subsistence.

The fires served as a device for hunting large mammals, provided access to wild honey sources, as well as killing and cooking the Kalapuya delicacy: caterpillars and grasshoppers (Jacobs 1945:26).

Chapter 4. Previous Archaeology

The earliest evidence of human activity in the Willamette Valley is suggested by surface finds of a Clovis projectile point. The Clovis fluted spear point, attributed to the paleo-Indian period, falls within an age range, dated elsewhere in North America, at 11,500 to 11,000 years B.P. In the upper Willamette Valley along the Mohawk River, a tributary of the McKenzie River (Figure 6), a Clovis fluted projectile point was recovered from the surface of the river gravels (Alley 1975).

In addition, two reported finds from the central Willamette Valley have yielded artifacts in probable association with extinct Late Pleistocene faunal remains. Near Lebanon, Oregon, Cressman and Laughlin (1941) found fossilized mammoth bones with a possible modified stone tool. Near the town of Tangent, Oregon, Cressman (1947) reported a mammoth vertebrae, tooth, and tusk fragment with two artifacts resembling Yuma and Sandia projectile points (Cressman 1947:177). Although the evidence for early occupation in the Willamette Valley is scant and the association of cultural material with extinct Late Pleistocene faunal remains needs further investigation, the evidence remains significant for the suggestion of early peopling of the Willamette Valley.

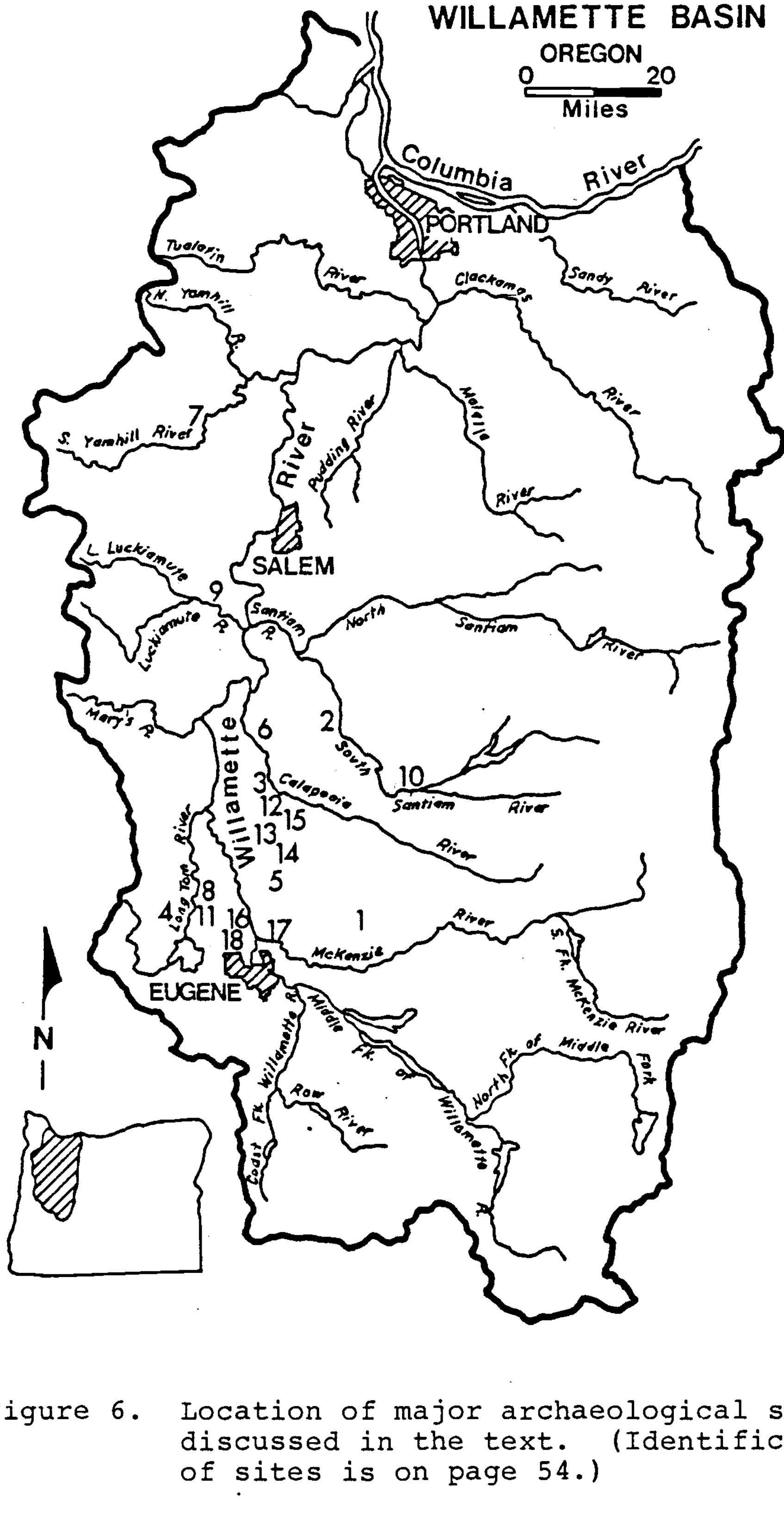

Figure 6. Location of major archaeological sites discussed in the text. (Identification of sites is on page 54.)

Table 6. Location of Major Archaeological Sites Discussed in Text (key to Figure 6)

Map Reference Number	Site
1.	Clovis Find
2.	Lebanon Site
3.	Tangent Site
4.	Virgin Ranch and Smithfield Middens
5.	Barnes Site, Spurland and Miller Mounds
6.	Halsey and Shedd Mounds
7.	Fuller and Fanning Mounds
8.	Lingo Site
9.	Luckiamute Hearth
10.	Cascadia Cave
11.	Benjamin Sites
12.	Simrock, Kropf, and Miller Farm Sites
13.	Davidson Site
14.	Lynch Site
15.	Litle Muddy Creek Sites, 35LIN31-33 and 35LIN35
16.	Flat Creek Sites
17.	Hurd Site
18.	Flanagan Site

With the early evidence suggesting the presence of people in the valley around 11,500 years B.P., Collins made the first attempt at devising a tentative cultural chronology based on relative dates rather than the cultural differences or cultural changes alone. Since radiocarbon dating techniques had not been developed, Collins (1951:101-109) estimated relative dates on the basis of extinct faunal remains of mammoth in association with crude stone tools (10,000 years ago), and tree ring counts (385 years ago or A.D. 1600), and estimated the introduction of historic trade goods in the Willamette Valley (235 years ago or A.D. 1750).

Collins's most significant contribution to archaeological research in the Willamette Valley came with his conclusion that the Kalapuya people were most closely related to the peoples of the Columbia Plateau (Collins 1951:138-146). Originally Wissler (1917) and Kroeber (1939) assigned the Kalapuya to the Northwest Coast Culture Area. According to Beckham, Minor, and Toepal (1981:120):

> Subsequent archaeological and ethnographic research has substantiated that the Kalapuya and their ancestors were an interior, riverine-oriented people with cultural affiliations with the Columbia Plateau Culture Area rather than the marine oriented inhabitants of the Northwest coast.

When Lloyd R. Collins presented the first synthesis of archaeological research in the Willamette Valley in 1951, only six archaeological projects provided evidence for discussion of the cultural position of the historic Kalapuyan Indians in relation to other Pacific Northwest aboriginals.

Early archaeological investigations in the Willamette Valley concentrated on the mound sites found on elevated positions above the valley floodplains. The first written accounts of the mound features are full of speculations of the origins of the prehistoric mound builders (Powers 1886, Homer 1919, Wright 1922). In 1928, a map locating over 100 mounds was compiled after a systematic survey in the central Willamette Valley (Collins 1951:58). The speculations over the origins of the mounds range from the notions of a unique race of mound builders (Homer 1919, Margason 1974, Wright 1922) to the works of the predecessors of the Kalapuya (Clark 1927).

In the mid-1920s, Strong, Schenck, and Steward (1930) conducted archaeological excavations at mound sites near the confluence of the Calapooia and Willamette Rivers. The results of the investigation conclude that most of the mounds were natural features inhabited by the prehistoric Kalapuya. The elevated natural rises were preferred occupation sites due to the better drainage and flood-free, dryer ground.

Upon re-analysis of the archaeological collections from Willamette Valley sites, Collins presented a significant conclusion that the mounds were, in fact, natural features, suggesting the use of the term "midden" to clarify the confusion with the constructed mounds found in the eastern United States (1951:58).

In 1933, archaeological investigations were conducted by Cressman, Berreman, and Stafford (Cressman 1940) at mound sites located along the Long Tom River in the upper Willamette Valley (Cressman 1940). Of the fourteen mounds located during the reconnaissance, two were selected for limited test excavation. Both sites are located near Franklin, Oregon, and are known as the Virgin Ranch and Smithfield middens. Excavations revealed very little information and few cultural materials. Collins (1951:59) observed that the absence of European trade goods and lack of worked bone artifacts indicate a date well before European contact.

In the Harrisburg-Halsey-Shedd area of the central Willamette Valley, four middens were excavated by Laughlin (1941): Spurland, Miller, Halsey, and Shedd mounds. Further north in the valley, near McMinnville, Oregon, two middens known as Fuller and Fanning were excavated in 1940 and 1941 (Laughlin 1943). The artifacts, faunal remains, and burials recovered at the mound sites were very similar. Laughlin concluded that the sites were used for burials and seasonal campsites by the Kalapuya people (Laughlin 1941:154). The cultural materials from the sites, similar to other known historical materials of the Kalapuya include: antler flakes, bone needles and awls, composite harpoon points and harpoon points, skin dressers, a bone blade, bone tubular beads, ear plugs, horn wedges, camas root digging stick handles of deer or elk antler, whalebone clubs, bone chisel, mortars, pestles, projectile points, undescribed stone artifacts, and European trade goods--buttons, copper tube beads, copper rings, pendants, copper thimble, glass trade beads, and a 40 caliber musket ball (Collins 1951:59-61).

Laughlin reported the occurrence of over 400 mound sites between the cities of Albany and Eugene, noting that the sites are commonly situated on the east bank of the Willamette River and located on the post-Pleistocene floodplains (Laughlin 1941:47).

The archaeological investigations in the Willamette Valley during the mid-1960s and 1970s were focused primarily toward the salvaging of cultural resources threatened by federally-sponsored projects. Site selections were biased toward last minute efforts in collecting archaeological data and were geared for the major university field school projects. Consequently, the archaeological investigations were fairly limited in scope and the cultural materials recovered represented relatively smaller-sized collections which limited the possibility of formal analysis of the site collections.

In 1965-1966, the University of Oregon excavated the Lingo Site, situated along the Long Tom River near Junction City (Cordell 1975). Well-controlled excavations revealed that the midden site was unstratified. Charcoal samples from the site yielded the first C14 dates in the upper Willamette Valley: 2080$\pm$120 and 4165$\pm$110 years B.P. (Cordell 1975:275). The prehistoric artifact assemblage includes 257 projectile points, twelve drills, eight gravers, twenty-three scrapers, fifty-four bifaces, 129 retouched flakes, five ground stone pestles, a stone bead, and two modified river cobbles. The absence of European trade goods at the Lingo Site substantiates the earlier C14 dates. Although several human burials were unearthed at the site, there is a curious absence of non-human bone material, unlike most other midden sites in the Willamette Valley. The absence of groundstone tools, bone tools, and faunal remains suggests that more specialized economic activities such as camas harvesting took place at the Lingo Site (Cordell 1975:304).

In 1966, additional evidence for early occupation on the Willamette Valley floodplains is provided by a C14 date from a site known as the Luckiamute Hearth. Soil scientists exposed a buried hearth in the bank of the Luckiamute River. Several charred acorns were found in association with the hearth that was in use 5285±270 years ago (Reckendorf and Parsons 1966).

The earliest radiocarbon-dated site in western Oregon, Cascadia Cave, is situated on the eastern margins of the Willamette Valley in the Cascade foothills along the Santiam River. The investigation, conducted by Thomas Newman in 1966, revealed evidence for occupation there as early as 7900 B.P., with intermittent occupations until 3000 years ago. Prehistoric artifacts recovered from nine to twelve feet thick wind-blown deposits at the site include 109 large obsidian leaf-shaped points, thereby named Cascade points, knives, scrapers, drills, modified flakes, hammerstones, manos and metates, and two-edge ground cobbles. Thick side-notched projectile points were common to the upper levels, similar to points dated elsewhere in the Northwest at 6000 and 7000 years ago (Newman 1966:25). The faunal assemblage is dominated by deer, elk, snowshoe rabbit, with some marmot, rabbit, weasel, and unidentified bird. The faunal remains and the presence of hazelnuts and grinding stones suggest a late summer to early fall occupation. Newman (1966:28) speculates that Cascadia Cave was inhabited by hunting parties, representing "an earlier, generalized culture" that moved into the forested foothills of the Cascade Range from the Willamette Valley floodplains during the spring and summer. This earlier subsistence pattern provides a nice contrast to later Kalapuya stream-focalized collectors.

During the summer of 1967, the University of Oregon tested five midden sites, recorded as the Benjamin Sites, on the western edge of the valley near Franklin, Oregon (Miller 1975). The midden features are described as circular in form, varying from 25 to 40 meters in diameter, and range from 8 to 10 meters in elevation above the terrain of an old channel of the Long Tom River (Miller 1976:311). Test excavations reveal no physical or cultural stratification but uncovered evidence of several small fire hearths and large earth ovens. The charred camas bulbs from the roasting pits provided C14 dates of 2320 B.P. and 1640 B.P. The projectile point types from the site collections provide evidence that the occupation at the Benjamin Sites may have begun earlier and continued later than the C14 dates indicate (Aikens 1984:94). Beyond the primary activity of gathering and roasting camas, the artifactual evidence suggests that the inhabitants were involved with activities of hunting, fishing, and tool manufacturing during the summer months (Miller 1975:345).

Salvage archaeology of the Little Muddy Creek Flood Prevention Project north of Harrisburg, Oregon was conducted at eleven sites during 1969 to 1971: the Simrock Site and the Kropf Site (Davis 1970); Miller Farm Sites I and II, the Barnes Site (Oman and Reagan 1971); the Davidson Site, the Lynch Site, 35LIN31, 35LIN32, 35LIN33, and 35LIN35 (Davis, Aikens, Henrickson 1973). Later, in 1973, five sites along Flat Creek in Lane County, Oregon were archaeologically sampled (Davis 1978). Then in 1975, a survey and testing program was accomplished in Washington County for the Gaston Reservoir Project (Decker and Davis 1976).

As a result of the additional archaeological work that had been accomplished on all of the flood sites in the Willamette Valley, Davis proposed a structural model of Willamette Valley cultural sequences (Davis 1978). A summary and discussion of Davis's Kalapuya Culture Phase chronology prepared by Beckham, Minor, and Toepel (1981:121-122) is presented:

> <u>The Santiam Phase</u> (10,000-5000 B.P./8000-3000 B.C.) is characterized by relatively large lanceolate and side-notched projectile points, referred to as the Santiam Lanceolate and Santiam Side-notched types by Davis (1978). The

phase is represented in the lower component of Cascadia Cave (Newman 1966) and in the lower component at the Davidson Site on the Willamette Valley floodplain (Davis et al. 1973). According to Davis (Davis et al. 1973:24-25; 1978:71), typological similarities exist between artifacts from the Davidson Site and those from the Early Stage at The Dalles, radiocarbon dated between 9785 and 6090 B.P. (Cressman et al. 1960). The artifacts referred to by Davis (see Davis et al. 1973, Figure 14) are not particularly distinctive, however, and are very similar to those recovered from other Willamette Valley floodplain sites, the occupation of which took place within the last 3000 years.

The Fall Creek Phase (5000-2400 B.P./3000-400 B.C.) is characterized by the same lanceolate and side-notched projectile point styles found during the preceding phase, as well as the new Long Tom Corner-removed type. This phase is represented at a number of sites in the Cascade foothills and on the Willamette Valley floodplain. According to Davis (1978:75), during this phase "an expanding resident population was developing special adaptations to lowland resources."

The Kalapuya Phase (2400-185 B.P./400 B.C.-A.D. 1800) was the time of "the Kalapuya culture climax which was based on permanent valley settlement and full exploitation of lowland habitats" (Davis 1978:77). Projectile point styles specifically characteristic of this phase are not listed, but it is implied that new types referred to as Long Tom Triangular, Muddy Creek Corner-notched, and Muddy Creek Base-notched were introduced. This phase is also represented at a number of sites on the Willamette Valley floodplain. Burials encountered at the Davidson and Lynch sites along Little Muddy Creek (Davis et al. 1973:13-15, 30-31) are assigned to this phase. The mortuary practices at these sites are characterized by supine inhumations in flexed and semi-flexed positions.

The Ethnographic Phase (185-85 B.P./A.D. 1650-1900) is marked by the initiation of Euro-American exploration in the Pacific Northwest. The reason for the 150 year overlap between the end of the Kalapuya Phase at A.D. 1800 and the beginning of the Ethnographic Phase at A.D. 1650 is not explained. The presence of items of Euro-American manufacture appears to be the principal archaeological feature which distinguishes sites of the Ethnographic Phase from those of the preceding Kalapuya Phase. According to Davis (1978:82), "the occurrence of items of White manufacture [in the Willamette Valley] seems to date no earlier than the 1840s." As during the preceding phase, burials assigned to the Ethnographic Phase are generally flexed inhumations, although during this period the body was generally placed on the side. The practice of including grave goods increased, and the custom of head flattening is observed on some burials assigned to this phase.

In a five year period beginning in 1970, the University of Oregon field school programs contracted several archaeology projects throughout the Willamette Valley basin. In addition, a grant to the University of Oregon from the National Science Foundation sponsored extensive surveys as developed by the Willamette Valley Prehistory Project (Southward 1970, Woodward 1970).

The National Science Foundation grant provided support to the archaeological investigations at the Hurd Site, situated at the valley edge, near Coburg, Oregon (White 1975:141-226). The archaeological excavations uncovered the remains of a semi-subterranean house structure with two charcoal filled hearths yielding C14 dates at 2800 B.P. and 2820 B.P (White 1975:220). The house features and distinctive artifact assemblages at the Hurd Site suggest a significant discovery of a stable winter base settlement. Charcoal collected from fire hearth and earth oven features across the site provide evidence for a later phase of occupation, from 1100 B.P. to essentially historic times (White 1975:221). With a noted absence of house structures for the later occupation and eleven radiocarbon dates representing approximately 1100 years, White suggests that the Hurd Site served as a temporary camp, repeatedly occupied during the spring and early summer season (White 1975:223).

Minimal artifactual evidence was collected from the early levels of occupation that is associated with the architectural features. Given the limitation in number and range of artifacts collected, White (1975:221) concluded that the early inhabitants at the Hurd Site focused primarily on hunting and gathering activities.

The lithic tools recovered from the later period of occupation include over 400 projectile points and large numbers of scrapers, knives, and utilized flakes, suggesting a dominate importance in hunting activities. Woodworking and possibly bone working activities are represented by large flat unifacial chopping tools (possibly axes), scraper planes, spokeshaves, reamers, drills, and denticulate tools. Carbonized camas bulbs, several earth ovens, pestles, and mortar fragments give evidence of the technologies of food processing at the

Hurd Site. Fine-grained basalts, representing the dominant material type for tool manufacturing, as well as obsidian and cryptocrystalline silicas were immediately available to the site inhabitants in the nearby gravel beds of the McKenzie River. Although no pottery was recovered, a burnt clay daub was recovered throughout the site.

The Flanagan Site near Eugene, Oregon provides the earliest evidence of occupation on the active floodplains of the Willamette Valley (Toepel and Minor 1980). The radiocarbon dates clustering around 5700, 3300, 1800, 900, and 500 years B.P. (Toepel and Minor 1980; Beckham, Minor, Toepel 1981) make this the earliest site known in the valley floor setting. The prehistoric tool assemblage included a single leaf-shaped point, large side-notched and corner-notched points, and several small, stemmed triangular arrow points. Biface knives, scrapers, perforators, utilized flakes, choppers, drills, spokeshaves, and abraders also represent the prehistoric tool kit. Manufacturing of tools at the site is evidenced by several exhausted cores, bifaces at various stages of manufacture, hammerstones, and an abundance of debitage. The earliest use of camas and roasting pits in the Willamette Valley is well documented at the site and date to 3264±150 B.P. Other plant remains include charred acorn hulls, wild cherry pits, and Klamath plum. The cultural remains at the Flanagan Site represent a wide variety of subsistence activities. Due to the absence of house or shelter remains and the site location on the floodplain, site occupation probably took place during the summer months.

With the results of the Willamette Valley Prehistory Project fieldwork and the archaeological data from 113 sites (ninety-six of which were surface collections, ten testing projects, and the excavation at the Hurd Site), John White (1975, 1979) proposed a cultural chronology and settlement-subsistence model for the prehistory of the upper Willamette Valley. The typology of settlement-subsistence systems is based on an ecological model that divides sites into four fairly broad environmental zones, each zone consisting of more than one microenvironment. The four culturally meaningful environment zones are Valley Edge sites, Narrow Valley Plain sites, Primary Flood Plain sites, and Riparian sites. After synthesizing all of the site specific information, White (1975:98) identified eight principle activity complexes: large game hunting; tool manufacturing; hide preparation and processing; camas gathering and processing; diversified hunting, fishing, woodworking; and grinding and milling. On constructing the typology of sites, White also considered variables for seasonality and age; yet limitations in site specific information eliminated the precise determination for a size variable. The four upper Willamette Valley environmental zones provided White with the criteria for assigning the site typology, as follows:

Valley Edge Sites: These sites are located above 500 feet in elevation, representing the lower boundary of conifer forests with an understory of various berries. These sites were primarily spring and summer hunting camps.

Narrow Valley Plain Sites: These sites are located on the leading edges of low terraces in the narrow flood plains adjacent to streams tributary to the Willamette River. Oak savannas and grassy marshes are characteristic of these areas, suggesting spring and summer occupations for acorn processing and camas gathering activities.

Primary Flood Plain Sites: Periodic flooding of sites located in the Willamette River floodplains were often inundated with extensive ponds and marshy conditions. Vegetation characteristics of these sites are oak stands and open grasslands. Task-specific camps were set up in this zone during the spring, summer, and fall for camas gathering and hunting activities. These sites generally lack midden deposits.

Riparian Sites: Sites in this zone are located adjacent to the major tributaries of the Willamette River. The sites along the streamside were commonly wooded with cottonwood, willow, maple, and alder. Since these locations served as base camps occupied throughout the year, several activities are represented. Characteristic to these sites are distinctive midden formations.

White's chronology of the upper Willamette Valley prehistory is divided into five periods of occupation. The chronology is derived from the comparison and analysis of radiocarbon dating, tree ring counts, typological comparisons of projectile points, pollen analysis, stratigraphy, and cross-dating with historic artifacts (White 1975:54). The final revision of the chronological sequence with lists of archaeological traits commonly associated with each period are presented in Table 7 (White 1979:562). A summary of the upper Willamette Valley site chronology follows this in Table 8 (White 1979:565). The settlement-subsistence model for the upper Willamette Valley prehistory proposed by White (1974, 1975, 1979) represents the first integrated study and prehistoric land-use model for the region.

Table 7. Archaeological Traits Commonly Associated With Chronological Periods of the Upper Willamette Valley.

Period I. 10,000 - 8000 B.P.

1. Early point types such as Clovis, Sandia, and Plano
2. Crude stone tools
3. Associated extinct mammals
4. Isolated finds

Period II. 8000 - 6000 B.P.

1. Point types 4a and 4b are the only point types (Cascade bipoints)
2. Crude scrapers on random flakes
3. Edge-ground cobbles
4. Short lanceolate blades or bifaces
5. Mount Mazama pumice (in some areas)

Period III. 6000 - 2200 B.P.

1. Large, thick points; e.gs., types 31, 12, 13, 14a, 14b (often in conjunction with types 4a and 4b)
2. Fewer artifacts and types of artifacts than in Period IV.
3. Less specialized tools
4. Small camas ovens (less than 1 m 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. 2200 - 285 B.P.

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
4. Unifacial and bifacial chopping tools on basalt cobbles
5. Scraper planes
6. Spherical net weights
7. Reamers and perforators

Table 7. Continued

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8. Core and flake spokeshaves
9. Large camas ovens
10. Phallic pestles
11. "Killed" artifacts
12. Antler and bone flakers
14. Antler ear plugs
15. Antler fleshing tools
16. Bone harpoon points
18. Ensiform whalebone clubs
19. Tubular bone beads
20. Bone poniards
21. Disc beads
22. Whole shell beads and lopped olivellas
23. Ear and nose plugs
24. Abalone pendants
25. Dentalia
26. Marine shell remains
27. Cranial deformation
28. Elaborate grave goods
29. "Yurok"-type obsidian blades

Period V. 285 - 135 B.P.

1. Copper ornaments and bangles
2. Copper trombac buttons
3. Bottle glass scrapers (one found at 35LA118)
4. Trade beads
5. Iron nose plugs
6. Iron knives

Table 8. Summary of Upper Willamette Valley Site Chronology.

Period	Sites	Date	Methods of Determination
Period I 10,000-8000 B.P. (Big Game Hunting)	Lebanon site Templeton site Spore find	9000-10,000 B.P. 9000-10,000 B.P. + 10,000 B.P.	Pollen analysis of mammoth-bearing stratum Finding of Clovis point
Period II 8000-6000 B.P.	Unrepresented in valley sites (nonvalley sites include Cascadia Cave Geertz site, and Baby Rock	8000-6000 B.P.	Inferences based on radiocarbon dates at a known nonvalley site (Cascadia Cave); Mount Mazama pumice layer at Baby Rock
Period III 6000-2200 B.P.	Luckiamute hearth	5250±270 B.P. (I-1472)	Radiocarbon
	Early components at:		
	Hurd site	2800±110 B.P. (Gak-2660) and 2820±230 B.P. (Gak-2659)	Radiocarbon
	Lingo site	4130±110 B.P. (Gak-1120)	Radiocarbon
	Benjamin sites	2320±80 B.P.	Radiocarbon
	Fall Creek sites	4000-6000 B.P.	Comparative typology
	Middle component at:		
	Baby Rock shelter	4000-6000 B.P.	Comparative typology, obsidian hydration
Period IV 2200-285 B.P.	Late components at:		
	Hurd site	1120±140 B.P. (Gak-3110) to 330±110 B.P. (Gak-3106)	Radiocarbon (nine dates)

Table 8., Continued.

Period IV, Continued

	Lingo site	2045±120 B.P. (Gak-1121)	Radiocarbon
	Benjamin sites	1640±130 B.P.	Radiocarbon
	Fall Creek sites, Baby Rockshelter	2200-285 B.P.	Comparative typology
	Precontact aspects at: Fuller Mound, Fanning Mound, Gettings Creek sites, Spurland Mound, and Davidson site	2200 - 285 B.P.	Comparative typology
	35LA118	980±120 B.P. (Gak-3117)	Radiocarbon
	All occupation levels at: Scroggin Creek, 35LA70 35LA92, Dery, Perkin's Peninsula, Kropf, Simrock, Miller Farm, Halsey, Shedd, Lynch, Beebe, Simons, and Siuslaw Falls	2200-285 B.P.	Comparative typology
	Smithfield site	Abandoned 1700	Tree-ring count
	Virgin Ranch	Abandoned 1700	Tree-ring count
	Miller Mound	Abandoned 1600	Tree-ring Count
Period V 285-135 B.P.	The uppermost levels at: Fuller Mound, Fanning Mound, Spurland Mound, Gettings Creek sites, 35LA118, and Davidson site	285-135 B.P.	Presence of historic artifacts

Chapter 5. Methodology

Field Methodology

An archaeological reconnaissance in 1980 in the Wm. L. Finley Refuge disclosed the general location of seven prehistoric sites, noting the following restrictions (Peterson, Bell, Brauner 1980:104):

> Since no test pits were excavated and no diagnostic artifacts were noted on the surface, the vertical and horizontal parameters of the sites were not defined. Horizontal site parameters are based on the distribution of the surface cultural debris. The antiquity and possible functions of the site also could not be determined by surface debris.

The report also provided a review and evaluation of all previous cultural research and recommended additional research for three sites.

Although all of the prehistoric sites were identified by lithic flake scatters in disturbed areas (rodent burrows, plowed fields, etc.), the sites occurred in environments with high probability for buried cultural remains. To properly evaluate the significance of a few selected sites, it was essential to determine whether or not cultural remains were buried in the deposits and, if so, what the nature of those remains might be.

The three prehistoric archaeological sites, 35BE37, 35BE10, and 35BE39, were selected for testing based on the recommendations provided in the cultural resource inventory (Peterson, Bell, and Brauner 1980:73-75). The primary objectives set for the testing program at the selected prehistoric sites were: 1) to determine the vertical and horizontal site parameters; 2) to discern, if possible, the specific activities taking place at each site; and 3) to produce evidence for further insights concerning the cultural chronology and settlement-subsistence patterns of the prehistoric inhabitants on the Refuge lands.

The archaeological sampling of site 35BE37, 35BE10, and 35BE39 began with the establishment of a primary datum. A standard cartesian grid was established with the north-south axis aligned to magnetic north. All grid baselines were set with the aid of a transit. The test units were tied into the grid system, each assigned coordinates determined by the distance from the baseline.

The locations for the test pits were selected with the goal of obtaining the maximum amount of subsurface information with the minimum amount of excavation. Units were placed in areas with the least observable disturbance. This often meant digging in areas edging plowed fields, up against vegetation lines, and avoiding areas in on-going agricultural processes (plowing, cutting, combining, and field burning). The units were usually oriented with the long axis parallel to the fall line to obtain the best possible stratigraphic profile.

Site maps were drawn to scale, plotting primary and secondary datum locations, excavation units, distinct physical features, and other details. Each test pit was assigned and labeled with a unique alpha designator.

The most efficient test pit size, in terms of information gained for expenditure of time, was a 1 x 2 m unit in buried sites and a 1 x 1 m unit for shallow sites. Units were excavated in 10 or 20 cm arbitrary levels with flat-nosed shovels and hand trowels. All sediment removed was passed through a 1/4" mesh screen. A unit level record was completed for each level excavated. All artifacts, debitage, and samples were bagged separately for each level. Excavations were extended past culturally bearing sediments in at least one test pit at each site for stratigraphic information.

Field notes were routinely taken by the excavators and field supervisors. Data recovery included unit level excavation records, feature records, site maps, stratigraphic profiles, photographic inventories, and artifact field catalogues for each site.

Since the main emphasis of this project was the excavation of test pits, a very selective and limited amount of surface collection was undertaken. Collection of surface material was limited to only diagnostic artifacts (artifacts that may provide chronological or specific cultural information). The surface collections were measured into the existing grid system and assigned a unique specimen number.

After excavations were well underway, a field laboratory trailer was brought into the Refuge. The laboratory tasks of washing and labeling all of the cultural materials was accomplished by a member of the field school. Students would rotate into the lab on a weekly basis for training in collections management. Artifacts were assigned a unique specimen number, labelled, and stored in a stamped coin envelope with all the provenience information. The artifacts, level bags, and samples were inventoried, boxed, and sent to the laboratory at the Department of Anthropology, Oregon State University.

Analytic Methodology

The cataloging procedures continued back at the Laboratory of Archaeology in the Department of Anthropology. Once this process was complete, all the cultural material was separated into analytical groups. The carbon samples were dried, cleaned, and weighed in preparation for radiocarbon date selections. Botanical specimens, primarily charred camas bulbs, were dry brushed and sent out for identification. The entire collection of debitage was re-examined for consistencies in material type designations, and counts, and inspected for overlooked artifacts. The faunal collection was sorted into identifiable and unidentifiable categories and set aside for more detailed analysis. All artifacts were unpacked and sorted by inferred functional class.

The analysis of archaeological collections from 35BE37, 35BE10, and 35BE39 is oriented toward providing a descriptive and processual typology of the prehistoric material culture. The artifact typology includes all of the materials in the collections but is only a representative sample of the artifacts that may occur in the archaeological sites at Wm. L. Finley National Wildlife Refuge.

The most abundant artifact type from the site collections is represented by flaked stone artifacts. Lithic tool production sequences or types are presently used in the analysis of the Finley artifact assemblages. The process of stone tool manufacture is represented by four major processes 1) selection of raw material; 2) shaping and reducing the material, using various technologies; 3) employing the product for a certain task or tasks; and 4) disposal (the product is lost, discarded, or disposed of) (Schiffer 1976).

The manufacturing process of stone tools is a process viewed as a continuum (Muto 1971:47) starting with the raw material and ending with a finished tool:

> As a continuum, the manufacturing process produces many and varied results along the way. The methods and techniques employed in any sequence of production leave behind some form of diagnostic waste.

The artifacts from the Finley sites were broken down into types based on the stage of tool manufacture and use. Each type represents a production point in the manufacturing process and are arbitrary points of analytic references. Each artifact was assigned a three-part alpha-numeric designation. The first two numeric digits of the code refer to the functional class. The second two numeric digits, preceded by a dash, indicate a subclass or style based on major morphological variations within the functional class. The final digit, a capital letter, refers to secondary variations in form. This artifact classification system was devised by Brauner in 1976 and has been employed in artifact descriptions for collections throughout the Pacific Northwest. It is hoped that others utilizing the results will find this presentation yields significant information concerning tool production and implement utilization. The artifact typology, complete with descriptions, is included in Appendix B.

A second typlogical variable taken into consideration with the analysis is the selection of raw material. As described by Crabtree (1972:4), the selection of material plays an important role in the manufacturing process: "The shape and functional performance of the tool is governed by the quality of the material and the skill of the worker." For instance, since obsidian and crypto-crystalline silica are fine-grained materials, they are easier to work into a razor-sharp cutting edge than a visicullar basalt.

Three material classes are used to describe the collection: cryptocrystalline silica, obsidian, and others. The category of cryptocrystalline silica includes a variety of fine-grained silicas of chert, jasper, and chalcedony. Obsidian is described by Crabtree (1972:79) as an igneous glass of volcanic origin in which there exists no discernible crystalline structure. Basalt, an igneous rock of volcanic origin, is quite variable in texture from fine-grained to course-grained varieties. The "other" category includes materials that were not crypto-crystalline silica or obsidian. Rhyolite, granites, conglomerates of basalt-like materials, crystals, minerals, and sandstone are represented in the collections.

Chapter 6. Descriptive Archaeology

35BE37

The archaeological inventory of the Wm. L. Finley National Wildlife Refuge recorded site 35BE37 in September 1980 (Peterson, Bell, Brauner 1980). The site was originally assigned a temporary number 2-P and named "Poison Oak Loop." During the 1980 survey, "Poison Oak Loop" referred to a mile-long guided hiking trail that passed through the prehistoric site. Since then, the trail has been upgraded and renamed the "Trail of Discovery."

Site 35BE37 is located near the western boundary of the Refuge, north of the main access road and south of Bald Top, in the SE 1/4 of the NE 1/4 of Section 30 in the Greenberry Quadrangle. The Trail of Discovery begins in an open grassland setting starting at an elevation of 300 feet and heads west crossing Brush Creek. The trail gently ascends up a series of terraces, each terrace about 20 feet higher, until reaching an elevation of 420 feet. The terraced area is covered in a dense, forest canopy of maple and Douglas fir trees with a heavy riparian surface vegetation.

TSP.? RNG.?

The site was identified by a surface lithic scatter consisting of a utilized hammerstone, several utilized flakes, and numerous obsidian and cryptocrystalline flakes. The site boundaries were evidenced by an abundant fire-cracked rock scatter centering at the 340 foot contour and observed "for several hundred feet throughout the area" (Peterson, Bell, Brauner 1980).

The archaeological sampling of site 35BE37 was expanded in order to test each successive terrace contour. The cartesian grid system, centered on the top of the highest terrace, spanned an area 80 meters east-west and 125 meters north-south. Fourteen 1 x 2 meter test pits were placed within the 10,000 square meter area (Figure 7).

Five 1 x 1 meter test pits were employed in establishing the site boundaries. Test pit J was placed just off the Trail of Discovery to assess the eastern site boundary. Test pit P was placed 41 meters south of test pit L, in an open meadow, on the western site boundary. Test pits Q, R, and S were set off the trail to the west, approximately 20 meters apart, to insure establishment of the western site boundary. The northern boundary of the site was well-established by the small stream that paralleled the site approximately 30 meters north of test

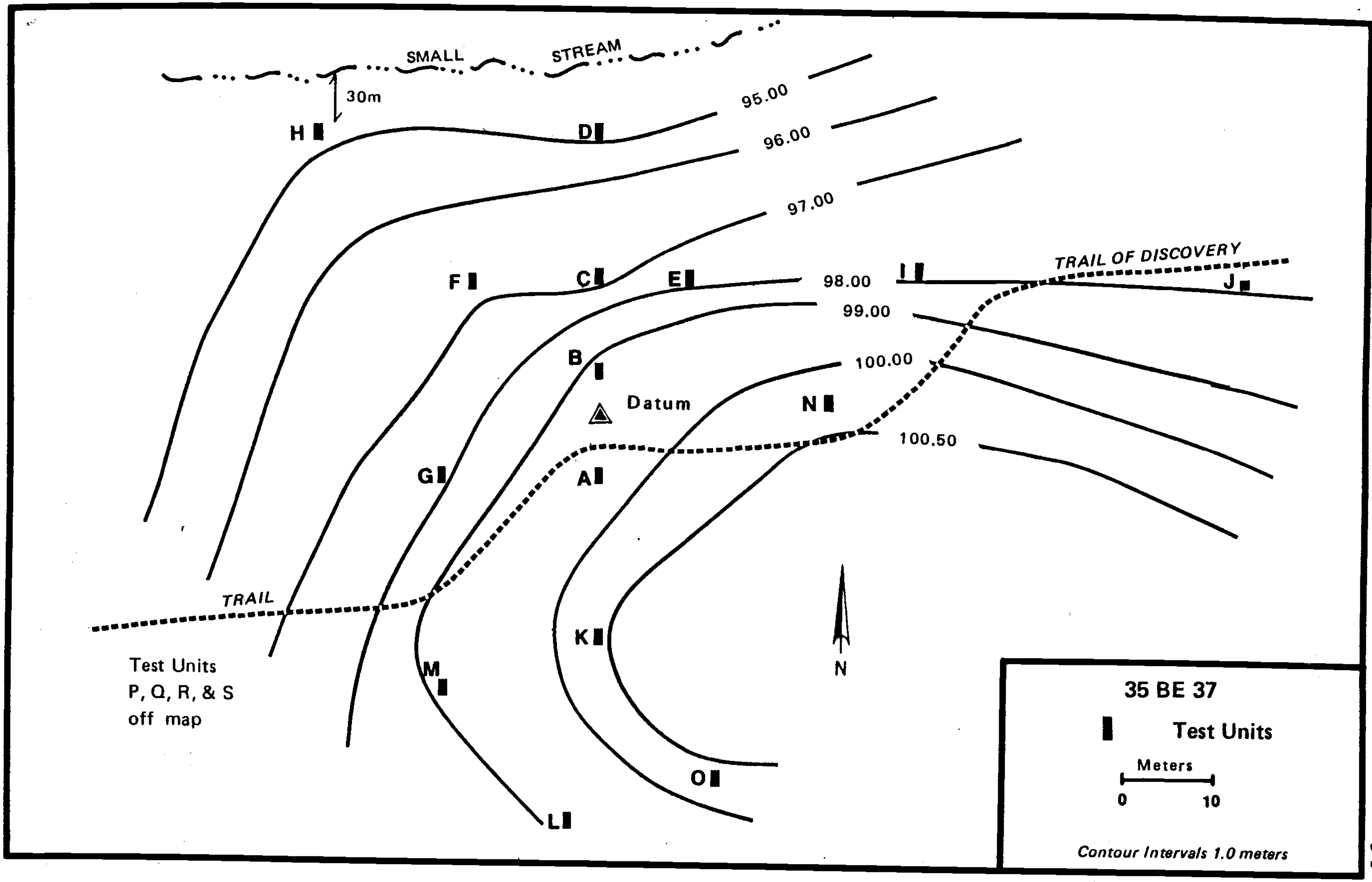


Figure 7. Location of test pits, 35BE37.

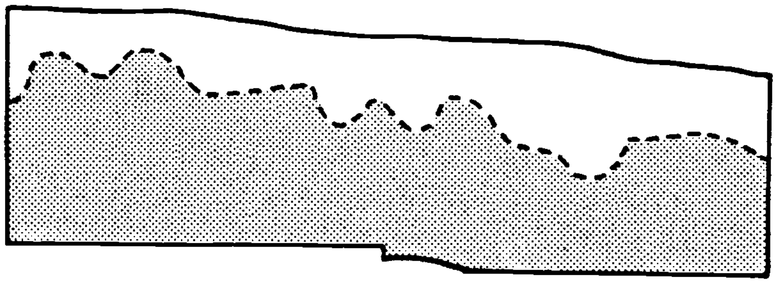
pit H. A total of 22.9 cubic meters of dirt was hand excavated from the 19 test units.

The excavations revealed two distinct stratigraphic units at 35BE37. Unlike the tested sites 35BE10 and 35BE39, the deposits at 35BE37 were not disturbed by agricultural activities. Instead, the surface is covered by a heavy humus layer. Test pit B, located central to the site on a gentle north-facing slope, provides a general site stratigraphic descriptions.

As illustrated in Figure 8, Stratum II consists of a dark greyish brown (10YR 4/2) silty clay loam. Small rounded baked clay nodules are abundant, rodent activity is heavy, and roots are common. Undulations at the Stratum II/Stratum I contact are common and attributable to heavy rodent activity.

Stratum I is described as a brown (7.5YR 5/4) silty clay loam. At varying depths within the lower stratum the matrix grades to a strong brown (7.5YR 5/6) loamy clay, subangular blocky structure which grades to a strong brown (7.5YR 4/6) loamy clay, angular blocky structure. Cultural material is abundant and fire-cracked rocks frequent throughout Stratum I.

The artifact distribution and frequency from the upper stratum, as presented in Table 9, clearly constitutes the primary focus of human activity at 35BE37.



DEPTH	DESCRIPTION
0-2 cm	0 Horizon
2-24 cm	10YR 4/2 (dry) dark greyish brown silty clay loam, moderate sub-angular structure, slightly sticky and slightly plastic when wet, small rounded baked clay nodules abundant, rodent burrowing heavy, roots common.
24-70 cm	7.5YR 5/4 (dry) brown silty clay loam, roots common, grades to: 7.5YR 5/6 (dry) strong brown loamy clay, sub-angular blocky structure, sticky and plastic when wet, grades to: 6.5YR 4/6 (dry) strong brown loamy clay, angular blocky structure, sticky and plastic when wet, roots infrequent. Cultural material is abundant and fire-cracked rocks frequent throughout stratum. Very diffuse broundary between this stratum and the next; undulations due to rodent activity.

Figure 8 . Stratigraphic profile of the west wall, test pit B, 35BE37.

Table 8. Artifact distribution, upper cultural stratum, 35BE37.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	Total
									Test Pits											
01-Projectile Points:																				
01-01: Side-notched		1																		1
01-02: Base-notched	3	1								1	1				2					8
01-03: Corner-notched	2	1		2		1	4	1					2		2					15
01-04: Corner-removed	1							1	2						1					5
01-05: Stemmed								1	2											3
01-07: Triangular	2	1		2					3	1				1						10
01-08: Fragments	1	1		1											1					4
02: Knives				1										1						2
03: Drills			1																	1
04: Gravers	2			2	1	1		3	3			1		2	2					17
05: Scrapers	5	1		1		1		2	1			2		2						15
06: Utilized Flakes	2	2	2	3	1	1	2	5	6	1	5	2		2	1					35
07: Bifaces	4	1	1		1	2	1	6	2	1	6	1	2	8	7					43
08: Unifaces	3	1		3			3	3		2	2		1	2	1					21
09: Worked Cobbles	6	2		2		3	1	1	2	1	1	2		3	4		1			29
10: Edge Polished Cobbles	1					1														3
12: Hammerstones												2								2
13: Anvil									1											1
14: Pestle	1																			1
15: Mortar	1		1						1											3
16: Abraider									1					1						2
17: Manuport	2			1			2		1											6
18: Worked Bone		1																		1
Totals	36	13	5	18	3	10	13	23	25	7	15	10	5	22	21	--	1	--	--	227

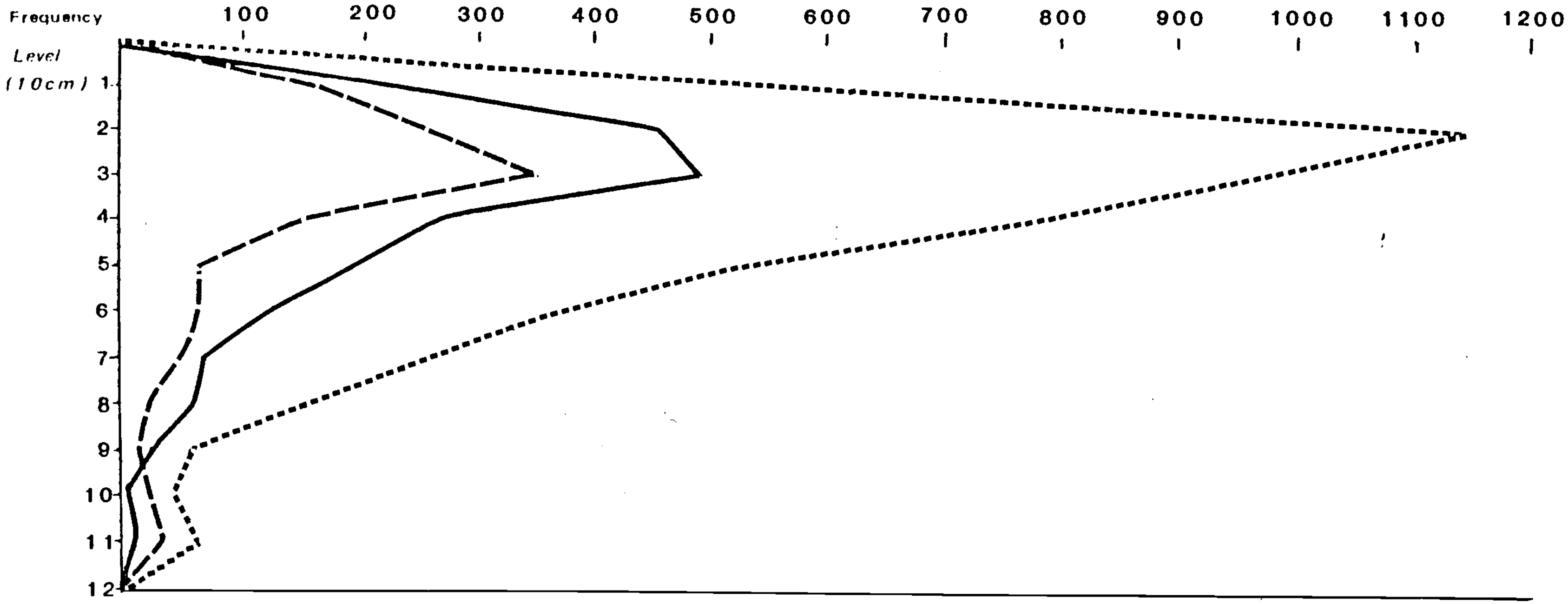
All artifact categories are present throughout the deposits. A total of 227 artifacts were recovered, constituting 62% of the 35BE37 tool assemblage. A total of 5007 pieces of chipping debris was recovered from the upper stratum. The debitage is represented by 61% cryptocrystalline silica, 24% obsidian, and 15% basalt. The frequency and distribution of debitage, as illustrated in Table 10, occurred throughout the upper stratum and reached a peak at the contact with the lower stratum. The highest frequency of debitage occurs at a depth of 30-40 cm across the site.

By contrast, the faunal remains from 35BE37, presented in Table 11, are distributed quite randomly, with a low frequency of occurrence. Dusky-footed wood rat, squirrel, deer, cow, and horse are the identified species from the upper stratum.

The analysis of data has shown the presence of an archaeological component within the upper stratum. Five cultural features represent what appear to be temporally related phenomena. All of the features in the upper stratum occur in the silty clay loam deposits at a depth of 10 to 40 cm below the surface.

In test pit A, a heavy concentration of fire-cracked rock was first encountered at 10 cm below surface. Burnt clay, charcoal, several bones, and an abundance of tools,

Table 10. Frequency Distribution of Debitage, 35BE37.



Material Type	% of Total
...... Cryptocrystalline silca	63
—— Obsidian	23
– – – Basalt	14

Table 11. Faunal Remains, 35BE37.

Test Pit	Level	Identification and Comments
A	1	left innominate; *Neotoma* sp. (dusky-footed wood rat) 26 unidentifiable bone fragments, 10 burnt
A	2	lower molar (P3), right side; *Odocoileus* (deer); 99 unidentifiable bone fragments, 22 burnt.
A	3	upper right premolar; *Odocoileus* sp. (deer); molarform fragment (deer-sized); distal 1st phalanx (deer-sized); molariform fragment (deer-sized); 20 identifiable bone fragments
A	4	distal metapodial epiphysis, unfused (deer-sized)
A	7	antler fragment; *Odocoileus* sp. (deer)
B	1	proximal metatarsal shaft fragment (deer-sized)
C	2	left, lower molari form (deer-sized)
E	2	distal metapodial (deer-sized)
E	4	unidentifiable canine
G	1	femur shaft fragment (deer-sized) 12 unidentifiable bone fragments, 5 burnt
G	2	left astragalus; *Equus* sp. (horse)
G	3	left astragalus (deer-sized); 7 unidentifiable bone fragments
J	3	metapodial shaft fragment (deer-sized); 1 unidentifiable burnt bone fragment
K	1	molariform fragment (deer-sized); 3 unidentifiable bone fragments, 2 burnt
K	4	left mandible; *Spermophilus* sp. (squirrel); 20 unidentifiable bone fragments

Table 11, Continued.

Test Pit	Level	Identification and Comments
L	2	left mandible; <u>Spermophilus</u> sp. (squirrel)
G	1	femur shaft fragment (deer-sized); 12 unidentifiable bone fragments, 5 burnt
G	2	left astragalus; <u>Equus</u> sp. (horse)
G	3	metapodial shaft fragment (deer-sized); 7 unidentifiable bone fragments
J	3	metapodial shaft fragment (deer-sized); 1 unidentifiable burnt bone fragment
K	1	molariform fragment (deer-sized)
K	4	left mandible; <u>Spermophilus</u> sp. (squirrel); 20 unidentifiable bone fragments
L	2	left mandible; <u>Spermophilus</u> sp. (squirrel)
L	3	molariform fragment (deer-sized); distal tibia fragment (deer-sized); 15 unidentifiable bone fragments
M	2	right mandible fragment; <u>Neotoma</u> sp. (dusky-footed wood rat)
N	1	right ulna, fetal (deer-sized)
N	3	right scaphoid (deer-sized); mandible (deer-sized); lower left molar (P3) (deer-sized); 36 unidentifiable bone fragments
N	4	femur shaft fragment (cow-sized)
O	2	left astragalus; <u>Bos</u> sp. (cow)

tool fragments, and 112 pieces of debitage occurred within the rock scatter. Twelve artifacts were recovered in the deposits in the first level of the feature: two base-notched points, one corner-notched point, two triangular projectile points, one graver, one scraper, one utilized flake, an edge polished cobble, pestle, mortar, and two manuports. Level two of the feature uncovered only one graver and one biface but provided the highest frequency of debitage: a total of 247 flakes. The maximum depth of the feature, at 30 cm below surface, is defined by a dramatic drop in frequency of cultural materials and occurs at the contact of the lower stratum.

Unlike the flat fire-cracked rock feature in test pit A, the fire-cracked rock feature in test pit M follows the 5% south-facing slope at 30 to 60 cm below surface. Excavations in level one revealed an abundance of fire-cracked rock scattered over the northern 60 cm of the 1 x 2 m unit. Level two exposed the scatter to include three-fourths of the unit. By level three, the entire surface, at a depth of 40 cm, was covered by a multitude of fire-cracked rock. Artifacts recovered from all three levels were consistently discovered just outside the rock concentration. Artifact and debitage frequencies are much lower than cultural materials recovered in test pit A. One corner-notched point, three bifaces, one uniface, and

78% of the total debitage from test pit M is associated with the feature.

Test pit I recorded a similar fire-cracked rock feature associated with two small pit features. At approximately 35 cm below surface, fire-cracked rocks were scattered across the 1 x 2 m surface. Similar to the features recorded in test units A and M, the frequency of artifacts and debitage increased dramatically. In the very southwest and southeast corner of the unit two semi-circular and steeply sloped pits extended out from the south wall about 50 cm and were 20 cm wide. The pits were about 50 cm deep and filled with a darker-colored mottled clayey loam matrix mixed with an abundance of burnt wood particles, debitage, and small baked clay nodules. At the upper contact of the feature, six artifacts were recorded, one corner-notched point, a small obsidian triangular point, one graver, one scraper, two worked cobbles, and an anvil stone. The highest frequency of debitage was recovered at this level, a total of seventy-two flakes, primarily represented by cryptocrystalline silica. Within the feature, at level five, four artifacts were identified as one graver, one scraper, one biface, and a mortar fragment. At the base of the feature, at 60 cm below surface, five artifacts were identified as a corner-notched projectile point, a triangular projectile point, one scraper, a utilized flake, and a heavily used sandstone shaft abrader.

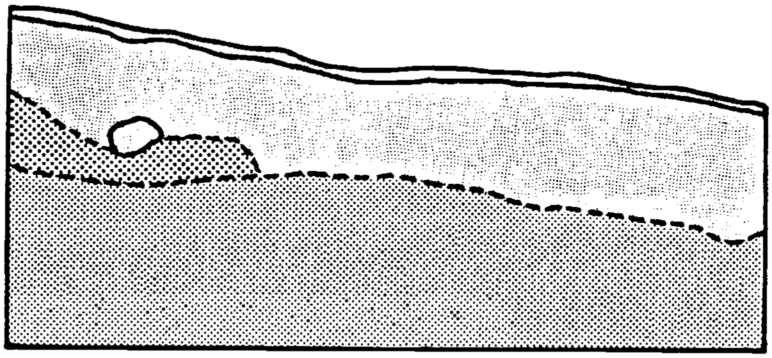
The feature recorded in test pit D appears to be a remnant of a roasting oven. The feature was first encountered at the bottom of the second level about 15 cm below surface in the southern half of the test pit. Excavations in level three exposed the floor of the feature resting on the silty clay loam contact in the central potion of the test pit. Over 400 fire-cracked rocks were "piled" in the middle of the 1 x 2 m unit. A small charred camas bulb was located in a concentration of burnt wood and organics (see Appendix C for lab identification report). Small pockets of orange colored burnt clay were found scattered between the rocks. Cultural material from level two consists of a corner-notched projectile point, two utilized flakes, one uniface, and ninety-five pieces of debitage. Level three recovered four projectile points: two stemmed, two triangular, and one basal fragment. Two gravers, one utilized flake, two unifaces, two worked cobbles, and 162 pieces of debitage are all from level three.

At the bottom of the roasting pit feature, about 35 cm in depth, a large obsidian knife was found between two fire-cracked rocks. The fire-cracked rocks were much larger than the rock recorded in features from units A, M, and I, often as large as 18 cm in diameter.

Test pit H, located 37 m west of test pit D and situated on he same north grid line, was placed on the lowest terrace to test the northern site boundary. Excavations in level two exposed a hearth in the very southwest corner of the unit. The hearth, as defined by a semi-circular ring of basalt rock, measured 80 cm east of the west wall and 60 cm north of the south wall. The central hearth area, measuring 40 sq. cm. was filled with burnt wood. Ample carbon served to date the occupation of the upper cultural stratum at 355$\pm$50 years B.P. (W.S.U. Sample Number 2825).

The artifacts associated with the hearth were consistently discovered an average of 30 cm outside the hearth area. Artifacts were identified as a corner-removed projectile point, three gravers, one biface, one uniface, and four utilized flakes.

Excavations in test pit H extended down to 90 cm below surface. The stratigraphic profile of the west wall, as illustrated in Figure 9, clearly shows a profile of the hearth feature. A mixture of the upper and lower strata matrix is located just above the hearth. The analysis of archaeological evidence from the lower stratigraphic unit, Stratum I, clearly demonstrates an



DEPTH	DESCRIPTION
0-2 cm	0 Horizon
2-2 cm	7.5YR 4/4 (dry) brown to dark brown loamy clay, subangular blocky structure, plastic and sticky when wet, occasional roots, krotovinas common.
22-42 cm	Mixture of upper and lower stratum matrix, associated with fire hearth feature. C-14 sample (W.S.U. Sample Number 2825) dated 355±50 years B.P.
42-90 cm	10YR 4/3 (dry) brown to dark brown clayey silty loam. Slightly subangular blocky structure, roots common, krotovinas common, fire-cracked rock and cltural debris.

Figure 9. Stratigraphic profile, test pit H, west wall, site 35BE37.

earlier occupation at site 35BE37. The early component is represented by 137 artifacts, 38% of the site artifact assemblage. All tool categories are represented in the lower stratum with the exception of pestles and shaft abraiders. As illustrated in Table 12, the frequency of artifacts is much lower and the distribution is somewhat more limited to units within the higher terraces at 35BE37. Unique to the assemblage is a lanceolate projectile point (01-06A). A total of 3256 pieces of debitage from the lower stratum represents 39% of the site collection. The debitage within the lower stratum is represented by 66% cryptocrystalline silica, 22% obsidian, and 12% basalt and other materials. The material type percentages are quite similar to recovery in the upper stratum.

Although organic preservation was fairly good, the faunal remains from the lower stratum are represented by a deer antler fragment found in test pit A (see Table 11). No culturally-modified bone was recovered.

A small concentration of charcoal was collected at 55 cm below surface in test pit B. The only artifactual material associated with the charcoal was a biface fragment and a few flakes. The charcoal sample dates the lower component at 35BE37 with a C-14 date of 1140$\pm$55 years B.P. (W.S.U. Sample Number 2823).

Table 12. Artifact distribution, lower cultural stratum, 35BE37.

	Test Pits																			
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	Total
01-Projectile Points:																				
01-01: Side-notched		1												1						2
01-02: Base-notched	1								1		1									3
01-03: Corner-notched														1	3					4
01-04: Corner-removed															2					2
01-05: Stemmed			1																	1
01-06: Lanceolate							1													1
01-07: Triangular							1				2			1						4
01-08: Fragments	2											1	1	1						1
02: Knives							1							1						2
03: Drills															1					1
04: Gravers	1	1	1							1		1	2	2	2					11
05: Scrapers	1		2			1		1	1			1		2						10
06: Utilized Flakes	2		3			4			1		1		2	10	4					27
07: Bifaces	2	2	1				1	1	2		2	1	1	2	1					16
08: Unifaces	2	1			1			1	1	1	1			2	1					11
09: Worked Cobbles	3		4		2		1	1					2	8	3					24
10: Edge Polished Cobbles					1			1												2
12: Hammerstones												1		1						2
15: Mortar		2			1															3
17: Manuport							1		1					3	1					6
Totals	14	7	12	--	5	5	8	5	7	2	7	5	8	35	18	--	--	--	--	137

Two distinct cultural features are identified in the lower stratum at 35BE37. In test pit O at a depth of about 60 cm below surface, excavations revealed a semi-circular ring of fire-hardened clay lined in a heavy concentration of fire-cracked rock. The feature was exposed and defined as a roasting pit. Several charred camas bulbs were found in the pit fill (see Appendix C). The oven was exposed within the 1 x 2 m unit and measured 80 cm wide and 100 cm long. The pit had been dug into the clayey matrix to a depth of about 40 cm, measuring from the rim to the bottom of the pit. The interior of the roasting pit was lined by a 8-10 cm thick fire-hardened clay. The fill consists of primarily fire-cracked rock, charcoal, and only a few flakes. The charcoal yielded a C-14 date of 1205±75 years B.P.

The second cultural feature recorded in the lower cultural stratum is located on the highest rise at 35BE37, test pit N. The highest frequency of artifacts from the lower stratum occurs in this unit from 40 to 120 cm below surface. A total of thirty-five artifacts, representing all artifact categories are recorded (see Table 12). Debitage counts from level four to eleven consistently report totals between eighty and 100 pieces of chipping debris. Close inspection of the stratigraphic profiles exposed in test pit N revealed no break in the 80 cm deposits within the lower stratum. However, the matrix was significantly different from the lower stratum composition. The soil was a very fine, lightly compacted silty loam, rich in organics and very dark colored. In view of the limited exposure of this feature in the 1 x 2 m test pit, and in consideration of the frequency and distribution of cultural material within a highly organic matrix, it is highly suspect that the feature represents an occupational zone.

35BE10

In 1973, David Brauner, Oregon State University, recorded site 35BE10. The site is located in Section 53, Township 13 South, Range 5 West of the Greenberry Quadrangle. The 1981 archaeological test excavations have established prehistoric site boundaries between the 260' and 360' contour lines on and above a present floodplain of Muddy Creek. As pictured in Figure 10, the northern site boundary is established at Brown Creek, Brown Swamp and Muddy to the east, test pit C of 35BE10 marks the southern limit, and the 360' contour line at test pit G in the area marked 35BE10B establishes the western boundary.

The site is situated on a floodplain currently under rye grass cultivation. The field, Finley T14-4, is annually plowed and burned. The terrain found less than

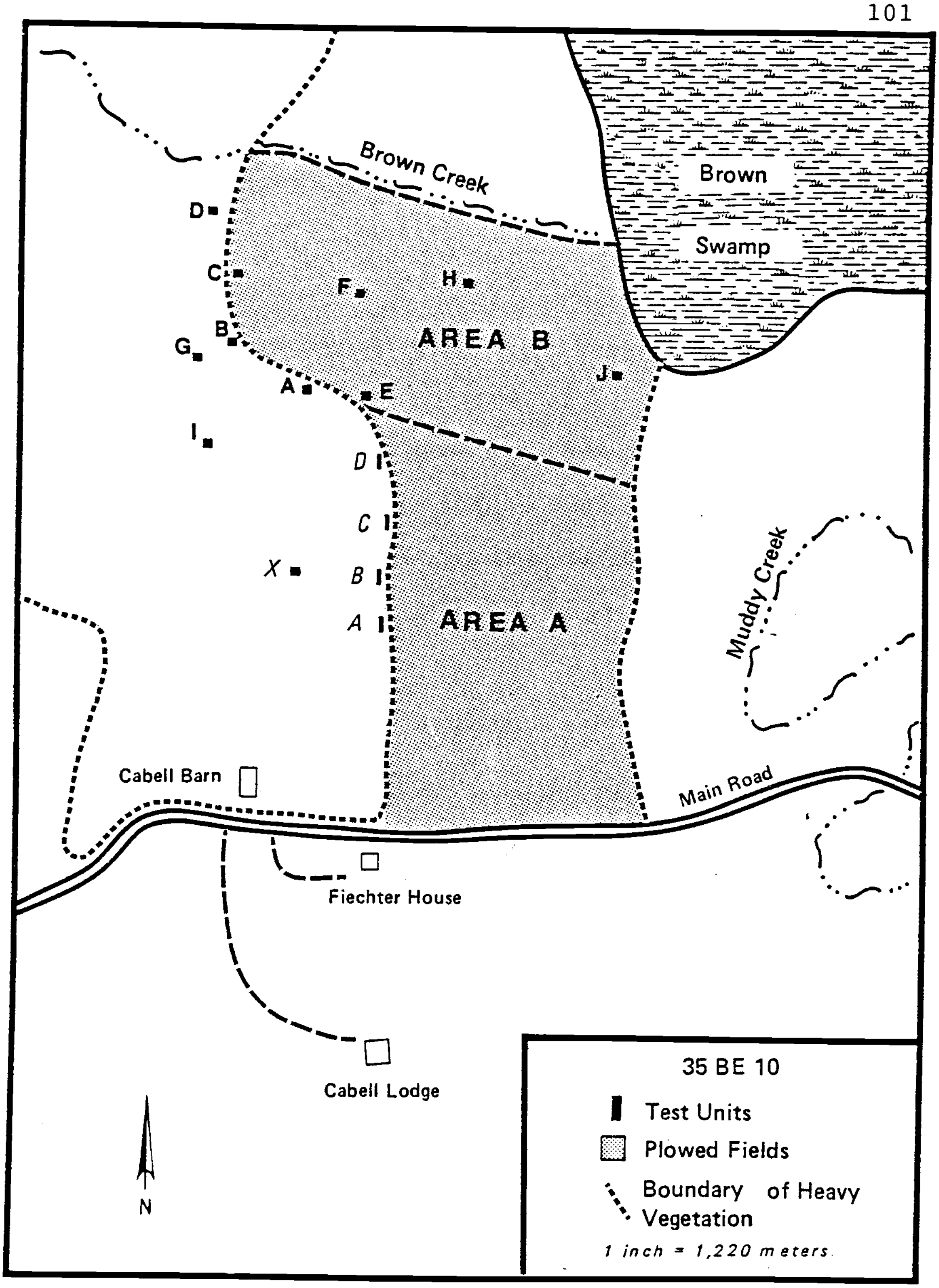


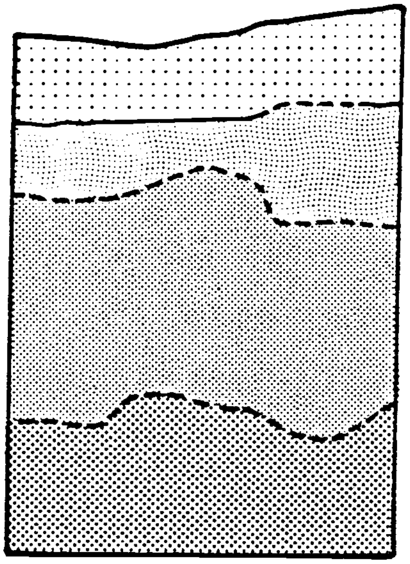
Figure 10. Location of test pits, 35BE10.

five feet above Muddy Creek is wet from winter to early spring and after periods of prolonged precipitation. The terrain west of the cultivated field is occupied by a dry deciduous plant community of Oregon white oak (Quercus garryana), Douglas fir (Pseudotsuga carr.), several shrubs, lush poison oak, and berries common to the bottomland forest communities.

The initial objective for test excavations at 35BE10 was to search for the original Fietcher cabin site. Test units A-D and X were set up inside the plowed field off a north/south baseline and spaced approximately 85 meters apart (see Figure 10, area A). While excavations were in progress, a fireline was plowed around the entire cut grass field in preparation for burning. Subsequent inspection of the plowed area revealed a significant amount of prehistoric cultural remains north of the on-going excavations. Results from the excavations in test units A, B, and X determined that there was no relationship to a prehistoric occupation. (Results from the historic sites testing program are not discussed in this report.) Since excavations in test units C and D uncovered prehistoric cultural material and provided a lack of historical information, work was continued.

At 35BE10, area B, ten 1 x 1 meter units were placed in the field from the first terrace of the Muddy Creek floodplain, moving up the slope and west to the third terrace in the forested area. The 1 x 1 meter units, excavated in 20 cm levels, provided expedient methods in retrieving site information prior to field burning. The first terrace sequence was sampled with test pit J. Test pits A-H tested the second terrace and unit I was located on the immediate rise of the third terrace.

Excavations in test pit D, 35BE10B, were extended beyond culturally bearing sediments for stratigraphic information. As illustrated in Figure 11, evidence of a previous plow zone extends from a grass-covered surface to a depth of 25 cm below surface. From the northeast corner of test pit D, Stratum III is contacted at 25 cm to 42 cm below surface. Stratum II consists of compacted, laminated sands and silts, with roots and krotovinas common. Apparently the test pit is situated adjacent to an old road cut and has undergone the effects of slope wash (Palmer Sekora, personal communication). An indistinct boundary defines the contact of Stratum II at 42 cm to 100 cm below surface. Stratum II is described as a dark brown (7.5YR 3/2) silty clay loam. Flakes and fire-cracked rock occur in profile to a depth of approximately 60 cm below surface. Stratum I consists of a brown to dark brown (7.5YR 4/4) loamy clay mottled with



DEPTH	DESCRIPTION
0-25 cm	Plow zone.
25-42 cm	Compacted laminated sands and slts; roots and krotovinas common.
42-100 cm	7.5YR 3/2 (dry) dark brown silty clam loam.
100-150 cm	7.5YR 4/4 (dry) brown to dark brown with 7.5YR 4/6 strong brown loamy clay, angular blocky structure.

Figure 11. Stratigraphic profile, test pit D, site 35BE10 (B).

a strong brown (7.5YR 4/6) angular, block structured loamy clay.

Although two separate site areas (35BE10 and 35BE10B) were assigned to the archeological remains during field excavations, the collections from test pits C and D, 35 BE10, and all the unit collections from 35BE10B are included as one prehistoric site assemblage.

The highest concentration of cultural remains was recovered in test pit C, 35BE10. The 1 x 2 m unit was excavated to a depth of 80 cm below surface and yielded a total of sixteen tools, 340 flakes, and sixteen unidentifiable mammal bones. Two obsidian base-notched projectile points and eighteen flakes were recovered in level one. The only cultural feature from 35BE10 is recorded in test pit C, level two. The feature consists of twenty-four fire-cracked rocks scattered across the northern half of the unit. Artifacts associated with the feature include: four base-notched projectile points (three are obsidian); a small triangular obsidian projectile point; a cryptocrystalline silica large stemmed projectile point; one obsidian uniface fragment; one obsidian worked cobble; a basalt core chopper; and 161 pieces of debitage, 66% of which are obsidian. A total of sixteen unidentifiable mammal bone fragments are associated with this occupational surface. Small particles of charcoal were collected, yet were insufficient for a radiocarbon date. Five tools were collected from level three: an obsidian base-notched projectile point, an obsidian drill-perforator bit fragment, two worked river cobbles, and a heat fractured basalt hammerstone. Level three recovered 142 pieces of debitage, with 80% of the total represented by obsidian material, 15% cryptocrystalline silica, and 4% basalt. Only twenty-nine pieces of debitage were collected from level four. No fire-cracked rocks, tools, or bone fragments were recovered from level four.

Test pit D was situated on a slightly lower contour, 32 meters north of test pit C. Two worked river cobbles were recovered from this 1 x 2 m unit and occurred in level one. Excavations to a depth of 80 cm below surface recovered only seventy-six flakes; 56% basalt, 22% obsidian, and 22% cryptocrystalline silica. No fire-cracked rocks, bone, or charcoal were recovered.

Surface collections from the plowed fireline were located directly between test pits C and D: an elongated granitic river cobble used as a pestle without prior modification, an elongated granitic river cobble intentionally tapered and showing evidence of intensive use as a pestle, and a basalt cobble chopper.

Test pit J was located on the first terrace of the modern Muddy Creek floodplain near the edge of the plowed field and bottomland forest zone. A laterally split, elongated basalt river cobble, used as a chopper, was recovered with eleven obsidian flakes in the top 40 cm of the unit.

Test pits H and E were further upslope from test pit J, situated on the lowest point of the second terrace. The same distribution and frequency of cultural materials in test pit J was encountered in units H and E. In test pit H, cryptocrystalline silica tools were identified as a utilized flake and uniface fragment. Debitage was low in frequency, with only eleven flakes recovered. Tools from test pit E were both manufactured of obsidian and identified as a corner-notched projectile point and broken biface fragment. A total of thirty flakes were recovered from 60 cm of excavation. Both units record fire-cracked rocks to a depth of 60 cm below surface.

Test pit F, located on a slight rise of the second terrace, recorded the highest frequency and greatest variety of cultural remains in area B. The top 20 cm level recovered obsidian tools identified as a uniface fragment, a distal fragment of a projectile point, and one utilized flake, including one cryptocrystalline silica graver-perforator. There were a total of thirty-one flakes; 58%

of the total represented in cryptocrystalline silica, 29% obsidian, and 13% basalt. Tools from level two were identified as an obsidian serrated corner-notched projectile point, an obsidian small triangular projectile point, and a cryptocrystalline silica worked river cobble. The exact percentages of debitage from level one are found in level two. The frequency of tools drops at level three. An obsidian base-notched projectile point, a worked basalt cobble, and a bifacially worked chert, with a noticeable drop in debitage (total of 24) was recorded.

Small particles of burnt wood collected from levels two and three of test pit F yielded a C-14 date for the upper cultural levels at 35BE10 at 1720±75 years B.P. (W.S.U. Sample Number 2826). Fire-cracked rock was abundant in the top 60 cm of this unit, 116 in total in level one, fifty-five total in level two, nine total in level three, and no fire-cracked rock in level four.

Test pits A, B, and C in 35BE10, area B, are all situated inside the plow zone, within a heavy vegetation cover consisting primarily of poison oak. Excavations in test pit A were accomplished to a depth of 60 cm below surface. Four tools were collected from the surface of the unit, located near active rodent holes. The surface collection includes an obsidian base-notched projectile point, a cryptocrystalline silica corner-removed projectile point, a small triangular projectile point, and a utilized flake. Forty fire-cracked rocks and charcoal were associated with three obsidian tools, a biface fragment, a uniface fragment, and a utilized flake in level one. Cultural remains from level two include two obsidian projectile points, one corner-notched and one base-notched, along with an obsidian point tip and a worked chert cobble. The debitage count for the unit record is a relatively low frequency at twenty-two total; 77% cryptocrys-talline silica and 23% obsidian flakes. Fire-cracked rocks were also low in frequency, averaging forty in levels one and two, and ten counted in level three.

Excavations in test pit B were extended to a depth of 40 cm below surface. Only one tool was recovered from this unit, a cryptocrystalline silica graver-perforator from level one, associated with fifty-five flakes. Since only a few flakes were recovered at the top of level two, excavations were terminated at 40 cm below surface.

Test pit C was situated directly in the plow zone at the western edge of the cultivated field. Only a few flakes (nine total) were recovered from level one. Excavations in level two recovered two cryptocrystalline tools, a worked cobble, a graver-perforator, and an obsidian uniface fragment. Obsidian tools from level three include a medial biface fragment and a unifacially worked flake. Debitage from test pit C totals 110 flakes, 65% cryptocrystalline silica, 28% obsidian, and 7% basalt. No fire-cracked rocks were recorded.

Test unit D (see Figure 11) is situated at the western extent of the second terrace in a flat grassy area. Excavations in level one revealed a previous plow zone heavily disturbed by rodent activity. The right mandible of a mouse or vole (Microtus sp.) and a few flakes were recovered in level one. Further evidence of disturbance at levels two and three is determine by three clear glass fragments and only forty-one flakes of debitage. A cryptocrystalline silica base-notched projectile point, eight flakes, four fire cracked rocks, and a few particles of burnt wood were located in level four. After level four, cultural material frequencies dropped dramatically. Excavation to 150 cm below surface continued for stratigraphic information.

Table 13. Faunal remains, 35BE10 (Area B)

Test Pit	Level	Identification and Comments
D	1	1 right mandible; Microtus sp. (mouse or vole)
D	3	1 distal left humerus, unidentifiable, 1 unidentifiable bone fragment
G	2	5 unidentifiable burnt bone fragments

Test pit G was situated on the same contour line as test pit D, located near the top of the second terrace. Similar to test pit D, cultural remains were most abundant to the second level of excavation. Level two tools include a basalt hammerstone, a graver-perforator, a worked cobble, biface fragment, uniface fragment, and a bifacially worked flake. Eleven fire-cracked rocks, small particles of burnt wood, and five unidentifiable burnt bone fragments were also recovered from level two. The last two levels of excavation revealed a lower frequency of tools: a basalt chopper and a graver-perforator, fewer fire cracked rocks, and fewer flakes. The lithic debitage collected from test pit G was composed of 64% cryptocrystalline silica, 35% obsidian, and 11% basalt material.

Test pit I sampled the third terrace sequence at 35BE10. Forty centimeters of excavations recovered one utilized flake; a unifacially worked flake, both of cryptocrystalline silica; and thirteen flakes of debitage. Fire-cracked rock averaged fifteen per level.

Site 35BE10 is a large, yet shallow, site covering the western floodplain of Muddy Creek. Excavations removed a total of 1000 cubic meters. Artifact and debitage densities reach a maximum amount in the site area occupying the second terrace of the floodplain. The site tool assemblage (Table 14), comprises a wide variety of flaked stone tools, a total of sixty-five tools. Material type selections from tools at 35BE10 are comprised of 34% cryptocrystalline silica, 55% obsidian, and 11% basalt. The debitage material types represent a similar pattern of tool stone selection: 40% cryptocrystalline silica, 48% obsidian, and 12% basalt.

35BE39

This site was first recorded by Jim Bell and Bonita Peterson in September 1980 with temporary site number 4-P. The site is located in the SE 1/4 of Section 53, Township 13 South, Range 5 West of the Greenberry Quadrangle. Site boundaries are defined by the main road on the southwest extending in a northeast direction to Muddy Creek in the Refuge, Field T14-9. The site lies at an elevation of about 255 feet above sea level on terrain classified as seasonal wetlands and floodplain. Heavy vegetation, extending from the creek south approximately 90 meters, consists primarily of Oregon white oak (Quercus garryana), and several secondary species common to the bottomland forest communities. The remaining portion of the site, as defined by Bell and Peterson (1980), is situated on a floodplain presently in use for rye grass cultivation. The site area is wet in the winter, throughout early

Table 14. Prehistoric Artifact Assemblage for 35BE10.

	35BE10 Test Pits			35BE10 (Area B) Test Pits										
Artifact Category	C	D	Surface	A	B	C	D	E	F	G	H	I	J	Total
Projectile Points:														
01-02A Base-notched	6			2			1		1					10
01-03B Corner-notched				1				2	1					4
01-04A Corner-removed				1						1				2
01-05A Large stemmed	1													1
01-05C Small stemmed									1					1
01-07A Small triangular	1													1
01-07B Small triangular-serrated									1					1
01-08A Distal fragments				1					1					2
01-08B Medial fragments						1								1
Drill-Perforators:														
03-01A						1								1
03-02A	1													1
Graver-Perforators:														
04-02A									1					1
04-03A					1	1								
Utilized Flakes:														
06-01A											1			1
06-01B									1					1
06-01C										1				1
06-01E				1						1				2
Bifaces:														
07-01A Blanks				1										1
07-02A Bifacially Worked				1						2				3
07-02B Bifacially Worked				1					1					2
07-03A Biface Fragments							1	1						2

Table 14., Continued.

Artifact Category	35BE10 Test Pits C	D	Surface	35BE10 (Area B) Test Pits A	B	C	D	E	F	G	H	I	J	Total
Unifaces:														
08-01A						1				1	1			3
08-01B				1					1					2
Worked River Cobbles:														
09-01A	3	2		1		1			3	1				11
Choppers:														
11-01A	1		1							1				3
11-02A													1	1
Hammerstones:														
12-01B	1													1
12-02A										1				1
Pestles:														
14-01A			1											1
14-01B			1											1

N=65

spring, and occasionally after periods of prolonged precipitation.

The site datum was established approximately midpoint at the edge of the tall grass and cultivated field. A north/south baseline was set from datum at the edge of the grassy opening extending north into the oak trees and heavy vegetation (Figure 12). Test pits A, B, and F were set off the baseline. Test units C and D were set 12 meters west and east of the baseline. Test pit E was established, by use of transit and rod, at a point 93° W and 138 m west of datum.

All six test pits were 1 x 2 meter units and were excavated, in 10 cm levels, to an average depth of 60 cm below surface. A total of 650 cubic meters was hand excavated at 35BE39.

Excavations revealed evidence of two primary stratigraphic units below the plow zone, identified in the soil profile of test pit C. As depicted in Figure 13, the plow zone extends from the surface to an average depth of 20 cm below surface. Stratum II is a light brownish grey (10YR 6/2) loamy clay which extends from the plow zone to a depth of 54 cm below surface. The loamy clay has a sub-angular blocky structure and is sticky and plastic when wet. An indistinct boundary separates Stratum II and Stratum I. Stratum I is described as a light grey (10YR

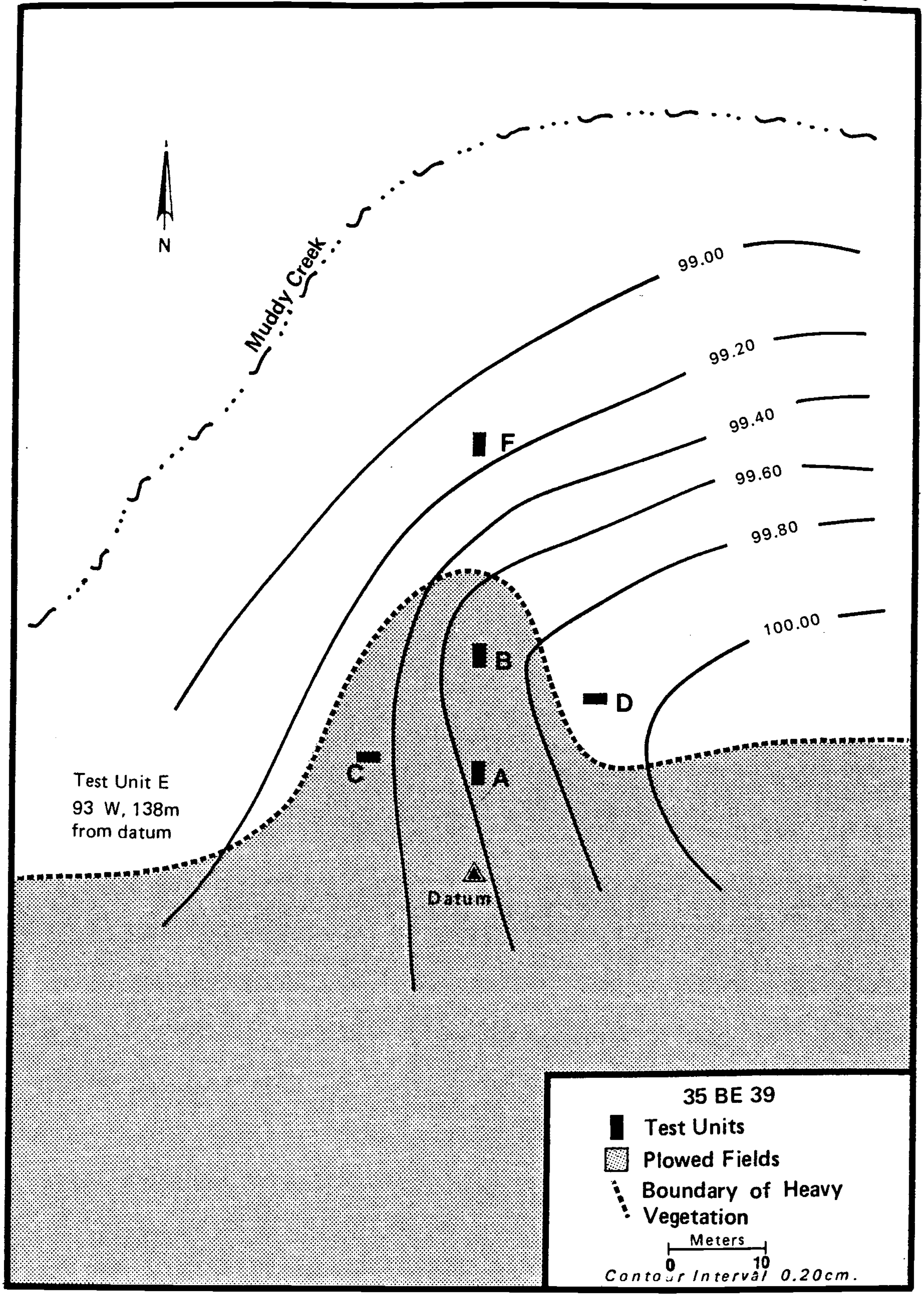
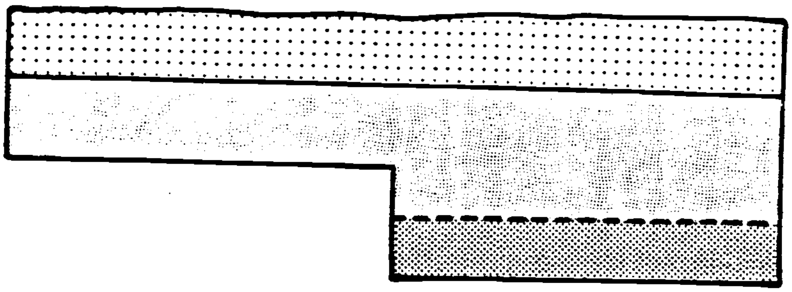


Figure 12. Location of test pits, 35BE39.



DEPTH	DESCRIPTION
0-20 cm	Plow zone.
20-54 cm	10YR 6/2 (dry) light brownish grey loamy clay; sub-angular blocky structure; sticky and plastic when wet.
54-70 cm	10YR 7/2 (dry) light grey clay; angular, blocky structure, sticky and plastic when wet.

Figure 13. Stratigraphic profile of test pit C, north wall, 35BE39.

7/2) clay. The clay has a well-developed angular, blocky structure and is very sticky and plastic when wet. The soils at 35BE39, similar to those described at the Flat Creek Site (35LA202), is best described by Davis (1976:31) as "a quagmire when wet and concrete when dry."

The surface of site 35BE39 has been disturbed and mixed to a maximum depth of 20 cm by plowing associated with previous agricultural activities. The plow zone contained cultural materials in relatively low frequencies. Only 31% of the total artifacts and 31% of the total debitage collected from the entire site came from the plow zone. No cultural material was located on the site surface. Not more than 2% of the tools and 21% of the debitage was recovered from the plow zone in level one. The highest frequency of tools (80%) and debitage (79%) from the plow zone occurs in level two. The evidence may suggest that the disturbance from plowing has truncated and mixed the lower sediments of Stratum II (containing the highest frequency of cultural material) into the plow zone sediments.

Flaked stone tools, predominately undiagnostic fragments, manufactured from cryptocrystalline silica and found in the plow zone include three utilized flakes, a graver-perforator, biface fragment, and a uniface fragment. Three obsidian unifacially worked flakes and one edge-polished river cobble were recovered. Fire-cracked rock was not abundant, occurring on an average of about five per level.

The entire collection of faunal remains from 35BE39 was located in levels one and two in test pit F (Table 15). The faunal remains from level one represent a minimum number of two individuals of raccoon (Procyon lotor). Two unidentifiable canine were located in level two of the same unit.

Table 15. Faunal remains, 35BE39

Test Pit	Level	Identification and Comments
F	1	1 left maxilla with teeth (not worn); Pyrocyon lotor (raccoon); 1 right mandible without teeth; Procyon lotor (raccoon); 1 proximal left tibia fragment; Procyon lotor (raccoon)
F	2	left and right ulnas; Procyon lotor (raccoon); left and right mandible with teeth (well worn); Procyon lotor (raccoon). Comments: minimally 2 individuals of Procyon lotor represented; 2 unidentifiable canine

In Stratum II, the total number of cultural materials increases dramatically: 59% of the total artifacts and 66% of the total debitage collected at 35BE39 are represented. Ten flaked stone tools of cryptocrystalline silica include three bifaces, two scrapers, one graver, one uniface fragment, and one utilized flake. Obsidian tools include one scraper, one uniface fragment, and one utilized flake. Basalt and basalt-like tools, found in levels three to five, were identified as a mortar fragment, chopper, hammerstone, edge-polished cobble, and a worked river cobble. A total of 517 flakes collected from Stratum II represents 66% of the debitage from 35BE39.

Fire-cracked rocks were most abundant in Stratum II, averaging about ten per unit level. The heat-altered rock was not found in any definite cluster, pile, or concentration, yet was scattered unsystematically throughout the sediments. Small particles of charcoal were collected yet were in a poor state of preservation and insufficient for radiocarbon date.

Stratum I was exposed in the final levels of test pits C and D. Excavation revealed only 10% of the artifacts and 3% of the debitage from the collections at 35BE39: one each cryptocrystalline silica utilized flake and biface, one obsidian biface fragment, and twenty-five flakes represent the collection. Obviously, with a limited sample, the collection yields minimal information. No fire-cracked rock was recovered in the clay sediment.

As illustrated in Table 16, very few diagnostic tools were recovered at 35BE39. The distribution of artifacts is presented in Table 17. Material types for the tool

Table 16. Prehistoric Tool Assemblage for 35BE39.

Artifact Category	Test Pits A	B	C	D	E	F	Total
Graver perforators:							
04-03A	1		1				2
Scrapers:							
05-03A	1	1	1				3
Utilized flakes:							
06-01A		2	1				3
06-01C	1	1					2
06-01G			1				1
Bifaces:							
07-01A				1			1
07-02A				1			1
07-03A	1	2		1			4
Unifaces:							
08-01A	1			2	1		4
08-01B			2				2
Worked river cobbles:							
09-01A		1					1
Edge-polish cobbles:							
10-01A	1						1
10-02A						1	1
Choppers:							
11-01A		1					1
Hammerstones:							
12-01A		1					1
Mortars:							
15-01A				1			1
Total	6	9	6	6	1	1	29

Table 17. Distribution of Artifacts at Site 35BE39.

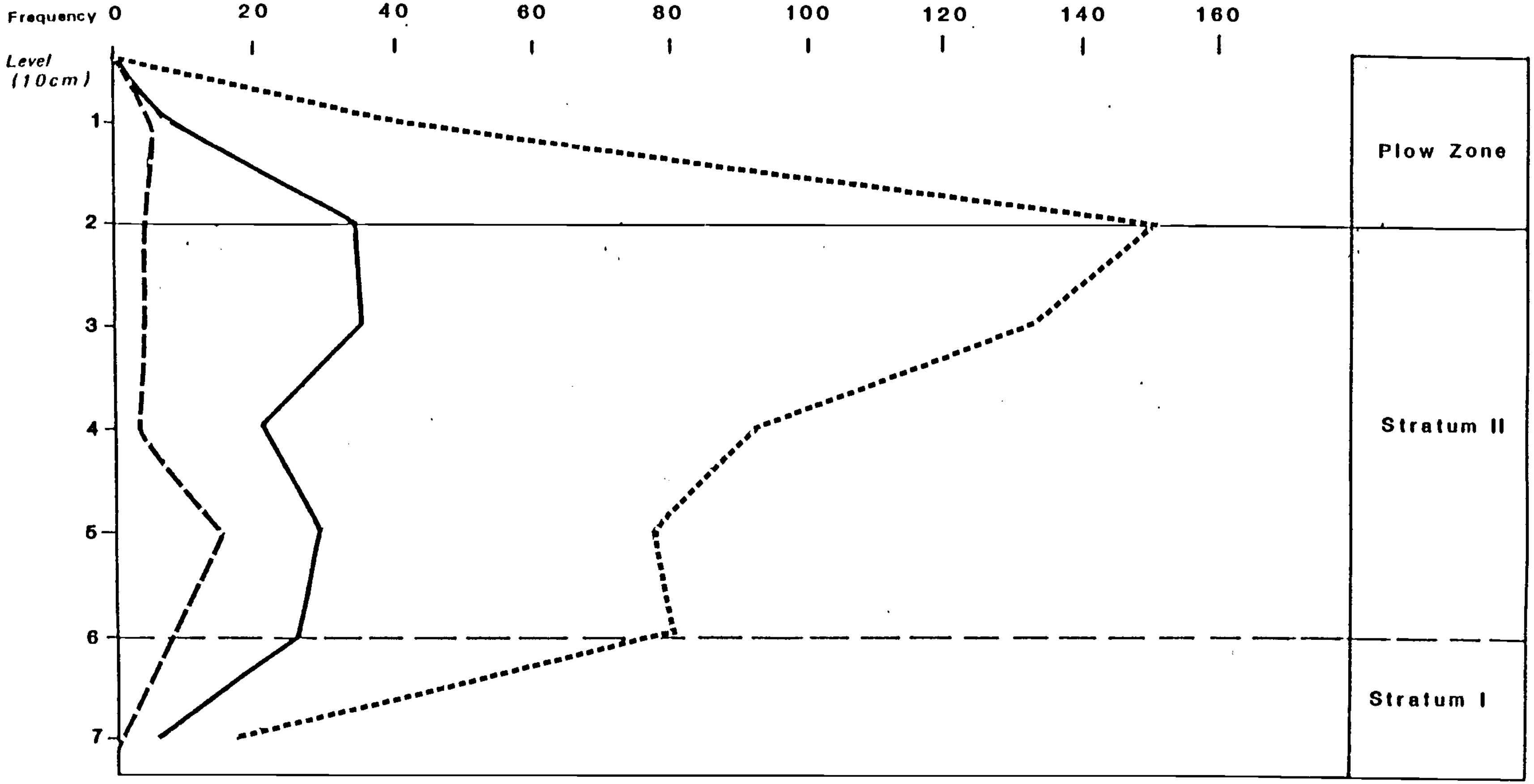
Level	Graver	Scraper	Utilized Flake	Biface	Uniface	Worked Cobble	Edge-Polish Cobble	Chopper	Hammer-Stone	Mortar	Stratum
1			C-1						F-1		Plow
2	C-1		B-2	B-1	A-1,D-2, E-1						Zone
3	A-1	A-2	B-1		C-1					D-1	
4		B-1,C-1		D-1			A-1	B-1			Stratum
5			A-1		C-1	B-1			B-1		II
6	A-2										
7			C-1	D-2							Stratum I
Totals	4	3	6	4	6	1	1	1	2	1	

Alpha Digit Designates Test Pit

Numeric Digit Indicates Total Number

assemblage show that 55% are cryptocrystalline silica, 24% obsidian, and 21% are manufactured from basalt. The debitage, as presented in Table 18, shows a similar pattern of material type selection, with cryptocrystalline silica representing 76% of the debitage, obsidian at 20%, and 4% basalt.

Table 18. Frequency Distribution of Debitage, 35BE39.



	Material Type	% of Total
······	Cryptocrystalline silica	76
——	Obsidian	20
— — —	Basalt	4

Chapter 7. Discussion and Conclusions

Lithic Technology and Production Patterns

The results of an extensive analysis of the artifact collections from site 35BE37, 35BE10, and 35BE39 provides a descriptive and processual typology of the material culture. The artifact typology presented as Appendix B has employed traditional "type" names to refer to the artifact classes. During the analysis, several lithic tool production sequences have been defined for the Wm. L. Finley National Wildlife Refuge artifact collection. As discussed in the analytic methodology section, the production sequences are best understood as a continuative process.

The debitage represents the largest category of cultural material from the prehistoric sites at Finley. The chipping debris are the products of tool manufacturing and the by-products of implement use. All of the debitage collected from the three prehistoric sites fall into three fundamental raw material classes: cryptocrystalline silica, obsidian, and basalt. The material composition of the debitage and manufactured tools is presented in Table 19.

Table 19. Material Composition in Debitage and Tool Collections from Sites 35BE37, 35BE10, and 35BE39.

Selective Attributes	35BE37	35BE10	35BE39
% Material Type In Debitage:			
Cryptocrystalline Silica	63%	40%	76%
Obsidian	23%	48%	20%
Basalt and Other	14%	12%	4%
% Material Type In Tools:			
Cryptocrystalline Silica	42%	34%	55%
Obsidian	38%	55%	24%
Basalt and Other	20%	11%	21%

The sample is dominated by the cryptocrystalline silica class for sites 35BE37 and 35BE39. Obsidian represents the primary material type in debitage and tool composition at site 35BE10. The selection of the basalt materials is limited in representation to about 20% at all three sites. The selection of raw material for tool production at the Finley sites is consistently dominated toward the fine-grained materials.

A second level of debitage analysis was undertaken in order to assess the nature of the raw material and patterns of production stages. Debitage of the fine-grained materials, cryptocrystalline silica and obsidian, from the 35BE37 collection was selected. A total of 7137 flakes, representing 86% of the total site debitage collection, were divided into three classes of flake types: primary, secondary, and tertiary. Primary flake attributes recognize cortex on the dorsal surface and platform; wide variations in form, from large angular chunky pieces to small irregular shaped flakes and are usually indicative of core shaping and initial flake production. Secondary flakes had an absence of cortex, a more regular form, usually thin and flat, and are indicative of core reduction and preliminary shaping. Tertiary flakes exhibit attributes of the absence of cortex, small size, regular shape, slightly curved, retention of bifacial edge remnant common and indicative of the final stages in tool manufacture. The results of the analysis are presented in Table 20.

Table 20. Summary of Selected Attributes Derived from 35BE37 Debitage.

Flake Classes	Cryptocrystalline	Obsidian
Primary	26%	30%
Secondary	30%	12%
Tertiary	44%	58%

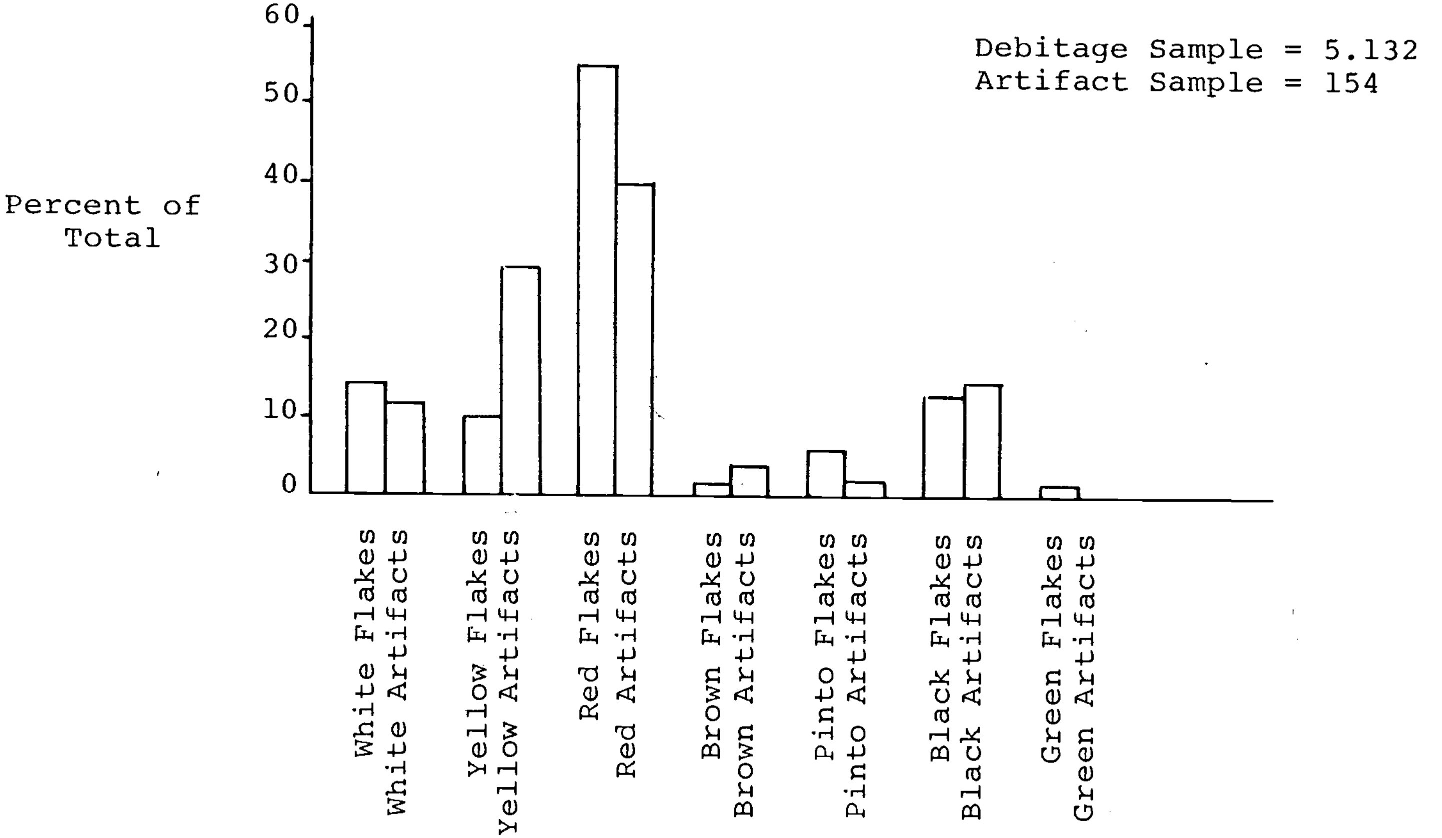
The results of the analysis show that core production flakes and core shatter, from the primary stage, are more abundant in obsidian than the cryptocrystalline silica. The heavy emphasis of obsidian at the primary and tertiary stages may represent the debris of a more highly curated and maintained tool. Since obsidian artifacts at 35BE37 represent only 38% of the total artifact sample, the abundance of tertiary stage flakes may suggest the conservation of a more favorable tool material. In contrast, cryptocrystalline silica consistently maintains a high representation throughout the reduction stages and into tool material production. The analysis results suggest a lack of conservatism in use of cryptocrystalline silica material.

The relative abundance of debitage from the primary reduction stages suggests 1) that the tools were being manufactured at the site, and 2) that the tool makers were in close proximity to the source material. The primary reduction flakes represent the initial detachment of a flake from the raw material or core. Residual lithic material resulting from the initial flake detachment consists of small pieces of cortical shatter and irregularly shaped cortical chunks and cortical flakes. The nature of the cortex on the primary flakes, a well-developed and water-worn surface, originates in the form of a sub-rounded to well-rounded pebble or cobble.

During the debitage analysis, similarities in colors of cryptocrystalline silica flakes and flaked stone tools were observed. The initial debitage study of the selected debitage sample from 35BE37 concluded that the finer-grained cryptocrystalline silica and obsidian materials were preferred over the coarser-grained basalt for tool manufacture. A color study of the cryptocrystalline silica materials, using the same selected sample of debitage from 35BE37, was initiated. The object of the analysis was to investigate the relationship between color representation in debitage and flaked stone tools of cryptocrystalline silica to extract the patterns of tool production sequence. First, the debitage was divided into seven color classes and tallied by unit and level totals. Then, using the same color classes, all of the cryptocrystalline silica flaked stone tools were classified. The results were plotted on a graph, presented in Table 21. The analysis shows a high degree of correlation between the flaked stone artifacts and debitage of the same color class. An important point to note here is of great significance to this study. Examination of debitage produced in replicative experiments demonstrate that 70% of debitage in tool manufacture is smaller than 7 mm (Raymond 1974). Since a 1/4 inch or 7 mm mesh hardware cloth was used to screen the sediment, a very large percentage of the debitage is not collected. Consequently, the correlations reflected in the graph are, at best, relatively conservative.

The results of the debitage analysis have substantiated that tool stone material was plentiful and probably originating from the Willamette River drainage gravel beds. To substantiate these findings, trace

Table 20. Comparison of cryptocrystalline silica flaked stone tools and debitage at site 35BE37.



element analysis was performed on five obsidian lithic specimens from site 35BE37. The specimens were compared with twenty known obsidian sources located in west central and central Oregon. Sappington (Appendix E) reports that:

> All five items were correlated to two sources which occur as float material in the Willamette Valley (Table 2). Three items were correlated to the Fern Ridge source located some 10 km west of Eugene and in the Long Tom River drainage; the remainder were correlated to the North Sister source which has been redistributed into the Willamette Valley via the McKenzie River. The use of locally available obsidian has been demonstrated by the author at numerous other sites in the Willamette Valley and these results suggest that the inhabitants of 35-BE-37 followed a procurement strategy similar to that employed throughout the region.

Obsidian debitage has been collected from several excavated sites in the Willamette Valley. In comparison with collections from selected sites as illustrated in Table 22, the Finley site collections reflect a relatively high abundance of obsidian. The abundance of obsidian at sites 35BE37, 35BE39, and especially 35BE10 may be attributable to a close or closer proximity of source material.

Table 22. Comparative Abundances of Obsidian in Debitage Collections from Selected Willamette Valley Sites (adopted from Baxter, Swift 1983).

Site Number	Obsidian Debitage	Total Debitage	Percent Obsidian	Site Name
35BE37		1903	23.0	Finley National
35BE10		473	48.0	Wildlife Refuge
35BE39		158	20.0	Sites
35MA7	293	2314	12.7	Hagars Grove
35LA565	1651	2577	64.1	Kirk Park
35LA261	1187	5913	20.1	Flanagan
35LA43	1791	4527	39.6	Benjamin
35LA116	206	1785	11.5	Simons
35LA33	4781	104	2.2	Fall Creek
35LA133	1	24	4.2	Hobby Field

The reduction of the pebbles and cobbles collected from the Finley sites was accomplished by a systematic bipolar technique. Although this reduction technique was not fully described until 1981 (Flenniken), the results of the bipolar technique have been recovered from archaeological sites all over the world and range over two million years of time (Flenniken 1981). A description of the bipolar reduction technique provides the framework for briefly describing the archaeological collections from the Finley sites. However, a fully descriptive and detailed analysis of the artifact typology is provided as Appendix B.

The bipolar reduction technique is best described by Flenniken (1981:32):

> Bipolar flaking is a technique of resting a core, pebble, cobble, or lithic implement, etc. (target piece) on an anvil (solid support) and striking the target piece by direct percussion with a wood, bone, antler, stone, etc. percussor. The force from the anvil and from the percussor are nearly directly opposite. Initial splitting of a target piece would be included in this technique with subsequent flakes being removed part way or all the way down the face of a core.

Once the raw material for tool production had been selected, heat treatment of the cryptocrystalline silicates was commonly practiced. The thermal alteration of siliceous rocks is employed to improve their flakeability and to increase their edge sharpness (Flenniken 1981). Although not fully documented, the overall majority of silicate material collected from 35BE37, 35BE10, and 35BE39 appears to have been heat treated.

The ethnographic reference from a Santiam Kalapuya myth depicts the heat treatment process (Jacobs 1945:260-261):

> 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.'

The flakes remaining in the hearth feature, test pit H at 35BE37, were definite "casualties" of the heat treating process. The over-heated and cracked flakes were found in the charcoal-rich hearth fill. The archaeological record from this feature documents rare evidence of heat treatment of siliceous materials in the Willamette Valley.

The category of worked river cobbles or cobble remnants (09-01A) in the artifact typology represents the fragments of cobbles utilized as the "target pieces." From a total of sixty-five specimens, fifty-three were recovered at 35BE37, eleven from 35BE10, and only one from 35BE39. All of the split cobble cores in the finer-grained material were flaked to exhaustion.

Percussors, or hammerstones (12-01A, 12-01B, 12-02A), were comprised of subangular to rounded basalt river cobbles and were recovered from all three prehistoric sites. Only one anvil stone (13-01A) was recovered from site 35BE37. The basalt river cobble exhibited distinctive use marks of circular patterned ring cracks located on both flat faces and on one edge of the specimen.

Several split cobble fragments were utilized as chopping tools. One edge of the split face cobble was commonly flaked to produce sharp edges. These edges showed attrition by crushing as evidence of use. Choppers (11-01A and 11-02A) are represented in the collections from sites 35BE10 and 35BE39.

The bipolar reduction technique, as noted by Flenniken (1981) has two definite technological advantages over other flaking techniques. First, the technique is easily applied to the source material. The material from the Finley sites arrived in the form of small rounded pebbles of obsidian and medium-sized sub-rounded and rounded cobbles of cryptocrystalline silica and basalt. This technique allows the tool maker to hold the material firmly but easily for reduction. Second, the results of the bipolar technique produce flakes that are flat in half-section as opposed to the curved flakes commonly resulting from the direct free-hand percussion.

Several of the flakes produced in the first reduction stage show evidence of use without any prior modification. The utilized flakes are categorized into nine types (06-01A to 06-01I) based on the morphological attributes of the utilized edge unit. A total of seventy-seven utilized flakes, comprising a primary artifact type in the tool kits, are represented by a total of sixty-six at 35E37, five at 35BE10, and six at 35BE39. The acute convex edge unit was the dominant utilized flake type and cryptocrystalline silica the primary source of material.

Biface production stages were identified as three analytic types (07-01A, 07-02A, 07-02B). The first stage in the bifacial tool manufacture process results in a relatively thick, broad biface with an irregular plan edge and is lenticular in cross-section. The four specimens categorized as primary blanks are all fragmented and were discarded without evidence of use. All three sites have the roughed-out blanks represented, primarily by cryptocrystalline silica.

The bifacially worked flakes (07-02A) are produced from primary flakes that are bifacially flaked on the peripheral edges. The plan view of each is regularly shaped, the cross-section of each is subtriangular to lenticular, and all edges are convex. All of the specimens are fragmented and too incomplete for wear analysis. Of the fourteen specimens, eight were manufactured from obsidian and six of cryptocrystalline silica. Bifacially worked flakes (07-02B and 07-03A), worked across both the dorsal and ventral surfaces, were specimens too incomplete to classify. The majority of the specimens are tool fragments.

All of the unifacially worked specimens, predominately occurring at 35BE37, were highly fragmented and too incomplete to analyze for use wear. The first variation of uniface specimens (08-01A) are unifacially worked flakes and irregularly shaped chunks comprised of equal amounts of obsidian and cryptocrystalline silica. Random flake scars occur on peripheral edges, common to the dorsal side. These specimens may be a by-product of the bipolar reduction technology. The specimens grouped as unifacially worked flakes (08-01B) exhibit a secondary level of reduction across either the entire dorsal or entire ventral surface. These flakes are indicative of the final reduction process in shaping and thinning a biface form.

All of the scrapers analyzed from the collections, a total of twenty-eight, were produced on thick flakes and exhibit unifacial modification in preparation of the utilized edge. The scrapers from site 35BE37 comprise 89% of the total category. Over half of the scrapers are typed as steep-end scrapers (05-01A) and are manufactured from cryptocrystalline silica. The obtuse edge is produced on an irregular, thick flake and exhibit a high level of attrition across the convex edge.

The second most common scraping tool was produced on one lateral edge of a thick, irregular shaped flake. Ten specimens represent the category of side scraper (05-03A), seven from site 35BE37 and three from 35BE39.

Graver-perforators were purposefully manufactured on irregular obsidian flakes at site 35BE37. A unifacially formed tip, projecting about 5 mm, was worked as a graving and/or perforating tool. Over 79% of the gravers were produced on a flake without prior modification. Small acute projections on thick cryptocrystalline flakes were most commonly used at all three sites as graving-perforating tools.

Only one fairly complete drill-perforator is represented in the collection. The obsidian drill (03-01A) from 35BE10 was tapered with a round haft element and a fragmented bit. Two obsidian drill-perforator bits were identified, one from 35BE37 and one from 35BE10.

Four unique specimens, collected from site 35BE37, exhibit definite edge wear that suggest they functioned as knives. Each specimen differs in the method of manufacture and degree of modification. The obsidian knife representing category 02-01A was manufactured from a large regular shaped obsidian flake. The knife is ovate, lenticular in cross-section, with random flaking pattern across both faces. The second specimen, representing category 02-02A, was produced on a large elongated obsidian blade with limited secondary bifacial flaking across the edges and basal element. The side-notched basal element may have facilitated hafting the knife to a shaft. In contrast by technique, the cryptocrystalline silica knife, representing category 02-03A, is produced on an unmodified and irregular flake with only peripheral edge modification. The specimen, classified 02-04A, is called a seam knife since it was produced on an unusually occurring piece of seam cryptocrystalline silica. Bifacial modification along both lateral edges form an acute cutting edge.

The projectile points collected from the Finley sites also represent the final stage in tool projection. The final sectional and outline form of the biface, the attributes of the haft element, and the final treatment of the edge distinguish each projectile point type. From a total of eighty projectile points, seven typological classes are identified. Fragments too small to classify, are represented by fourteen specimens (01-08A, B, C). The distribution and frequency of projectile point types found at 35BE37, 35BE10, and 35E39 are presented in Table 23.

Table 23. Distribution and Frequency of Projectile Point Types Found at 35BE37, 35BE10, and 35BE39.

Type	35BE37	35BE10	35BE39
01-01A: Side-notch	3	--	--
01-02A: Basal-notch	11	10	--
01-03A, B: Corner-notch	19	4	--
01-04 A, B, C: Corner-removed	7	2	--
01-05 A, B, C: Stemmed	4	2	--
01-06 A, B: Lanceolate	1	1	--
01-07 A, B, C: Triangular	14	2	--
01-08 A, B, C: Fragments	10	4	--

A total of 69% of the assemblage is distributed at site 35BE37, only 31% are found at 35BE10, and none at 35BE39.

The majority of the projectile points and fragments, 84%, were manufactured in obsidian, while only 16% are of cryptocrystalline silica. No selection of the finer-grained basalts is represented in the projectile point collection.

Over half of the projectile point types are represented by the corner-notch (01-03A, B) and the basal-notch (10-02A) points. The triangular (01-07 A, B, C), the corner-removed (01-04A, B, C), and the stemmed or shouldered (01-05A, B, C) types are common. Point types described as side-notch (01-01A) and lanceolate (01-06 A, B) are very rare. All of the projectile point types representing the prehistoric assemblages from the Finley sites are common to Willamette Valley sites.

A total of eighteen groundstone or pecked stone tools were found at the Finley sites. Most are made from the local basalt, granite, or rhyolite river cobbles with the exception of a coarse-grain sandstone. The principle significance of these artifact types are that they document a separate range of activities from the flaked stone tools.

Six ground cobbles were intensively utilized to the point that the lateral edges of the river cobbles were ground to a faceted, highly polished edge. Four specimens (10-01A and 10-02A) were recovered at 35BE37 and two from 35BE39.

Elongated river cobbles were utilized as pestles (14-01A, B, C) at sites 35BE37 and 35BE10. (One specimen was a naturally tapered elongated cobble and one pestle was intentionally tapered to produce a similar shape.) The end surfaces of the cobbles are commonly battered and crushed from use. Two specimens, from 35BE10, exhibit nicks and scratches attributable to plow activity.

Three partial mortars or bowl fragments (15-01A) were identified from collections recovered at 35BE37 and 35BE39. The exterior surfaces were modified by pecking across the surface, and interior surfaces show attritional polish from grinding. Four additional specimens (15-02A) may be mortar fragments; yet due to the unusual composition of sandstone, the cultural function remains in question.

Tabular coarse-grained sandstone specimens (16-01A, B) from 35BE37 are classified as shaft abraders. Use wear from grinding left long, narrow and rounded grooves across the surface of the tabular stone.

Twelve specimens from site 35BE37 represent stones foreign to the setting and are thought to have been transported to the site, hence the name, manuport. Seven hemispherical stones (17-01A) similar in shape and size, were collected throughout the upper deposits and across the site. A fragment of petrified wood (17-02A), a quartz crystal (17-03A), and a flat ovoid, perforated pebble were also classified as manuports.

The only bone artifact from the Finley sites was recorded at 35BE37. The small unidentifiable fragment (18-01A) displayed several parallel incisions across one surface.

Reconstruction of Prehistoric Settlement and Subsistence Patterns

Prehistoric subsistence and settlement patterns were investigated in a cultural resource inventory of the Wm. L. Finley National Wildlife Refuge in 1980 and investigated by archaeological excavations in 1981. The results of the survey showed that prehistoric sites were located across the refuge lands. Excavations of three selected prehistoric sites provided information on the life styles of the early inhabitants occupying the refuge lands. Settlement-subsistence patterns can be described as:

> the way in which man disposed himself over the landscape on which he live. It refers to dwellings, to their arrangement, and to the nature and the disposition of other buildings pertaining to community life. These settlements reflect the natural environment, the level of technology on which the builders operated, and various institutions of social interaction and control which the culture maintained (Willey 1953).

Site 35BE37 occupies a unique position on a western slope of the foothills of the Coastal Range. Nearby, sites 35BE10 and 35BE39 occupy the floodplain terraces of Muddy Creek. The prehistoric sites are dominated by natural resources vital to the original inhabitants of the Wm. L. Finley National Wildlife Refuge lands.

Site 35BE37, located in a unique setting on the western margins of the cost-valley interface, would have be desirable for habitation by hunting and gathering societies. The site is situated in close association with three critical microenvironments: the broad marshy lowlands of the Muddy Creek floodplains, the open grasslands immediately to the south, and the more heavily wooded foothills directly west of the site boundary.

Three radiocarbon dates document occupation at the site: 355±50, 1140±55, and 1205±75 years B.P. (W.S.U. Samples 2825, 2823, and 2824). The large gap reflected in the radiocarbon dates and the vertical distribution of artifacts indicate that 35BE37 is a multi-component site. The total absence of historic trade material suggests that the site was abandoned prior to the 1800s.

The features and activities documented at 35BE37 suggest that the occupation occurred during the spring and early summer. The wide range of activities indicate a degree of centrality and suggests that the site served as a general base camp.

The lack of architectural remains at 35BE37 is historically consistent with the spring-summer settlement patterns. Based on the ethnographic model the early inhabitants occupying the site during the warmer months would have constructed only temporary shelters.

The occupation surfaces, upper and lower, are littered with stone artifacts, a high density of chipping debris, and fire-cracked rock. Hunting and hide preparation activities are suggested by the abundance of projectile points, gravers, drills, scrapers, knives, utilized flakes, and edge-polished cobbles. Manufacturing of tools is attested to by the high percentage of debitage, exhausted core material, the anvil, and hammerstones.

Diversified hunting of small and large game is documented by the faunal remains from 35BE37. The presence of deer remains dominates the faunal collection from the upper component, while only one deer antler fragment was recovered from the lower component collections. By the late spring and early summer months, the deer would have likely abandoned the Willamette Valley floor. The inhabitants occupying 35BE37 would have had optimum opportunity to exploit game in the nearby woodlands of the coastal mountains.

The assemblage of choppers, mortars, pestles, and the documentation of two camas roasting ovens within the upper and lower strata indicate a primary activity at site 35BE37. The inhabitants were apparently occupying the site in the spring and early summer when camas gathering took place. Camas gathering and processing has been ethnographically documented as a task-specific activity accomplished by women.

Site 35BE10 is a single component site situated on the floodplain of Muddy Creek. Archaeological evidence suggests an intermittent occupation, most likely in the months from late spring through summer. During these months, the floodplains are dry and abundant in subsistence resources.

The assemblage of knives, scrapers, flaked tools, and a high incidence of projectile points provide evidence of hunting, butchering, and hide processing activities. The presence of worked cobbles, hammerstones, and the high density of debitage indicate activities of stone tool manufacture and repair. A very limited assemblage of groundstone suggests that plant food processing was of only minor importance at 35BE10.

A radiocarbon date provides an absolute date of 1720±75 years B.P. (W.S.U. Sample Number 2826) for the occupation at 35BE10.

Site 35BE39, similar to 35BE10, may have been occupied as part of a transhumance seasonal round and may not have been occupied every year. The location on the floodplain of the Muddy Creek, a seasonal wetland, would have been inhabited during dry months. Site 35BE39 would likely have served as an open camp site during the summer and fall seasonal harvesting of floral and faunal resources.

The lack of diagnostic artifacts (i.e., projectile points) and the complete absence of cultural features at 35BE39 limit the definition of activities carried out at the site. However, the variety of artifacts from the assemblage does indicate activities of tool manufacture, hide preparation, and limited plant processing. Small and large game, camas, acorns, berries, and numerous plant resources would have occurred in the site vicinity and most likely were utilized.

Correlations of valley-wide artifact assemblages indicate that the aboriginal groups occupying the Wm. L. Finley National Wildlife Refuge lands were culturally affiliated with the Willamette Valley groups and were likely the ancestors of the Kalapuya. Radiocarbon dates establish occupation at sites 35BE37, 35BE10, and 35BE39 as early as 1800 years B.P. and as late as 300 years B.P. The principle criteria for Late Archaic Period Willamette Valley site correlations rely heavily on C-14 dates and documentation of distinct cultural activities. The stylistic changes in the artifact assemblages usually form the principle criteria in developing the cultural chronology; but during the Late Archaic period, the artifact types show a notable unbroken progression of projectile point styles (Aikens 1984). From about 2000 B.P. well into the historic period, small triangular and stemmed arrow points are documented in great abundance across the Willamette Valley region. The same stylistic patterns in projectile points are represented in the Finley site assemblage. Most all of the archaeologically excavated sites in the Willamette Valley contain components that represent Late Archaic or Period IV (White 1979) occupation.

A possible indication of occupation during the Middle Archaic, C-14 dated after about 5000 B.P. to 2000 B.P., is suggested by the presence of three larger-sized side-notched points (01-01A) at 35BE37. The three specimens were recovered within the lower cultural component, C-14 dated to 1140±55 years B.P. These larger points were manufactured for use with the atlatl and dart. According to Aikens (1984), several of these large thick points are "reminiscent of the Northern side-notched type from the Plateau and Great Basin."

The archaeological record from the Finley sites reveal that the basic aboriginal lifeways centered around a bi-seasonal shift in settlement-subsistence patterns, characteristic of the historic Kalapuya. The evidence also suggests that this pattern may have been practiced for several thousand years. Unlike several of the other excavated sites documented in the central and upper Willamette Valley, the Finley sites reflect a relative cultural conservativism in material culture. All of the flaked stone tools characteristic of the Late Archaic Period are represented; however, evidence of bone and shell artifacts, burials, and fish exploitation remain undocumented at 35BE37, 35BE10, and 35BE39. According to

Davis's structural model of the Willamette Valley cultural sequences, the Kalapuya culture climax, called the Kalapuya Phase, began around 2400 B.P. and lasted until 185 B.P. (Davis 1978). Davis suggests that the resident population had reached full development with special adaptation to lowland resources. The archaeological record of the prehistoric occupation and exploitation of the Wm. L. Finley Refuge was during the Kalapuya Phase.

The Kalapuya Phase is represented by point styles Davis has named "Long Tom Triangular," "Muddy Creek Corner-notched," and "Muddy Creek Base-notched." Although Davis does not fully describe these point styles, they appear similar to the predominate styles found at Finley.

The wide range of artifacts recovered from the Finley sites conform to Davis's scheme and suggest that the valley residents who occupied sites 35BE37, 35BE10, and 35BE39 were groups of people who came there on a seasonal basis to gather plant foods across the floodplains and hunt game such as deer and elk in the adjacent woodlands.

The cultural chronology for the Willamette Valley, proposed by John White (1979) places the archaeological evidence from Finley in Period IV, 2200-285 B.P. The diagnostic traits of this period are listed on Table 7. The most diagnostic trait of this period is the move from large to small-sized projectile points. The larger notched and stemmed points used with the atlatl and dart are replaced with the smaller triangular and stemmed arrow points. This shift in hunting tool kits is documented with the point styles recovered at 35BE37. The larger side-notched points recovered from 35BE37 are associated with the C-14 date 1140±50 B.P. and do not appear in the more recent component C-14 dated to 355±50 B.P. The other flaked stone tools listed as diagnostic of this period are all common to the three site collections. Absent from the list of diagnostics are net weights, artifacts of antler, bone, and shell, as well as burial features. The traits found absent from the Finley archaeological record (traits numbered 6 and 10-29) are only "commonly associated" with sites further north of Finley (i.e., the Fuller and Fanning Mounds) and are absent from sites in the central and upper Willamette Valley. It becomes apparent that White's model for traits diagnostic of Period IV cannot be extended across the entire Willamette Valley.

The nature of the subregional differences is an important focus for future research. Similar research questions focusing on the settlement pattern studies appeared in a recent overview of west-central Oregon (Beckham, Minor, Toepel 1981): "the degree to which the separate geographic provinces within the Willamette Basin supported different cultures remains to be more fully explicated."

Willamette Valley settlement-subsistence studies are just beginning to realize a subregional variation (Connolly 1982). The 1981 archaeological investigations at Wm. L. Finley National Wildlife Refuge provides the first opportunity to investigate floodplain and upland prehistoric sites along the western margins of the Willamette Valley.

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APPENDICES

APPENDIX A

Fauna in the Wm. L. Finley National Wildlife Refuge

Symbols used in the fauna inventory are defined as follow:

A - Abundant

C - Common

U - Uncommon

O - Occasional

R - Rare

+ - Threatened/Endangered species

* - Introduced species

° - Nests locally

S - Spring (March - May)

S - Summer (June - August)

F - Fall (September - November)

W - Winter (December - January)

Table 24. Mammals of Wm. L. Finley National Wildlife Refuge

COMMON NAME	TAXONOMIC NAME	OCCURRENCE
	OPPOSSUMS: DIDELPHIIDAE	
Common Oppossum	*Didelphis virginiana*	C*
	SHREWS: SORICIDAE	
Marsh shrew	*Sorex bendirei*	R
Trowbridge shrew	*Sorex trowbridgei*	C
Vagrant shrew	*Sorex vagrans*	C
	MOLES: TALPIDAE	
Townsend mole	*Scapanus townsendii*	C
Coast mole	*Scapanus orarius*	U
Shrew mole	*Neurotrichus gibbsii*	U
	MYOTIS AND OTHER PLAINNOSE BATS: VESPERTILIONIDAE	
Little brown myotis	*Myotis lucifugus*	C
Long-eared myotis	*Myotis evotis*	U
California myotis	*Myotis californicus*	U
Big brown bat	*Eptisicus fuscus*	C
Townsend's big eared bat	*Plecotus townsendii*	R
Silver-haired bat	*Lasionycteris noctivagans*	U
Hoary bat	*Lasiurus cinereus*	U
	BEARS: URSIDAE	
Black bear	*Ursus americanus*	R
	RACCOONS: PROCYONIDAE	
Raccoons	*Procyon lotor*	C

WEASELS, SKUNKS: MUSTELIDAE

Shorttail weasel	*Mustela erminea*	U
Longtail weasel	*Mustela frenata*	U
Mink	*Mustela vison*	U
Western spotted skunk	*Spilogale gracilis*	U
Striped skunk	*Mephitis mephitis*	C

FOXES, WOLVES: CANIDAE

Red fox	*Vulpes vulpes*	C
Grey fox	*Urocyon cinereoargentaeus*	U
Coyote	*Canis latrans*	U

CATS: FELIDAE

Mountain lion	*Felis concolor*	R
Bobcat	*Felis rufus*	U

SQUIRRELS: SCIURIDAE

California ground squirrel	*Spermophilus becheyi*	C
Townsend chipmunk	*Eutamias townsendi*	C
Chickaree	*Tamiasciurus douglasii*	C
Western gray squirrel	*Sciurus griseus*	U
Northern flying squirrel	*Glaucomys sabrinus*	U

POCKET GOPHERS: GEOMYIDIAE

Beaver	*Castor canadensis*	U

MICE, RATS, VOLES: CRICETIDAE

Deer mouse	*Peromyscus maniculatus*	C
Dusky-footed wood rat	*Neotoma fusipes*	C
Bushytail wood rat	*Neotoma cinerea*	C
Red tree vole	*Phenacomys arborimus longicaudus*	U
Western red-backed vole	*Clethrionomys occidentalis*	U
Townsend vole	*Microtus townsendi*	U
Grey-tailed vole	*Microtus canicaudus*	C

Oregon vole	Microtus oregoni	U
Muskrat	Ondatra zibethicus	U

OLD WORLD RATS AND MICE: MURIDAE

Norway rat	Rattus norvegicus	U
House mouse	Mus musculus	U

JUMPING MICE: ZAPODIAE

Pacific jumping mouse	Zapus trinotatus	U

PORCUPINES: ERETHIZONTIDAE

Porcupine	Erethizon dorsatum	R

NUTRIAS: CAPROMYIDAE

Nutria	Myocastor copyus	C

HARES AND RABBITS: LEPORIDAE

Blacktail jack-rabbit	Lepus californicus	U
Eastern cottontail	Sylvilagus floridanus	U
Brush rabbit	Sylvilagus bachmani	C

DEER: CERVIDAE

Elk	Cervus elaphus	R
Mule (Blacktail) deer	Odocoileus hemionus columbianus	C

FREE-RANGING DOMESTIC MAMMALS

Dog	Canis familiaris	U
House cat	Felis catus	C

(Adopted from Mammals of Willamette Valley National Wildlife Refuges, United States Department of Interior, Fish and Wildlife Service; Leaflet RF-1352600-3-7/76)

Table 25. Fish of the Wm. L. Finley National Wildlife Refuge

COMMON NAME	TAXONOMIC NAME	OCCURRENCE
	EELS	
Western Brook lamprey	*Lampetra richardsoni*	
	SALMON	
Cutthroat trout	*Salmo clarki*	U
	SUCKERS	
Large scale sucker	*Catostomus macrocheilus*	U
	MINNOWS	
Goldfish	*Carassius auratus*	U
Carp	*Cyprinus carpio*	C*
Oregon chub	*Hybopsis crameri*	U
Northern squawfish	*Ptchochelius oregonensis*	U
Redside shiner	*Richardsonius bal teatus*	C
	CATFISH	
Brown bullhead	*Ictalurus nebulosus*	C
	PIPEFISH	
Three-spined stickleback	*Gasterosteus aculteatus*	C
	TOPMINNOWS	
Mosquitofish	*Gambusia affinis*	U
	SUNFISH	
Warmouth	*Chaenobrytlus gulosus*	U
Bluegill	*Lepomis machrochirus*	U
Largemouth bass	*Micropterus salmoides*	U

Black crappie	*Poxomis higromaculatus*	U
White crappie	*Proxoms annularis*	U

AMPHIBIANS OF WM. L. FINLEY NATIONAL WILDLIFE REFUGE

COMMON NAME	TAXONOMIC NAME	OCCURRENCE
	SALAMANDERS	
Pacific giant salamander	*Dicamptodon ensatus*	U
Northwestern salamander	*Ambystoma gracile*	U
Long-toed salamander	*Ambystoma macrodactylum*	C
Rough-skinned newt	*Taricha granulosa*	C
Western red-backed salamander	*Plethodon rehiculum*	U
Ensatina	*Ensatina eschscholtzi*	U
Clouded salamander	*Aneides ferreus*	U
	FROGS	
Pacific tree frog	*Hylaregilla*	C
Red-legged frog	*Rana aurora*	U
Bullfrog	*Rana catesbeiana*	C

Table 26. Reptiles of the Wm. L. Finley National Wildlife Refuge

COMMON NAME	TAXONOMIC NAME	OCCURRENCE
	TURTLES	
Western Pond turtle	Clemmys marmorata	U
Painted turtle	Chrysemys picta	U
	LIZARDS	
Western fence lizard	Sceloporus occidentalis	C
Southern alligator lizard	Gerhonotus multicarinatus	C
Western skink	Eumeces skiltonianus	U
	SNAKES	
Rubber boa	Charina bottae	U
Northern garter snake	Thamnophis ordinoides	C
Common garter snake	Thamnophis sirtalis	C
Ringneck snake	Diadophis punctatus	U
Racer	Coluber constrictor	C
Gopher snake	Pituphis melanoleucus	C
Sharp-tailed snake	Contia tenuis	U

(Adopted from Fish, Amphibians, and Reptiles of the Willamette Valey, United States Department of Interior, Fish and Wildlife Service, Leaflet RF-424, July 1973)

Table 27. Birds of the Wm. L. Finley National Wildlife Refuge

	S	S	F	W
Pie-billed Grebe	u	u	u	u
Horned Grebe	r	r	r	r
Eared Grebe	r	r	r	r
Western Grebe	r		r	o
Double-crested Cormorant	r	r	r	r
American Bittern	u	u	u	u
Great Blue Heron	c	c	c	c
Great Egret	r	r	r	o
Green-backed Heron	o	o	o	o
Black-crowned Night Heron	r	r		
Tundra Swan	u	r	u	c
White-fronted Goose	u	r	u	u
Snow Goose	u		u	u
Emperor Goose				r
Canada Goose	c	o	c	a
Brant	r	r		r
Wood Duck	c	c	c	c
Green-winged Teal	a	o	a	a
Mallard	a	u	a	a
Northern Pintail	a	o	a	a
Blue-winged Teal	r	r	r	
Cinnamon Teal	u	u	u	
Northern Shoveler	c	r	c	c
Gadwall	o	o	o	o
Eurasian Wigeon			o	u
American Wigeon	c	r	c	c
Canvasback	r		r	r
Redhead	r			r
Ring-necked Duck	u	r	o	u
Greater Scaup	r			r
Lesser Scaup	o		o	o
Surf Scoter				r
Common Goldeneye	r	r		
Bufflehead	u		u	u
Hooded merganser	u	u	u	u
Common merganser			r	r
Ruddy Duck	u		u	u
Turkey Vulture	c	c	c	
Osprey	o	o	r	r

	S	S	F	W
Bald Eagle	o		o	o
Northern Harrier	c	c	u	c
Sharp-shinned Hawk	u	u	u	u
Cooper's Hawk	u	u	u	u
Goshawk		r	r	
Swainson's Hawk	r	r	r	
Red-tailed Hawk	c	c	c	c
Rough-legged Hawk	u	r	o	c
Golden Eagle	r			r
American Kestrel	c	c	c	c
Merlin	r		r	r
Prairie Falcon	r			r
Peregrine Falcon	r		r	r
Ring-necked Pheasant	c	c	c	c
Blue Grouse	u	u	u	u
Ruffled Grouse	u	u	u	u
California Quail	c	c	c	c
Mountain Quail	r	r	r	r
Virginia Rail	u	c	u	o
Sora	c	c	o	r
American Coot	c	o	u	c
Sandhill Crane	r	r	r	r
Black-bellied Plover	u	u	o	
Semipalmated Plover	u	u	o	
Killdeer	a	c	a	a
Greater Yellowlegs	c	u	u	o
Lesser Yellowlegs	o	o	o	r
Solitary Sandpiper		r	r	
Spotted Sandpiper	u	u	o	
Western Sandpiper	c	u	u	o
Least Sandpiper	c	u	u	o
Baird's Sandpiper	r	r	r	
Pectoral Sandpiper	r		r	
Dunlin	a	o	o	c
Common Snipe	c	u	c	c
Wilson's Phalarope	o	r		
Northern Phalarope	o	o	o	

Black-shouldered Kite	r	r	r	r
California Gull		o	r	r
Herring		r		
Western Gull		r		
Glaucous-winged Gull	r			r
Black Tern	r	r		
Rock Dove	u	u	u	u
Band-tailed Pigeon	u	c	o	u
Mourning Dove	c	c	c	u
Barn Owl	u	u	u	u
Western Screech Owl	u	u	u	u
Great Horned Owl	c	c	c	c
Snowy Owl			r	r
Northern Pygmy Owl	r	r	r	r
Burrowing Owl	r		r	r
Long-eared Owl	o	o	u	r
Short-eared Owl	o	r	o	u
Northern Saw-whet Owl	r	r	r	r
Common Night Hawk	o	o	o	
Vaux's Swift	u	u	o	
Rufous Hummingbird	c	c	u	
Belted Kingfisher	u	u	u	u
Lewis' Woodpecker	u	o	u	o
Acorn Woodpecker	u	u	u	u
Yellow-bellied Sapsucker	u	u	u	u
Downy Woodpecker	c	c	c	c
Hairy Woodpecker	u	u	u	u
Northern Flicker	c	c	c	c
Pileated Woodpecker	u	u	u	u
Olive-sided Flycatcher	u	u	o	
Western Wood Pewee	c	a	u	
Willow Flycatcher	u	c	o	
Western Flycatcher	u	u	o	
Say's Phoebe	r		r	r
Western Kingbird	o	r		
Eastern Kingbird	r	r		
Horned Lark	u	u	u	u

Bonaparte's Gull	r	r	r	r
Ring-billed Gull	o	o	r	o
Barn Swallow	c	c	u	
Steller's Jay	c	u	c	c
Scrub Jay	c	c	c	c
American Crow	c	c	c	c
Common Raven	u	u	u	u
Black-capped Chickadee	c	c	c	c
Chestnut-backed Chickadee	u	u	u	u
Bushtit	c	c	c	c
Red-breasted Nuthatch	c	u	c	c
White-breasted Nuthatch	c	c	c	c
Brown Creeper	c	c	c	c
Bewick's Wren	c	c	c	c
House Wren	c	c	u	
Winter Wren	c	c	c	c
Marsh Wren	c	c	u	u
Golden-crowned Kinglet	c	u	c	c
Ruby-crowned Kinglet	c	r	c	c
Western Bluebird	o	o	o	u
Mountain Bluebird	r		r	r
Townsend's Solitaire	r		r	
Swainson's Thrush	c	c	u	
Hermit Thrush	u		o	u
American Robin	a	c	a	a
Varied Thrush	u		o	c
Wrentit	u	u	u	u
Water Pipit	u		u	u
Cedar Waxwing	u	c	c	o
Northern Shrike	u		u	u
Loggerhead Shrike	r		r	r
European Starling	c	c	a	c
Solitary Vireo	u	u	o	
Hutton's Vireo	u	u	u	u
Warbling Vireo	u	u	o	
Orange-crowned Warbler	a	c	o	

Purple Martin	o	o	o	
Tree Swalow	a	c	u	o
Violet-green Swallow	c	c	c	o
Northern Rough-winged Swallow	u	o	o	
Bank Swallow	r	r		
Cliff Swallow	a	a	u	

MacGillivray's Warbler	u	u	o	
Common Yellowthroat	a	a	u	
Wilson's Warbler	c	u	o	
Yellow-breasted Chat	u	u		
Western Tanager	u	u	o	
Black-headed Grosbeak	c	c	u	
Lazuli Bunting	u	c	o	
Rufous-sided Towhee	a	a	a	a
Chipping Sparrow	u	c	u	
Vesper Sparrow	c	a	c	r
Savannah Sparrow	c	c	c	u
Fox Sparrow	u	u	u	c
Song Sparrow	a	a	a	a
Lincoln's Sparrow	u	o	o	u
White-throated Sparrow	o		r	o
Golden-crowned Sparrow	a		c	a
White-crowned sparrow	c	u	c	c

Nashville Warbler	o			
Yellow Warbler	c	o	o	
Yellow-rumped Warbler	c	r	u	u
Black-Throated Gray Warbler	u	u	o	
Townsend's Warbler	u		u	o
Hermit Warbler	o			

Dark-eyed Junco				
Red-winged Blackbird	a	c	a	a
Western Meadowlark	c	c	c	c
Yellow-headed Blackbird	o	o		
Brewer's blackbird	c	c	c	c
Brown-headed Cowbird	u	c	u	o
Northern Oriole	o			

Purple Finch	c	c	c	u
House Finch	c	c	u	c
Red Crossbill	u		r	u
Pine Siskin	u	o	o	u
Lesser Goldfinch	o	o	o	o
American Goldfinch	u	c	c	o
Evening Grosbeak	u	o	o	u

House Sparrow	u	u	u	u

Accidental Species With Year of Most Recent Observation

Red-throated Loon	1983
Common Loon	1983
Snowy Egret	1983
Trumpeter Swan	1978
Ross' Goose	1975
Tufted Duck	1982
Red-shouldered Hawk	1983
Black-necked Stilt	1980
American Avocet	1976
Long-billed Curlew	1979
Red Phalarope	1982
Parasitic Jaeger	1975
Black-legged Kittiwake	1983
Clark's Nutcracker	1975
Mountain Chickadee	1975
Northern Mockingbird	1973
Grasshopper Sparrow	1976
Swamp Sparrow	1983
Harris' Sparrow	1978
Lapland Longspur	1974

Names follow the Thirty-fourth Supplement to the American Ornithologists' Union (AOU) Check-list of North American Birds (Supplement to the AUK, Vol. 99, No. 3, July 1982). Revised in 1983 by John E. Cornely, Wildlife Biologist, Western Oregon Refuges.

APPENDIX B

Artifact Typology

01-01A Side notched; broad notch oriented perpendicular to the edge to form shoulders and expanding stem; small elongated triangular blade produced on a relatively medium-thick flake; edges convex; lenticular in cross section; random flaking pattern.

	Range	Mean
Length:	25 mm	25 mm
Width:	13 mm	12.3 mm
Thickness:	5 mm	5.5 mm
Neck Width:	8 mm	10 mm
L/W Ratio:	1.9 mm	1.9 mm

Material: cryptocrystalline silica: 1
obsidian: 2

N Sample: BE37:3
BE10:0
BE39:0

01-02A Base notched; stem straight with flat base or constricting with acute base, 68% with bases missing; narrow neck width, small notch positioned medially on the base; square-ended barbs; short triangular blade produced on a relatively thin flake; lenticular in cross section; edges slightly convex or slightly concave; some specimens slightly serrated; random to slightly parallel flaking.

	Range	Mean
Length:	13-22.5 mm	16.9 mm
Width:	8-16 mm	13.6 mm
Thickness:	1.5-5 mm	2.5 mm
Neck Width:	1.5-5 mm	3.0 mm
L/W Ratio:	1-1.6 mm	1.3 mm

Material: cryptocrystalline silica: 4
obsidian: 17

N Sample: BE37: 11
BE10: 10
BE39: 0

01-03A Corner notched; slightly expanding narrow stem; convex base; base generally thinned; pointed barbs; small triangular blade produced on a very thin flat obsidian flake; maximum width at shoulders; edges concave; flaking pattern fine and random; overall size is small.

	Range	Mean
Length:	13 mm	13 mm
Width:	9-12 mm	10.5 mm
Thickness:	1-2 mm	1.5 mm
Neck Width:	2.5-3 mm	2.8 mm
L/W Ratio:	1-2.1 mm	1 mm

Material: obsidian: 2

N Sample: BE37: 2
BE10: 0
BE39: 0

01-03B Corner notched; straight to slightly expanding stem; straight to slightly concave base; base usually thinned; relatively medium-thick triangular obsidian blade; maximum width at shoulder; lenticular cross section; edges straight to slightly concave; some specimens slightly serrated; flaking pattern random.

	Range	Mean
Length:	15-26 mm	19.9 mm
Width:	11-16 mm	13.6 mm
Thickness:	2-5 mm	3.26 mm
Neck Width:	3-8 mm	4.95 mm
L/W Ratio:	1-2.1 mm	1.47 mm

Material: cryptocrystalline silica: 1
obsidian: 20

N Sample: BE37: 17
BE10: 4
BE39: 0

01-04A Corner removed; constricting narrow stem with acute base; base usually thinned, narrow neck width; pointed barbs; short triangular blade produced on a relatively thin flake; plano-convex to lenticular in cross section; edges straight; some specimens slightly serrated; flaking pattern random.

	Range	Mean
Length:	19 mm	19 mm
Width	10.5-13 mm	11.8 mm
Thickness:	1-3 mm	2 mm
Neck Width:	1.5-5 mm	2.6 mm
L/W Ratio	1.5 mm	1.5 mm

Material: cryptocrystalline silica: 2
obsidian: 4

N Sample: BE37: 4
BE10: 2
BE39: 0

01-04B Same as 04A except straight stem with straight thinned base; edges straight to slightly concave.

	Range
Length:	--
Width	13 mm
Thickness	3.5 mm
Neck Width:	4 mm
L/W Ratio	--

Material: obsidian: 1

N Sample: BE37: 1
BE10: 0
BE39: 0

01-04C Corner removed, specimens broken with broken stems, elongated triangular obsidian blade, at least 2X width. Lenticular in cross section; straight to convex edges, slightly serrated, flaking pattern random.

	Range	Mean
Length:	26 mm	26 mm
Width:	12 mm	12 mm
Thickness:	3-3.5 mm	3.3 mm
Neck Width:	3.5 mm	3.5 mm
L/W Ratio:	2.2 mm	2.2 mm

Material: obsidian: 2

N Sample: BE37: 2
BE10: 0
BE39: 0

01-05A Large stemmed or shouldered projectile points; constricting stem; broken bases; maximum width approximately one half the length above the base; large triangular blade produced on a relatively thick flake; lenticular in cross section; edges slightly straight to convex; random flaking pattern.

	Range	Mean
Length:	23 mm	23 mm
Width:	16-17.5 mm	16.5 mm
Thickness:	6-7 mm	6.3 mm
Neck Width:	6-11.5 mm	8.7 mm
L/W Ratio:	1.4 mm	1.4 mm

Material: cryptocrystalline silica: 1
obsidian: 2

N Sample: BE37: 2
BE10: 1
BE39: 0

01-05B Same as 01-05A except much smaller; specimens slightly serrated.

	Range	Mean
Length:	24 mm	24 mm
Width:	9-11 mm	10 mm
Thickness:	4-5 mm	4.5 mm
Neck Width:	7 mm	7 mm
L/W Ratio:	2.2 mm	2.2 mm

Material: obsidian: 2

N Sample: BE37: 2
BE10: 0
BE39: 0

01-05C Small stemmed or shouldered projectile point; constricting stem with acute base; minor basal thinning; maximum width approximately one quarter the length above the base; triangular blade produced on a relatively thin flake; lenticular in cross section; edges straight to slightly convex; random flaking pattern.

	Range
Length:	19 mm
Width:	8.5 mm
Thickness:	2 mm
Neck Width:	3.5 mm
L/W Ratio:	2.2 mm

Material: cryptocrystalline silica: 1

N Sample: BE37: 0
BE10: 1
BE39: 0

01-06A Lanceolate projectile point; straight base; no basal thinning; small, relatively medium thick blade; lenticular in cross section; convex edges; random flaking pattern.

	Range
Length:	10 mm
Width:	16 mm
Thickness:	4.5 mm
L/W Ratio:	1.5 mm

Material:	obsidian: 1
N Sample:	BE37: 1
	BE10: 0
	BE39: 0

01-06B Lanceolate projectile point; convex base; moderate basal thinning; tip missing; blade length at least 3x width; thick lenticular blade in cross section; convex edges; random flaking pattern.

	Range
Length:	--
Width:	15 mm
Thickness:	10 mm

Material:	cryptocrystalline silica: 1
N Sample:	BE37: 0
	BE10: 1
	BE39: 0

01-07A Small triangular projectile points; straight to convex bases; no stem or purposely manufactured hafting element; small triangular blade produced on a very thin flake; maximum width at base; tip acute; plano-convex to lenticular in cross section; edges straight to slightly convex; random flaking with some parallel flaking; no serration.

	Range	Mean
Length:	12-24 mm	16.5 mm
Width:	7-10 mm	8.3 mm
Thickness:	1.5-2.5 mm	1.9 mm
L/W Ratio:	1.7-3 mm	2.1 mm

Material: cryptocrystalline silica: 2
obsidian: 2

N Sample: BE37: 3
BE10: 1
BE39: 0

01-07B Same as 01-07A except deep rectangular serration; random flaking pattern.

	Range	Mean
Length:	10-17 mm	12.7 mm
Width:	6-10 mm	8.5 mm
Thickness:	1.5-2 mm	1.9 mm
L/W Ratio:	1-1.9 mm	1.5 mm

Material: obsidian: 11

N Sample: BE37: 10
BE10: 1
BE39: 0

01-07C Same as 01-07A except convex base; only edge of flake modified by random bifacial flaking.

	Range
Length:	12 mm
Width:	13 mm
Thickness:	2 mm
L/W Ratio:	0.9 mm

Material: obsidian: 1

N Sample: BE37: 1
BE10: 0
BE39: 0

01-08A Distal or tip fragments of projectile points.

Material: cryptocrystalline silica: 5
obsidian: 4

N Sample: BE37: 6
BE10: 3
BE39: 0

01-08B Medial fragments of projectile points.

Material: cryptocrystalline silica: 1

N Sample: BE37: 0
BE10: 1
BE39: 0

01-08C Basal fragments of projectile points.

Material: cryptocrystalline silica: 1
obsidian: 3

N Sample: BE37: 4
BE10: 0
BE39: 0

02 KNIVES

02-01A Ovate knife; base convex and bifacially thinned; broad blade; edges convex; tip acute; lenticular in cross section; random flaking pattern.

	Range
Length:	33.5 mm
Width:	68 mm
Thickness:	8 mm

Material: obsidian: 1

N Sample: BE37: 1
BE10: 0
BE39: 0

02-02A Side notched knife; broad notch oriented perpendicular to edge; concave base; minor basal thinning; large elongated blade with straight to slightly convex edges; plano-convex to triangular in cross section; random flaking pattern.

Length:	51 mm
Width:	23 mm
Thickness:	8 mm
Material:	obsidian: 1
N Sample:	BE37: 1
	BE10: 0
	BE39: 0

02-03A Knife produced on an unmodified and irregular flake; edges bifacially thinned to produce cutting edge; triangular in cross section; convex edges; random flaking and only peripherally modified.

Length:	49 mm
Width:	33 mm
Thickness:	10 mm
Material:	cryptocrystalline silica: 1
N Sample:	BE37: 1
	BE10: 0
	BE39: 0

02-04A Seam knife fragment; irregular piece of thin seam cryptocrystalline silica; bifacial modification along both lateral edges to form an acute, convex cutting edge; specimen fragmented.

Length:	--
Width:	20 mm
Thickness:	3 mm
Material:	cryptocrystalline silica: 1
N Sample:	BE37: 1
	BE10: 0
	BE39: 0

03 DRILL PERFORATORS

03-01A Tapered drill-perforator; round haft element with basal thinning; bit cross section diamond to oval; flaking pattern random.

Length:	--
Bit Length:	--
Haft Width:	9 mm
Bit Width:	3 mm
Bit Thickness:	2 mm

Material: obsidian: 1

N Sample: BE37: 0
BE10: 1
BE39: 0

03-02A Drill-perforator bit fragments.

Material: obsidian: 2

N Sample: BE37: 1
BE10: 1
BE39: 0

04 GRAVER-PERFORATORS

04-01A Small, acute projection purposefully manufactured on an irregular flake; tip produced by unifacial flaking; tip projects 5 mm.

Material: obsidian: 1

N Sample: BE37: 1
BE10: 0
BE39: 0

04-01B Small, broad projection purposefully manufactured on an irregular flake; tip unifacially formed; tip terminates with wide, straight "micro-chisel-like" edge; length of working edge 5 mm.

Material: obsidian: 2

N Sample: BE37: 2
BE10: 0
BE39: 0

04-02A Small, acute projection produced on a flake; projection formed between two unifacially flaked notches approximately 10 mm apart.

Material: cryptocrystalline silica: 2

N Sample: BE37: 1
BE10: 1
BE39: 0

04-02B Same as 04-02A except multiple graver tips produced on a single flake.

Material: cryptocrystalline silica: 2

N Sample: BE37: 2
BE10: 0
BE39: 0

04-03A Natural projection on an irregular flake used as graver-perforator without modification.

Material: cryptocrystalline silica: 22
obsidian: 4

N Sample: BE37: 22
BE10: 2
BE39: 2

05 SCRAPERS

05-01A Steep-end scraper; produced on an irregular and thick flake or chunk; obtuse, convex working edge manufactured on the end of a flake or chunk; platform rarely removed; modification unifacial and on one edge only; ventral side of flake rarely modified; overall shape ovoid to square; working edge polished and/or crushed by use.

	Range	Mean
Length:	17-37 mm	25.4 mm
Width:	17-27 mm	23.2 mm
Edge Angle:	48-77 °	65-8 °

Materials: cryptocrystalline silica: 14

N Sample: BE37: 14
BE10: 0
BE39: 0

05-01B Same as 05-01A except working edge manufactured on both end and lateral edges.

	Range	Mean
Length:	19 mm	19 mm
Width:	15-20 mm	17.5 mm
Edge Angle:	56-63 °	59 °

Material: cryptocrystalline silica: 1
obsidian: 2

N Sample: BE37: 3
BE10: 0
BE39: 0

05-02A Steep-end scraper; produced on a small thick obsidian flake; obtuse, convex working edge manufactured on the end of a flake; modification only unifacial; side notched hafting element measuring one half the total scraper length and twice the width; convex base.

Length: 27 mm
Width: 15 mm
Neck Width: 10 mm
Edge Angle: 71 °

Material: obsidian

N Sample: BE37: 1
BE10: 0
BE39: 0

05-03A Side scraper; obtuse; straight to slightly convex scraper edge produced on one lateral edge of an irregular flake; striking platform rarely modified; modification unifacial and on lateral edges only; working edge polished and/or crushed by use.

	Range	Mean
Length:	21-43 mm	27.7 mm
Width:	15-30 mm	20.8 mm
Edge Angle:	45-76 °	60.1 °

Material: cryptocrystalline silica: 6
obsidian: 4

N Sample: BE37: 7
BE10: 0
BE39: 3

06 UTILIZED FLAKES

06-01A Acute edge of a flake or chunk utilized without prior modification; edge convex prior to use or as a result of utilization; flake detachment usually unifacial

Material: cryptocrystalline silica: 17
obsidian: 11
Other: 3

N Sample: BE37: 27
BE10: 1
BE39: 3

06-01B Same as 06-01A except an obtuse edge utilized.

Material: cryptocrystalline silica: 2
obsidian: 2

N Sample: BE37: 3
BE10: 1
BE39: 0

06-01C Acute edges of a flake or chunk utilized without prior intentional modification, edge straight prior to use or as a result of utilization; flake detachment usually unifacial.

Material: cryptocrystalline silica: 8
obsidian: 7

N Sample: BE37: 12
BE10: 1
BE39: 2

06-01D Same as 06-01C except obtuse edge utilized.

Material: cryptocrystalline silica: 4

N Sample: BE37: 4
BE10: 0
BE39: 0

06-01E Acute edge of a flake or chunk utilized without prior intentional modification; edge concave prior to use or as a result of utilization; flake detachment usually unifacial.

Material: cryptocrystalline silica: 3
obsidian: 6

N Sample: BE37: 7
BE10: 2
BE39: 0

06-01F Same as 06-01E except obtuse edge utilized:

Material: cryptocrystalline silica: 5
obsidian: 0

N Sample: BE37: 5
BE10: 0
BE39: 0

06-01G Acute edge of a flake or chunk utilized without prior intentional modification; flake has multiple utilized edges.

Material: cryptocrystalline silica: 6
obsidian: 0
other: 1

N Sample: BE37: 6
BE10: 0
BE39: 1

06-01H Same as 06-01G except obtuse edge utilized.

Material: cryptocrystalline silica: 1

N Sample: BE37: 1
BE10: 0
BE39: 0

06-01I Same as 06-01G except both acute and obtuse edges utilized.

Material: cryptocrystalline silica: 1

N Sample: BE37: 1
BE10: 0
BE39: 0

07 BLANKS AND BIFACE FRAGMENTS

07-01A Primary blank fragments; roughed-out biface; broad, random flake scars; lenticular in cross section; all specimens fragmented.

Material: cryptocrystalline silica: 3
fine grain basalt: 1

N Sample: BE37: 2
BE10: 1
BE39: 1

07-02A Unidentifiable bifacially worked flakes; fragmented specimens bifacially flaked on peripheral edges of flake; subtriangular to lenticular in cross section; edges convex; specimens too incomplete to classify.

Material: cryptocrystalline silica: 6
obsidian: 8

N Sample: BE37: 10
BE10: 3
BE39: 1

07-02B Unidentifiable bifacially worked flakes; fragmented specimens bifacially flaked across both ventral and dorsal surfaces; lenticular in cross section; slightly straight to convex edges; specimens too incomplete to classify.

Material: cryptocrystalline silica: 11
obsidian: 8

N Sample: BE37: 17
BE10: 2
BE39: 0

07-03A Unclassified biface fragments; specimens bifacially flaked over most of the dorsal and ventral surface. The majority of these specimens are unidentifiable tool fragments.

Material: cryptocrystalline silica: 19
obsidian: 16
fine grain basalt: 1

N Sample:	BE37: 30 BE10: 2 BE39: 4

08 UNIFACE FRAGMENTS

08-01A Unidentifiable unifacially worked flake or chunk; unifacial flaking on peripheral edges; flake scars common to dorsal side; specimens too incomplete to classify.

Material:	cryptocrystalline silica: 16 obsidian: 17 fine grain basalt: 1
N Sample:	BE37: 27 BE10: 4 BE39: 4

08-01B Unidentifiable unifacially worked flake; unifacial flaking occurs on either dorsal or ventral side but not on both; flakes removed across entire side of blade; specimens too incomplete to classify.

Material:	cryptocrystalline silica: 3 obsidian: 5 fine grain basalt: 1
N Sample:	BE37: 5 BE10: 2 BE39: 2

09 WORKED RIVER COBBLES/COBBLE REMNANTS

09-01A Flaked river cobble fragments used as a source material; cortex present on all specimens; tabular flakes struck off rounded cobble fragments; unidirectionally flaked along split face; exhausted core is discoidal to ovoid; fragments flaked to exhaustion in fine grained material.

Material:	cryptocrystalline silica: 21 obsidian: 7 fine grain basalt: 13 other: 24

N Sample: BE37: 53
BE10: 11
BE39: 1

10 EDGE POLISHED COBBLES

10-01A Discoidal river cobbles; lenticular to oval cross section; no modification prior to use; lateral edges ground to a faceted, nearly flat surface; edges slightly polished through use; ground surface ranges from 10 mm to 15 mm in width.

N Sample: BE37: 1
BE10: 0
BE39: 1

10-02A Ovoid to elongated river cobbles; lenticular to oval cross section, no modification prior to use; at least one lateral edge ground to a slightly rounded to flat surface; worn edge is convex and may show some polish; the ground surface ranges from 5 mm to 10 mm in width.

N Sample: BE37: 3
BE10: 0
BE39: 1

11 CHOPPERS

11-01A Medially split, irregular shaped basaltic or quartzite (rare) river cobbles; specimens may have been cores, secondarily used as choppers; unifacially flaked along one face to produce a sharp edge; edges crushed through use.

	Range	Mean
Edge Angle	73-90°	84°

N Sample: BE37: 0
BE10: 3
BE39: 1

11-02A Laterally split, elongated basaltic river cobble; specimen unifacially flaked along lateral and proximal edges to produce a sharp edge; edges crushed through use.

	Range	Mean
Edge Angle	79-86°	82.5°

N Sample BE37: 0
BE10: 1
BE39: 0

12 HAMMERSTONES

12-01A Subangular to rounded basaltic river cobbles; used without prior modification; crushing or pecking through use evident on all edges.

	Range	Mean
Length:	56-72 mm	64 mm
Width:	44-54 mm	49 mm

N Sample BE37: 2
BE10: 0
BE39: 1

12-01B Same as 01A except specimen fragmented; one edge fractured probably as a result of heat (fire cracked).

N Sample: BE37: 0
BE10: 1
BE39: 0

12-02A Slightly ovoid to elongated basaltic river cobbles; used without prior modification; crushing or pecking use wear confined to one or both ends; one specimen fragmented.

	Range	Mean
Length:	52-81 mm	66.5 mm
Width:	31-53 mm	42.0 mm

N Sample: BE37: 2
BE10: 1
BE39: 0

13 ANVIL STONES

13-01A Medially split, discoidal basaltic river cobble; circular patterned pock marks located on both faces and one edge of specimen.

N Sample — BE37: 1; BE10: 0; BE39: 0

14 PESTLES

14-01A Elongated, naturally tapering granitic river cobble; used with no modification prior to use as pestle; both ends battered from use.

	Range
Length:	183 mm

N Sample: BE37: 0; BE10: 1; BE39: 0

14-01B Same as 01A except proximal end of river cobble intentionally tapered; only distal end battered from use.

	Range
Length:	205 mm

N Sample: BE37: 0; BE10: 1; BE39: 0

14-02A Fragment of either a pestle or mano; rounded edges of river cobble modified by pecking; distal end flat.

N Sample: BE37: 1; BE10: 0; BE39: 0

15 MORTARS

15-01A Bowl fragments; modified prior to use; exterior surface modified by pecking total surface; interior surface may show polish from grinding; two specimens are rim fragments.

N Sample: BE37: 2; BE10: 0; BE39: 1

15-01B Bowl-shaped fragments; undetermined cultural function; specimens may be bowl fragments or natural exfoliating sandstone specimens.

N Sample:	BE37: 4
	BE10: 0
	BE39: 0

16 SHAFT ABRADERS

16-01A Tabular-shaped; coarse-grained sandstone; edges slightly tapered; two rounded grooves worn the length of both faces.

	Range	Mean
Groove Width:	7-10 mm	8.5 mm

N Sample:	BE37: 1
	BE10: 0
	BE39: 0

16-01B Plano-convex shaped, coarse-grained sandstone; single rounded groove on the length of one face.

	Range	Mean
Groove Width	8 mm	8 mm

N Sample:	BE37: 1
	BE10: 0
	BE39: 0

17 MANUPORTS

17-01A Hemispherical stones; fine-grained concretions of rhyolite; flat to slightly concave ventral surface; function, if any, unknown.

	Range	Mean
Diameter	17-21 mm	19 mm
Thickness:	4-12 mm	8 mm

N Sample:	BE37: 7
	BE10: 0
	BE39: 0

17-02A Fragmented, cylindrical piece of petrified wood; specimen diameter is 24 mm; function, if any, unknown.

N Sample: BE37: 1
BE10: 0
BE39: 0

17-03A Quartz crystal; small-sized quartz crystal fragments; function, if any, unknown.

N Sample: BE37: 3
BE10: 0
BE39: 0

17-04A Flat, ovoid-shaped pebble; fine-grained rhyolite; specimen has one complete perforation near edge of pebble, two small, shallow holes on one exterior surface; function, if any, unknown.

N Sample: BE37: 1
BE10: 0
BE39: 0

18 UNIDENTIFIABLE BONE ARTIFACT FRAGMENTS

18-01A Incised fragment.

N Sample: BE37: 1
BE10: 0
BE39: 0

19 SHELL CASINGS

19-01A .22 gun shell; "H" impress in bottom of casing.

N Sample: BE37: 1
BE10: 0
BE39: 0

APPENDIX C

Ethnobotonical Research Service Report

ETHNOBOTANICAL RESEARCH SERVICE
720 Manor Way
Lebanon, OR 97355
(503) 258-7609

Date: December 7, 1981

To: Fran Havercroft
Department of Anthropology
Oregon State University
Corvallis, OR 97331

From: Anthony B. Walters
Director of E.R.S.

Subj: Identification and analysis of bulbs recovered from archaeological site

Note: I have assigned a number to each of the packages containing the specimens. It is to these numbers that the following notes refer.

ID#1 & 2 -- These (both specimens) are monocotyledonous bulbs, probably of the Lily Family (Liliaceae). The general morphology of these bulbs is what you would expect to find in the genera Camassia (camas) and Allium (onion). The layers of the bulbs (actually modified storage leaves) are thicker and of a type different than is usually found in the genus Allium. Additionally, the longitudinal vascular striations of the bulbs are noticably thicker than those usually found in onions, and are of the type usually found in camas. There is no doubt that these are camas (Camassia spp.). It would be nearly impossible to say with certainty what species these may be.

Two species of camas are known to occur commonly in the Willamette Valley. They are: Camassia leichtlinii (Large Blue Camas or Leichtlin's Camas) and C. quamash (Small Blue Camas).

The size of these specimens is not very helpful, since we don't know how many layers (modified leaves) have been lost through deterioration. If these specimens have not lost any of their layers or have only lost a couple of layers, they are probably Camassia quamash. Thin charred flakes would have been evident in the surrounding soil if layers were lost.

The presence and condition (charred or overcooked) of these bulbs suggest that you have located an aboriginal cooking hearth.

Their presence at the site can have several explanations. They may have been overlooked when the other cooked bulbs were removed from the hearth. They may have been discarded due to their small size, or they may have been overcooked and simply left in the hearth.

Since these bulbs have been preserved for a considerable period of time in soils that normally would degrade them into soil organic material, it seems likely that they were well-charred or overcooked. Charred materials have a much longer life in acid soils than uncharred materials.

The overcooking probably was due to their size and the proximity to the hot rocks. If they were near the outside of the bunch of bulbs being cooked and if they were mixed with larger bulbs, these bulbs would have been charred in the time that it takes to cook the larger bulbs. It takes longer to completely cook the larger bulbs than it does for the smaller ones. Under normal circumstances these bulbs were cooked overnight in the cooking pit, of for several hours.

The charred edges of the layers have an appearance that you would expect to find if you had overcooked (by roasting or baking) camas bulbs. Camas bulbs are very starchy, and when overcooked, they have a shiny, burned-sugar appearance.

Examination of SEM photomicrographs would further corroborate this identification. If you have this done, have exposures taken of the outer or inner surfaces of the layers. I do not have funds to accomplish this on a volunteer basis, but would be happy to examine the photomicrographs, if you have this done.

My identification of these materials is: Camas bulbs (Camassia sp.) definite, and with a possible identification to species to remain tentative as C. quamash.

Thanking you for this opportunity to serve you, I remain--

Sincerely,

Anthony B. Walters
Ethnobotanist
Director of E.R.S.

ABW:mcd

APPENDIX D

Radiocarbon Dating Laboratory Report

RADIOCARBON DATING LABORATORY

WASHINGTON STATE UNIVERSITY
Pullman, Washington 99164
Office: 509-335-4731
Lab: 509-335-2417

SAMPLE REPORTING FORM

Name of Submitter: William L. Finley

Date Received:

Date Reported: June 22, 1983

WSU Account Number: 13J 3813 7003 #93

Description of Sample:

WSU Sample Number	Your Sample Number	^{14}C age, years B.P.
2823	35BE37-B42-45-129-132-137	1140 ± 55
2824	35BE37-B218-222	1205 ± 75
2825	35BE37-B143	355 ± 50
2826	35BE10B-B32-34	1720 ± 75

Sample Processed by: Welter

Sample Calculated by: Welter/Sheppard

Sample Reported by: Sheppard

Note: All analyses are based upon the Libby half-life (5570 ± 30 years) for radiocarbon. To convert ages to the half-life of 5730 years, multiply the age given above 1.03. Zero age date is A.D. 1950. (Reference: Editorial Comment, RADIOCARBON, Vol. 7, 1965.)

APPENDIX E

X-Ray Fluorescence Trace Element Analysis

LETTER REPORT 84-18

University of Idaho
Laboratory of Anthropology
Moscow, Idaho 83843
(208) 885-6123

17 May 1984

Francine M. Havercroft
Department of Anthropology
Oregon State University
Corvallis, OR 97331-6403

Dear Franny:

X-RAY FLUORESCENCE TRACE ELEMENT ANALYSIS OF OBSIDIAN ITEMS FROM 35-BE-37

Five obsidian items from 35-BE-37, located on the Finley Wildlife Refuge near Corvallis, Oregon, were analyzed by non-destructive energy dispersive x-ray fluorescence in order to determine their geological source areas. The system employed for this analysis was provided by the Idaho Bureau of Mines and Geology and consists of a Tracor Northern NS-880 instrument, a Nuclear Semiconductor 512 amplifier, a silicon (lithium-drifted) detector with a New England Nuclear americium 241 100 mCi source and a dysprosium secondary target, attached to a PDP 11/05 computer and a Decwriter II printer. All items were analyzed in air for a 300 second counting period and the intensities of ten trace elements (Table 1) were recorded. Four of these elements (Fe, Sn, La, and Ce) are unreliable for determining sources; the remaining six were employed as the variables for SPSS discriminant analysis using the Mahal stepwise method. Comparisons were made with 20 obsidian sources located in west central and central Oregon (Figure 1).

All five items were correlated to two sources which occur as float material in the Willamette Valley (Table 2). Three items were correlated to the Fern Ridge source located some 10 km west of Eugene and in the Long Tom River drainage; the remainder were correlated to the North Sister source which has been redistributed into the Willamette Valley via the McKenzie River. The use of locally available obsidian has been demonstrated by the author at numerous other sites in the Willamette Valley and these results suggest that the inhabitants of 35-BE-37 followed a procurement strategy similar to that employed throughout the region.

Sincerely,

Robert Lee Sappington
Research Associate

RLS:tb

Enclosure

Table 28. Trace Element Intensities for Samples From 35BE37.

Item No.	Fe	Rb	Sr	Y	Zr	Nb	Sn	Ba	La	Ce
F 85	0282	0029	0055	0095	0007	0041	0006	07307	0000	0000
F 93	0330	0010	0091	0140	0000	0030	0032	06042	0000	0000
F 98	0236	0095	0074	0144	0037	0052	0035	05441	0000	0000
F 166	0290	0056	0055	0064	0014	0062	0043	03650	0000	0014
F 175	0211	0008	0068	0108	0023	0051	0022	04581	0000	0000

Table 29. Correlation of the Obsidian Items From 35BE37.

Item No.	Highest Probability Group	P(X/G)	P(G/X)	2nd Highest Group	P(G/X)	Discriminant Scores				
F85	North Sister	0.8888	0.8892	Fern Ridge	0.0986	4.2860 -0.3877	-2.5576	0.8372	-0.4644	0.2341
F93	Fern Ridge	0.2679	0.9763	North Sister	0.0236	1.8183 -0.4870	-5.1037	0.9437	0.8618	-0.2509
F98	North Sister	0.0129	0.5531	Fern Ridge	0.4191	2.3737 -0.7815	-4.8485	-0.5641	-1.6139	1.0652
F166	Fern Ridge	0.0112	0.7114	Quartz Mt	0.2072	2.2104 1.4379	-3.8724	0.3483	-2.0714	2.1546
F175	Fern Ridge	0.7922	0.9906	South Sister	0.0088	1.6322 -0.2103	-4.4111	3.2239	0.1178	-0.2939

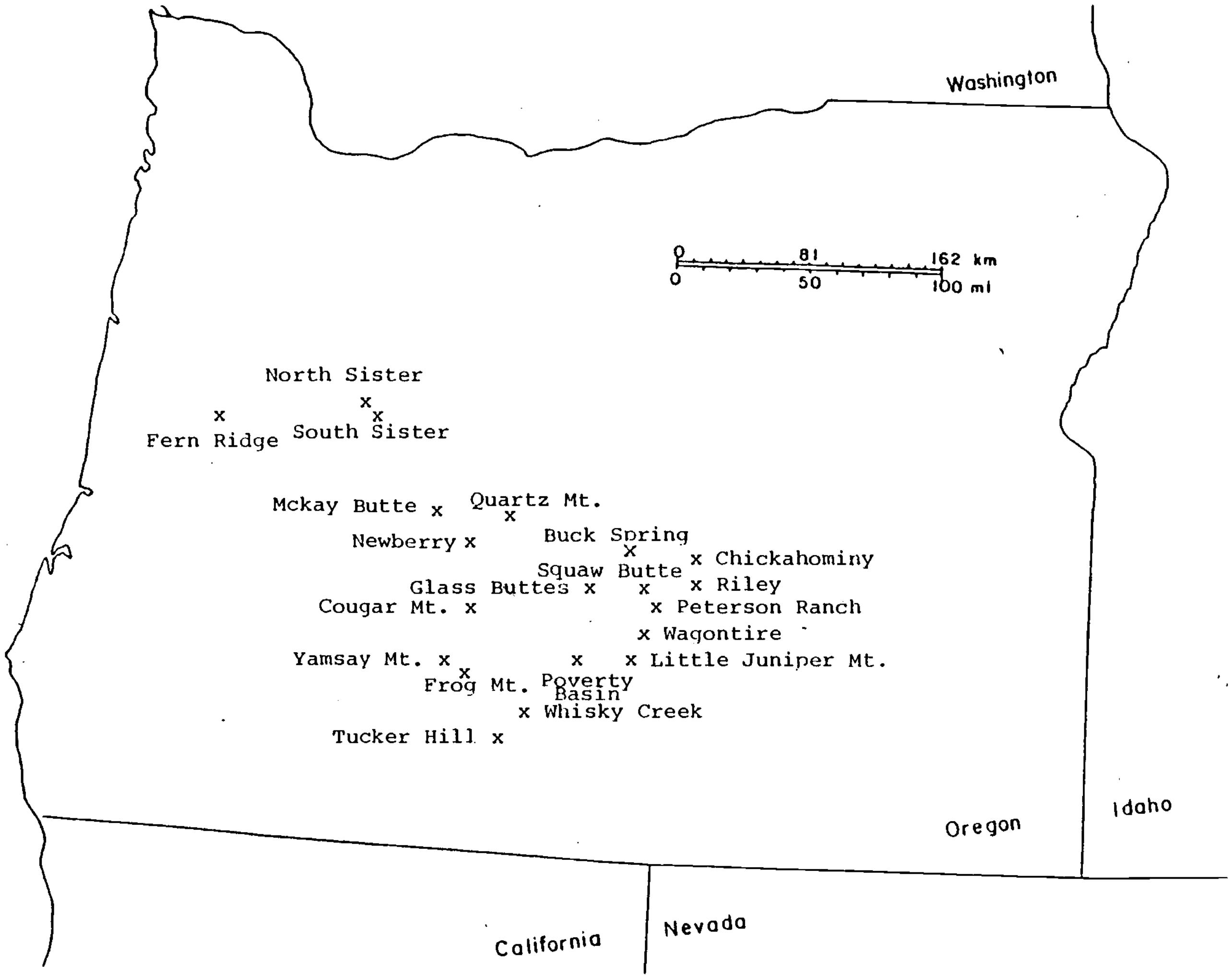

Figure 14. Location pf obsidian sources used for comparison with the 35BE37 sample.

APPENDIX F

Artifact Photographs

SPECIMEN	TYPE
A-B	01-01A
C-H	01-02A

Figure 15. Projectile points, 35BE37.

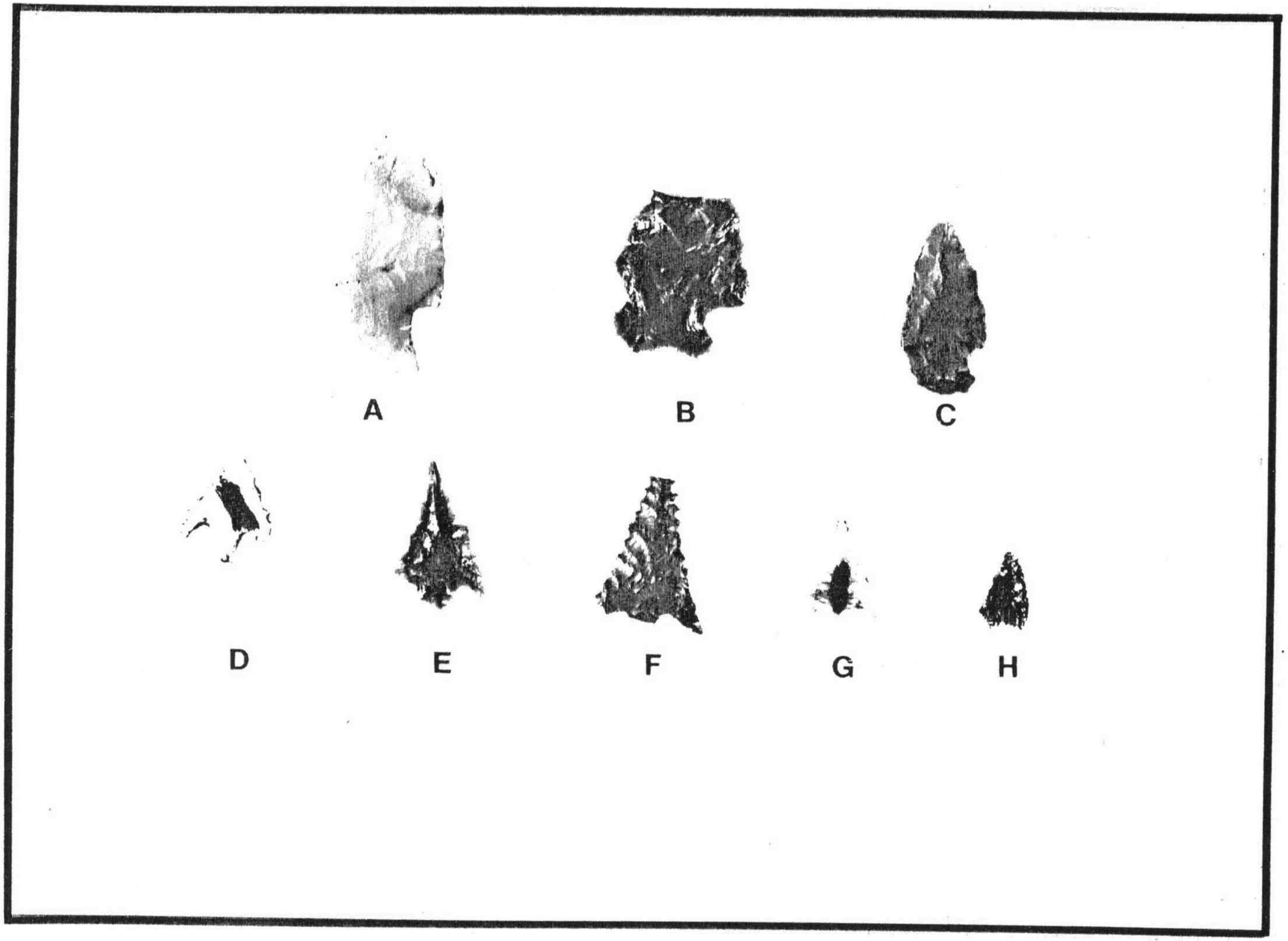

Figure 15. Projectile points, 35BE37.

SPECIMEN	TYPE
A and C	01-03A
B, D, E	01-03B

Figure 16. Projectile points, 35BE37.

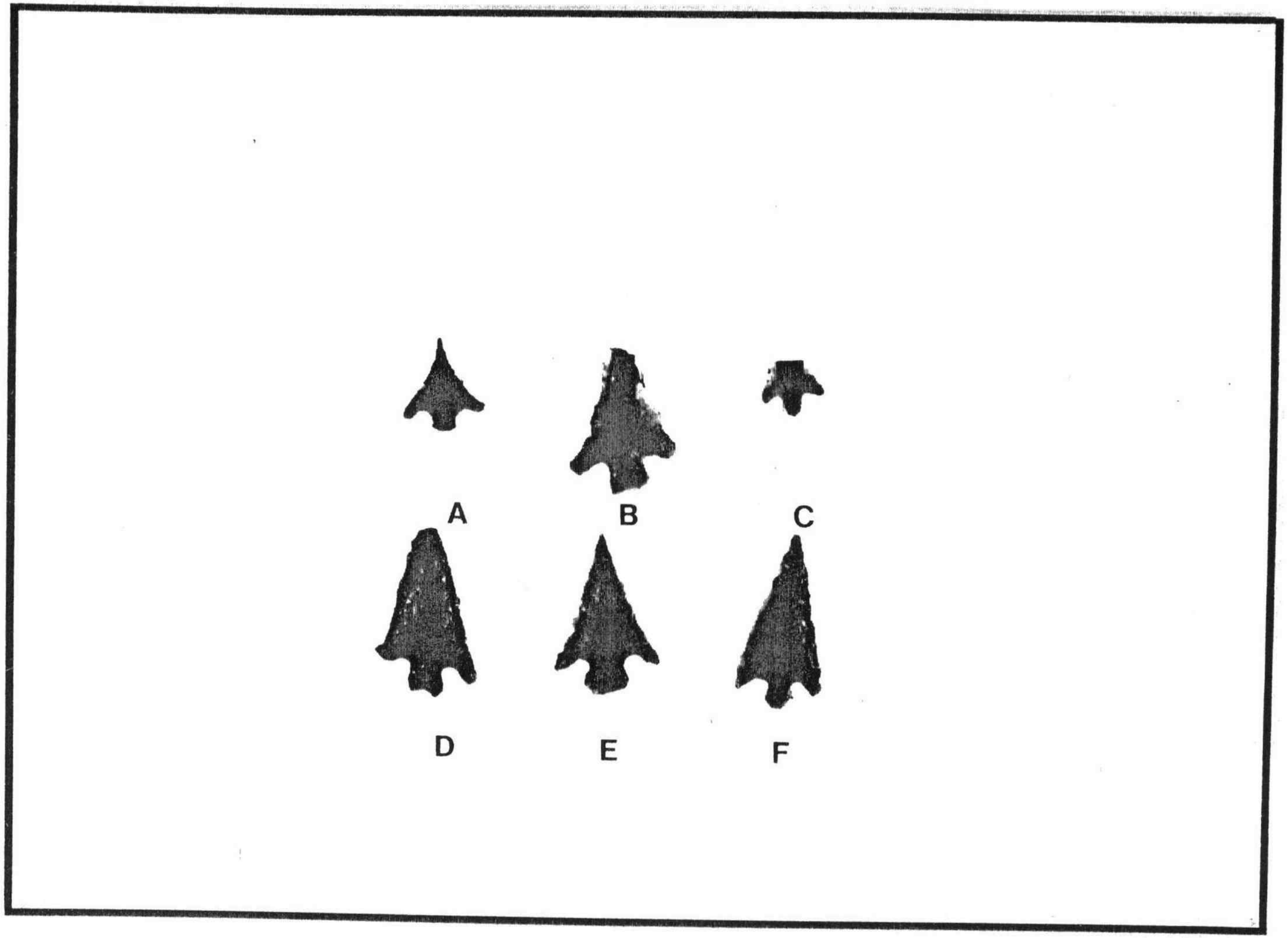

Figure 16. Projectile points, 35BE37.

SPECIMEN	TYPE
A	01-04A
B	01-04B
C	01-04C
D	01-05A
E	01-05B
F	01-06A

Figure 17. Projectile points, 35BE37.

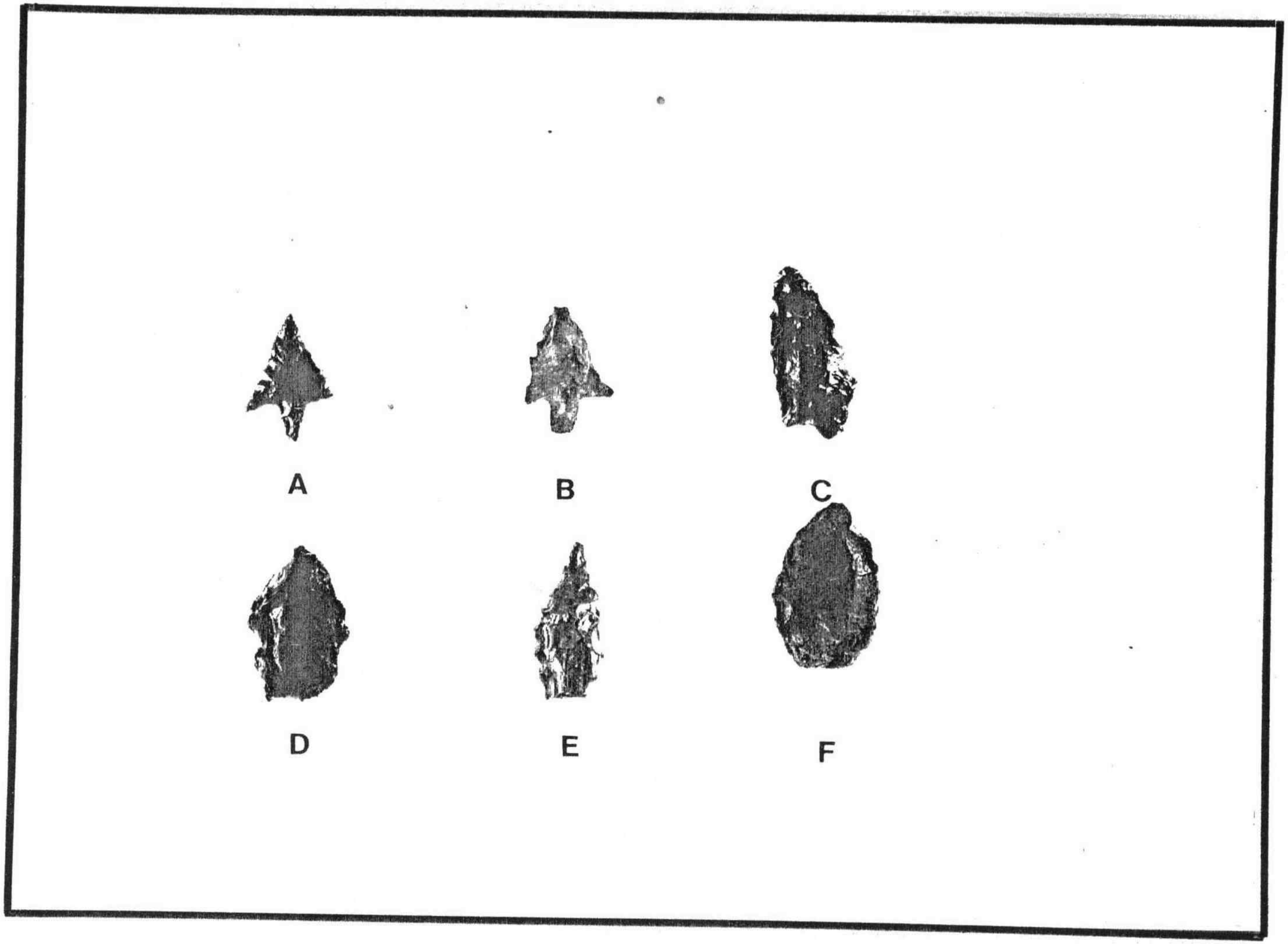

Figure 17. Projectile points, 35BE37.

SPECIMEN	TYPE
A-C	01-07A
D-F	01-07B
G	01-07C

Figure 18. Projectile points, 35BE37.

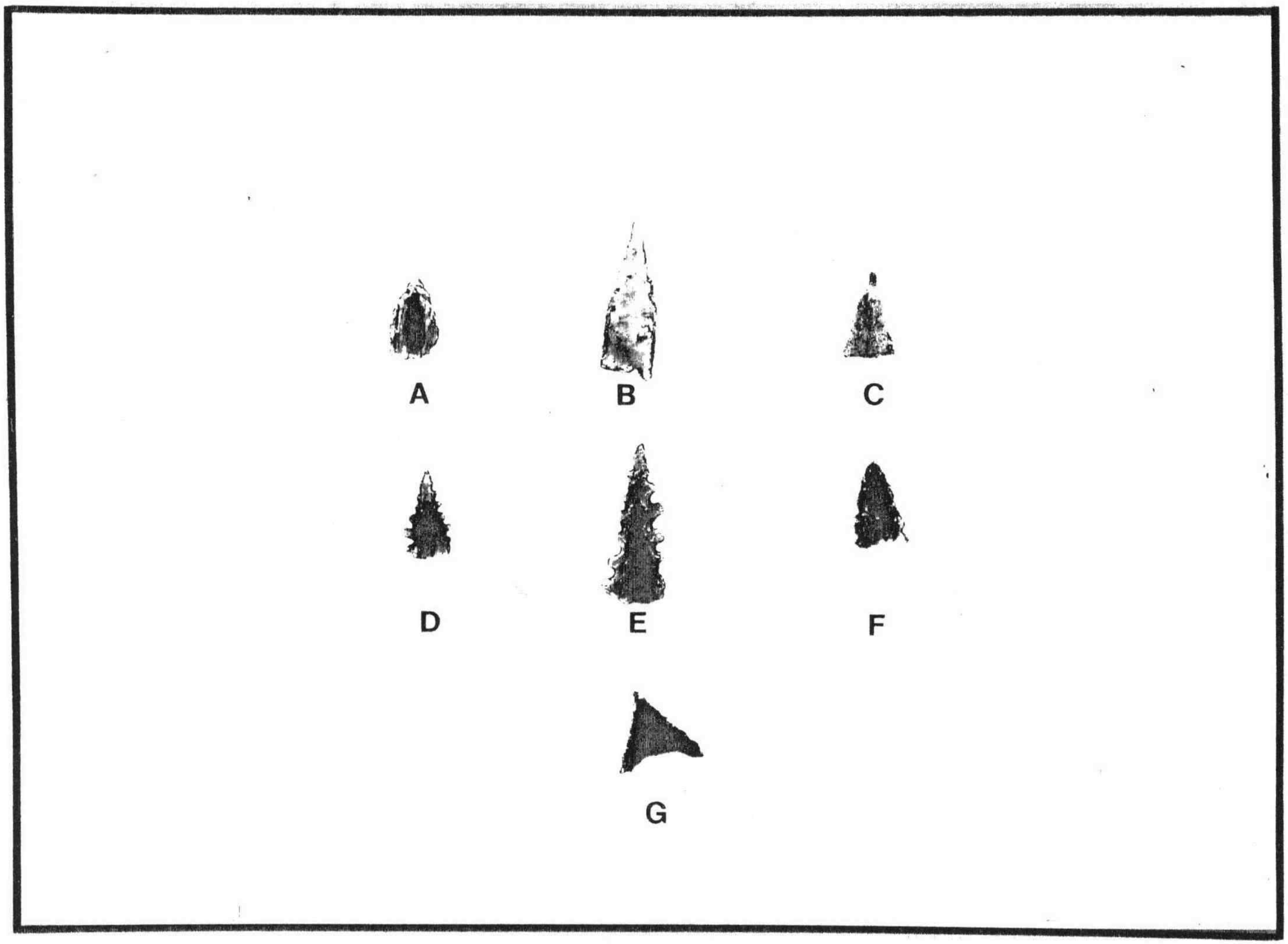

Figure 18. Projectile points, 35BE37.

SPECIMEN	TYPE
A-C	01-02A
D-E	01-05A

Figure 19. Projectile points, 35BE10.

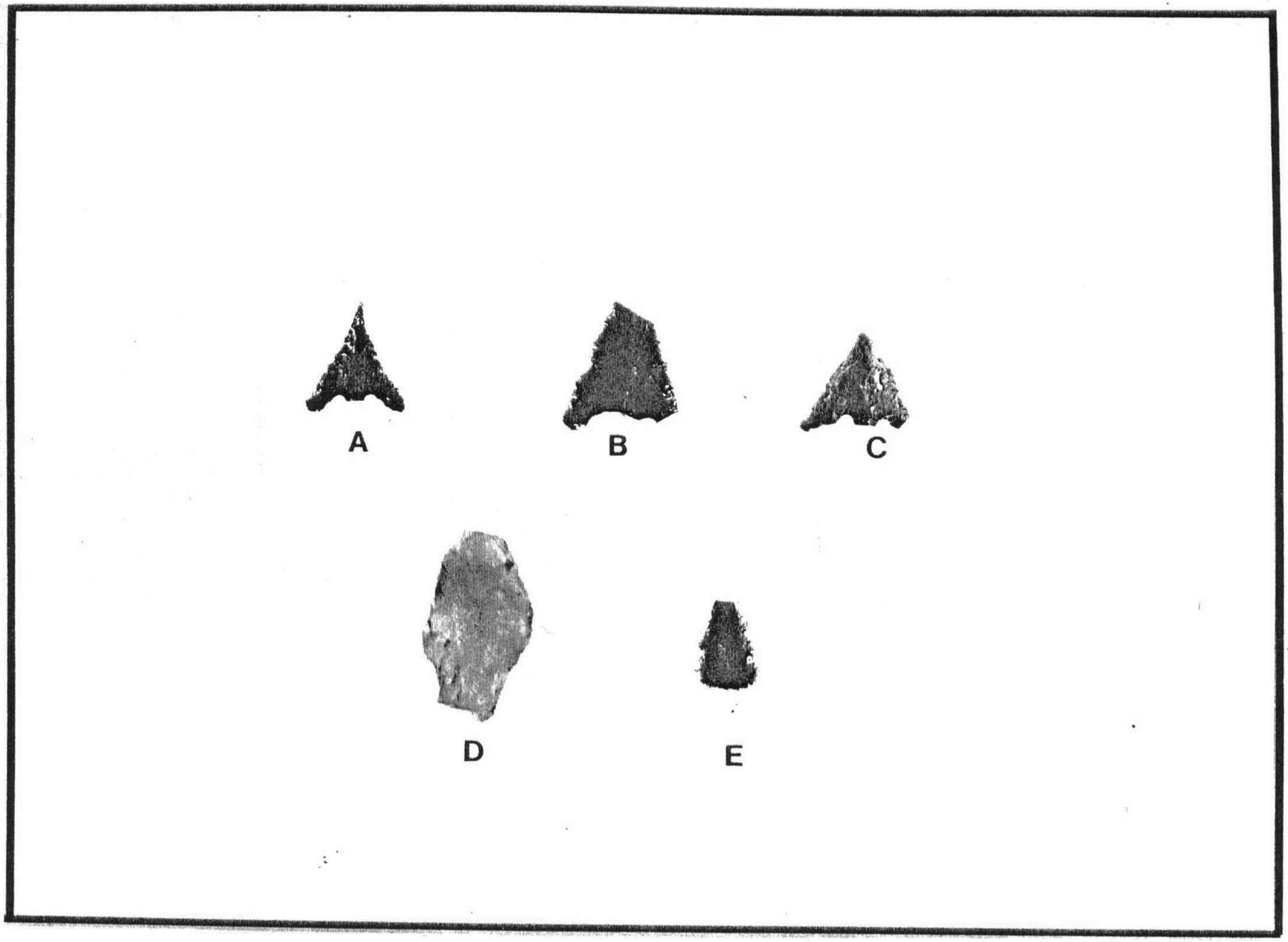

Figure 19. Projectile points, 35BE10.

SPECIMEN	TYPE
A-D	01-02A
E-H	01-03B

Figure 20. Projectile point, 35BE10B.

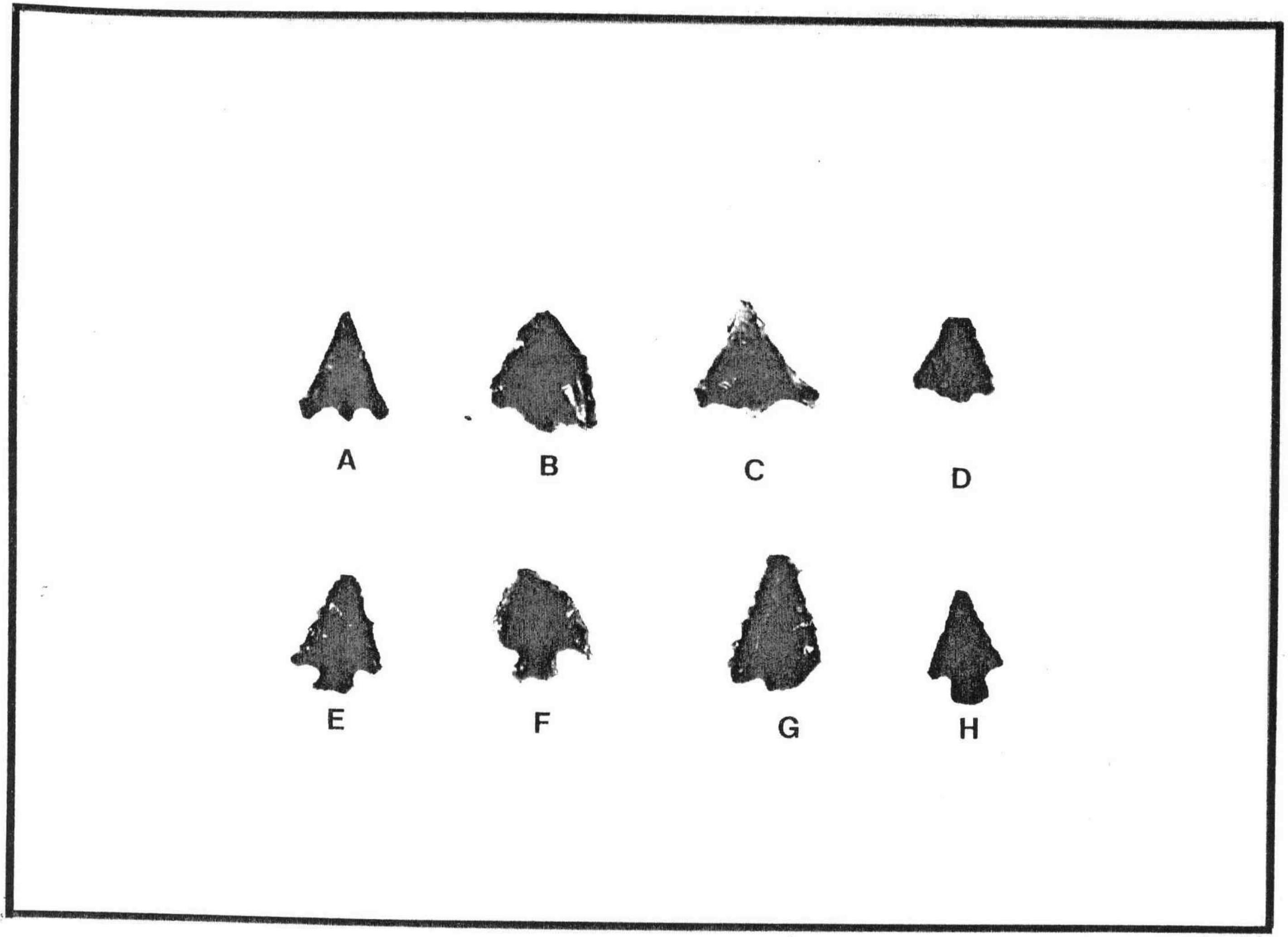

Figure 20. Projectile points, 35BE10B.

SPECIMEN	TYPE
A	01-04A
B	01-05C
C	01-06B
D	01-07B

Figure 21. Projectile points, 35BE10B.

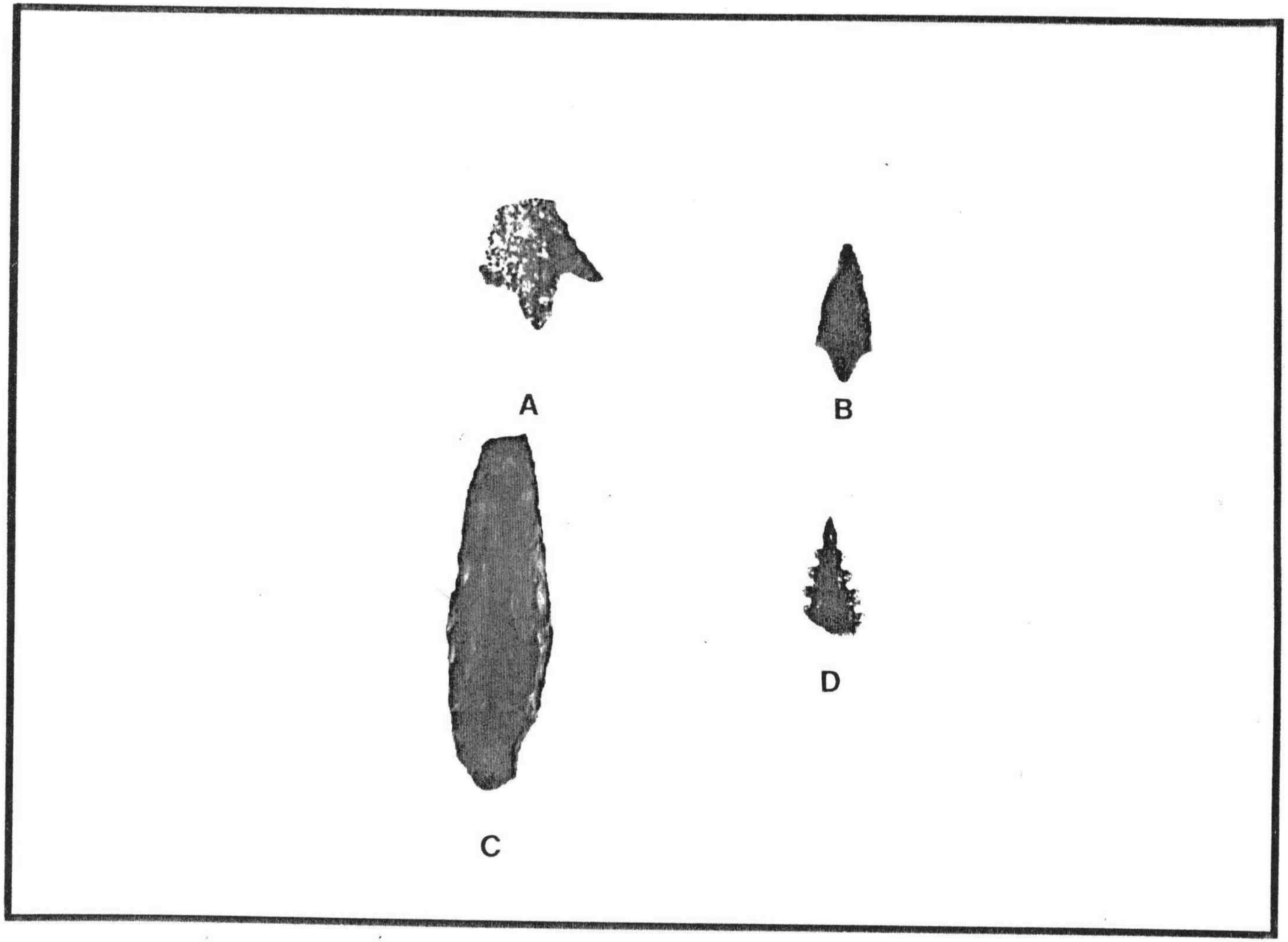

Figure 21. Projectile points, 35BE10B.

SPECIMEN	TYPE
A	02-01A
B	02-02A
C	02-04A
D	02-03A

Figure 22. Knives, 35BE37.

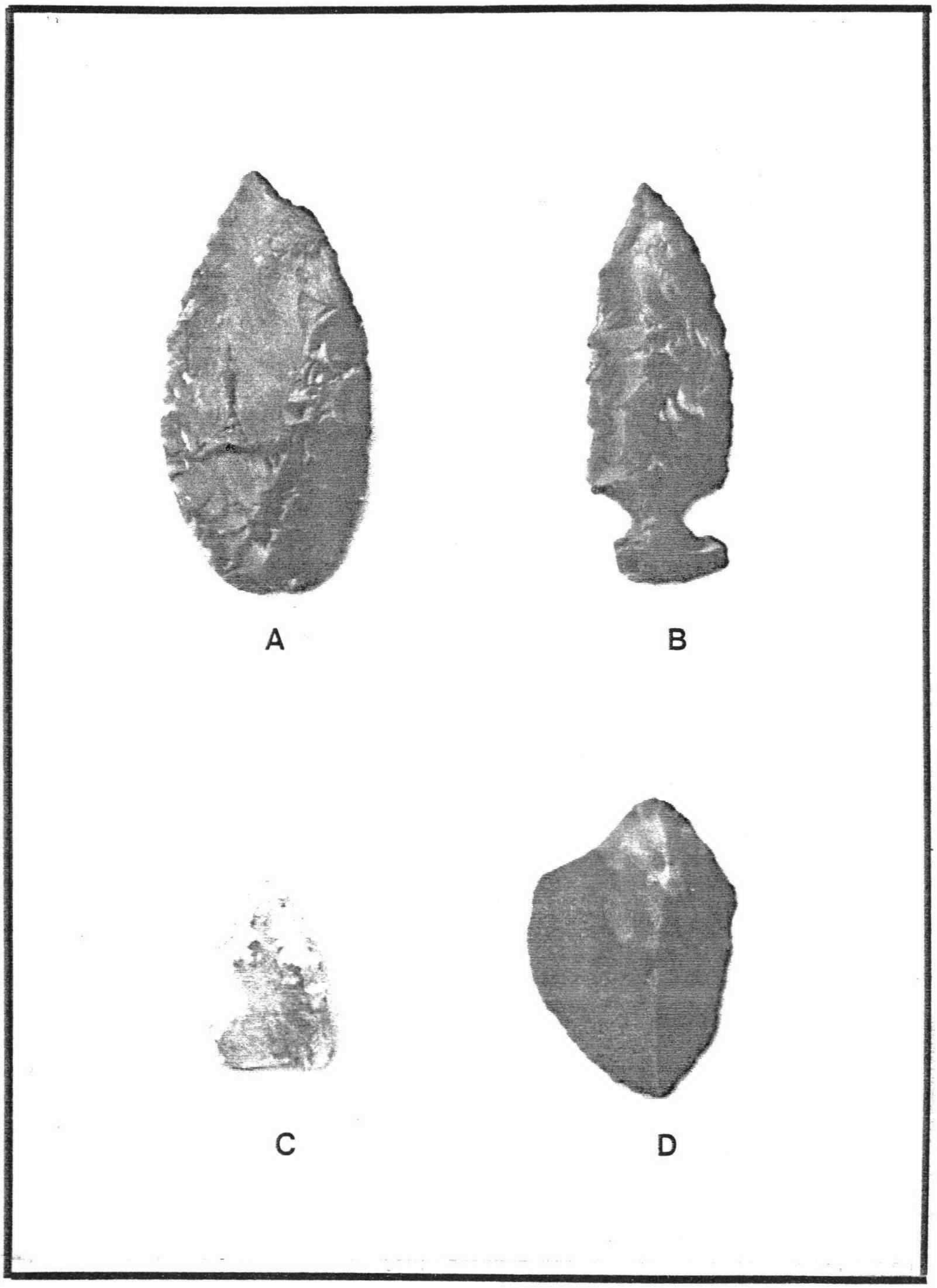

Figure 22. Knives, 35BE37.

SPECIMEN	TYPE
A-D	04-03A
E	04-02A
F-G	04-02A
H-I	04-01B
J	04-01A
K	03-02A

Figure 23. Drills and gravers, 35BE37.

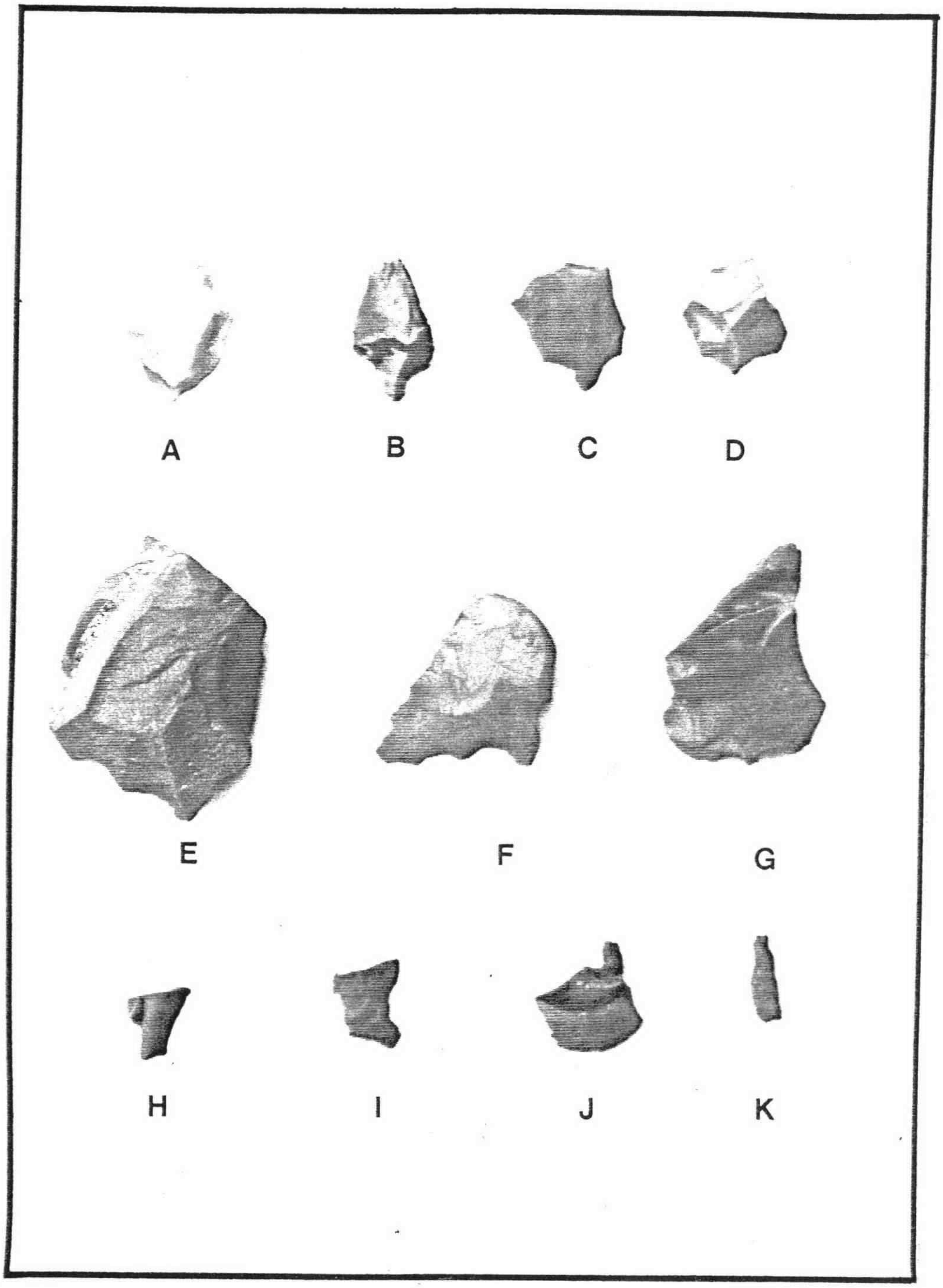

Figure 23. Drills and gravers, 35BE37.

SPECIMEN	TYPE
A-C	05-01A
D-E	05-01B
F	05-02A
G-I	05-03A

Figure 24. Scrapers, 35BE37.

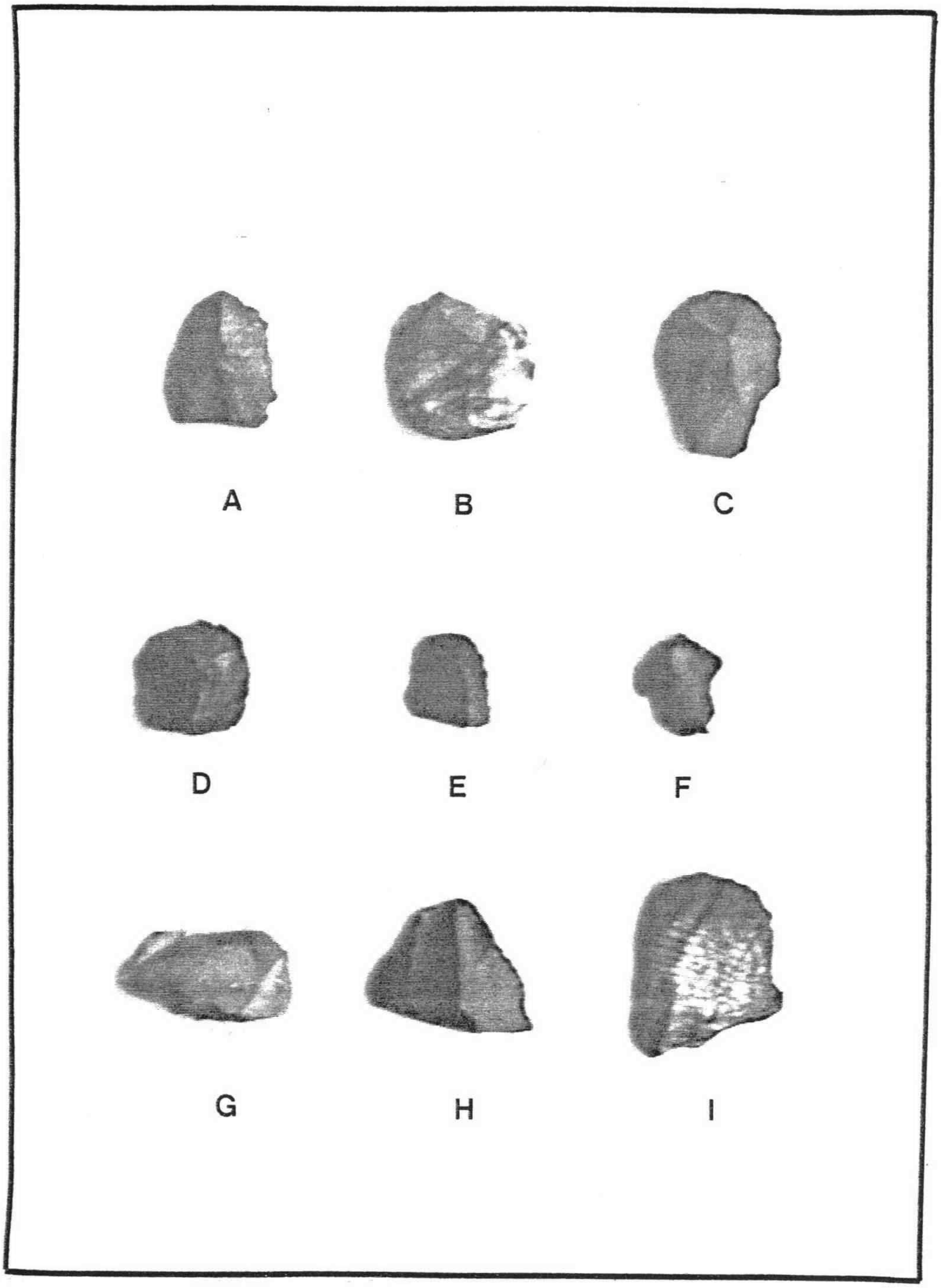

Figure 24. Scrapers, 35BE37.

SPECIMEN	TYPE
A-F	09-01A

Figure 25. Worked river cobbles, 35BE37.

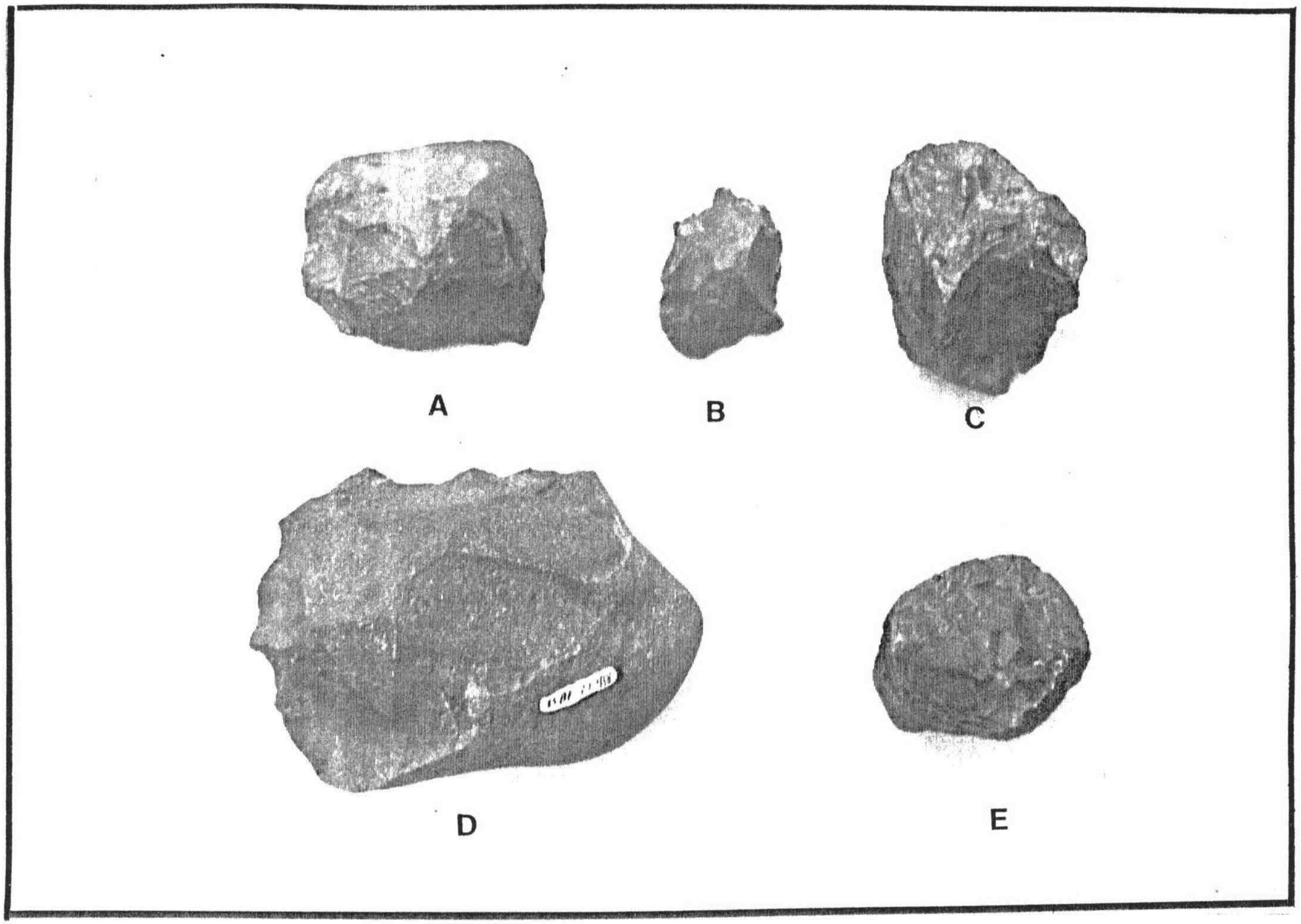

Figure 25. Worked river cobbles, 35BE37.

SPECIMEN	TYPE
A-C	10-02A
D	10-01A

Figure 26. Edge ground cobbles, 35BE37.

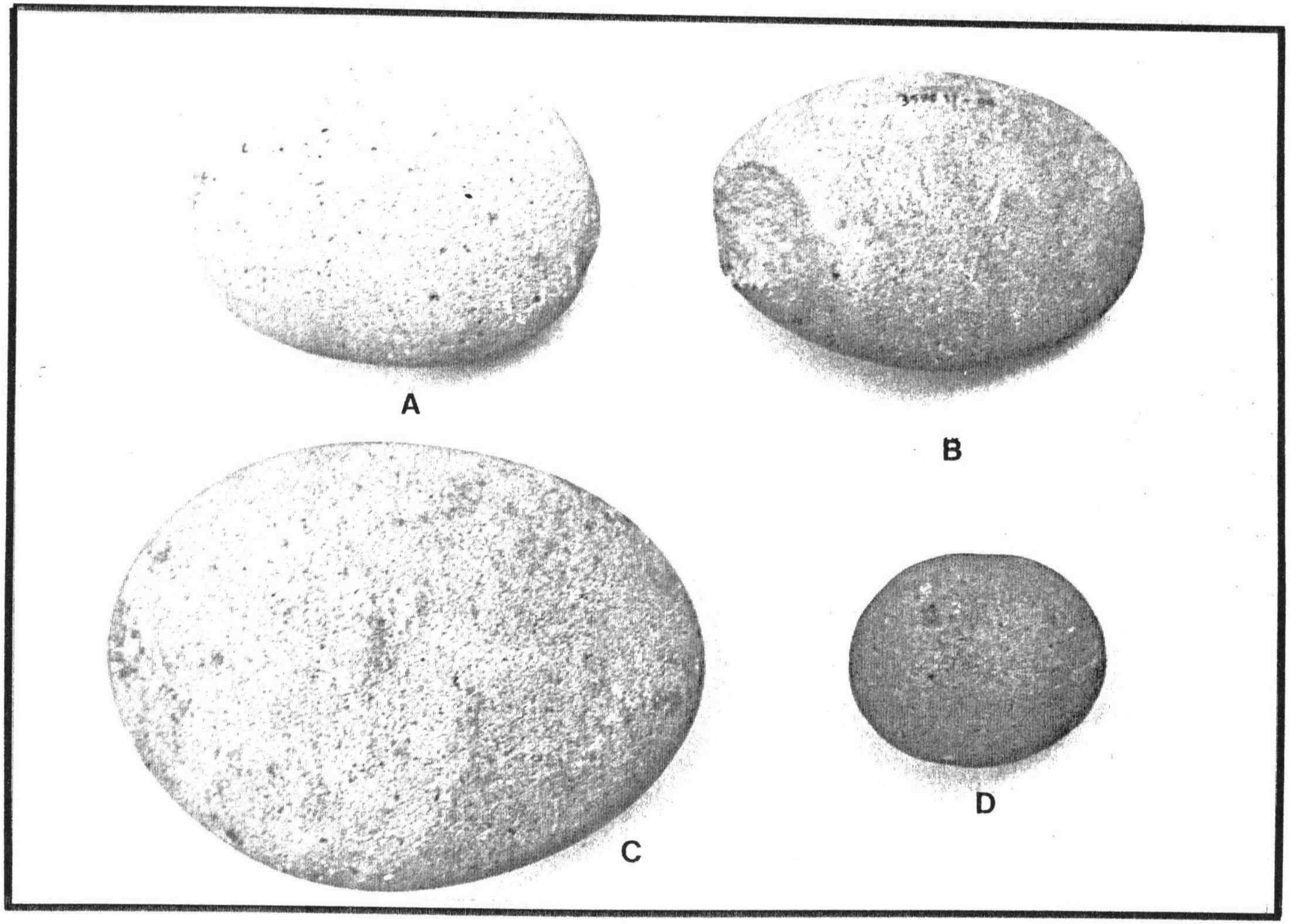

Figure 26. Edge ground cobbles, 35BE37.

SPECIMEN	TYPE
A	12-01B
B	12-01A
C	12-01B
D	12-01A

Figure 27. Hammerstones, 35BE37.

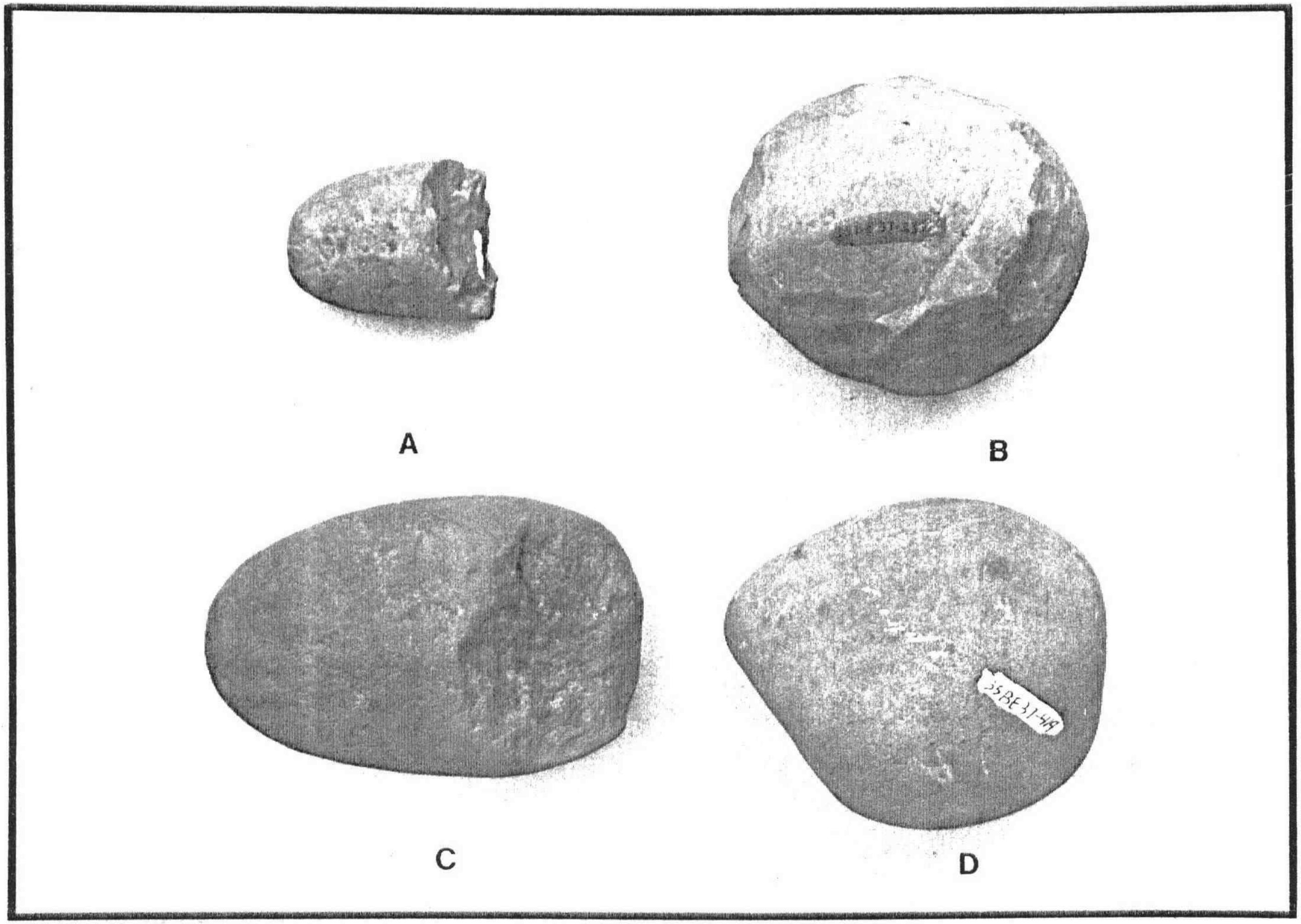

Figure 27. Hammerstones, 35BE37.

SPECIMEN	TYPE
A	13-01A
B	14-02A

Figure 28. Anvil and pestle, 35BE37.

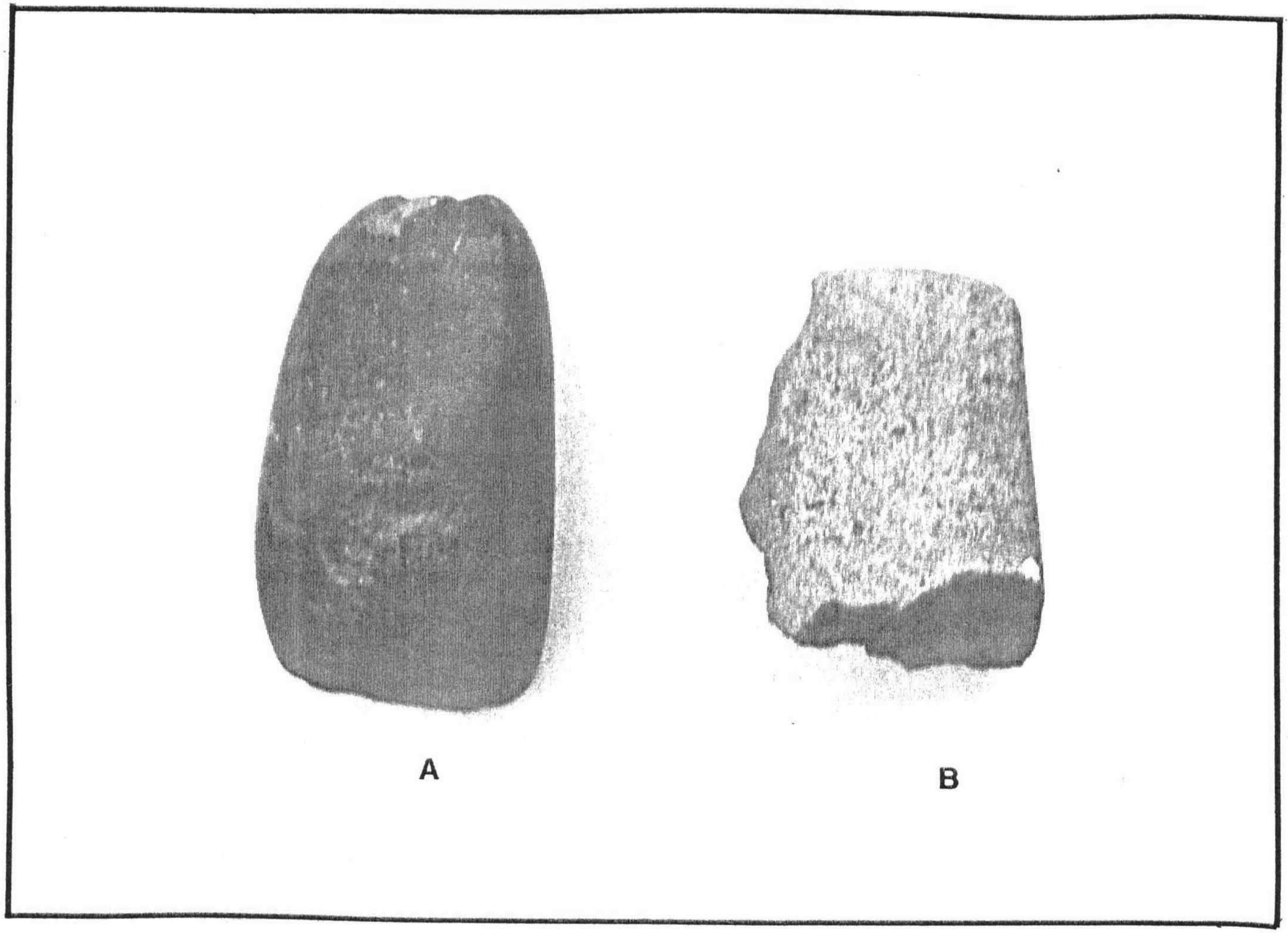

Figure 28. Anvil and pestle, 35BE37.

SPECIMEN	TYPE
A	15-01B
B	15-01A
C	15-01B
D	15-01A

Figure 29. Mortars, 35BE37.

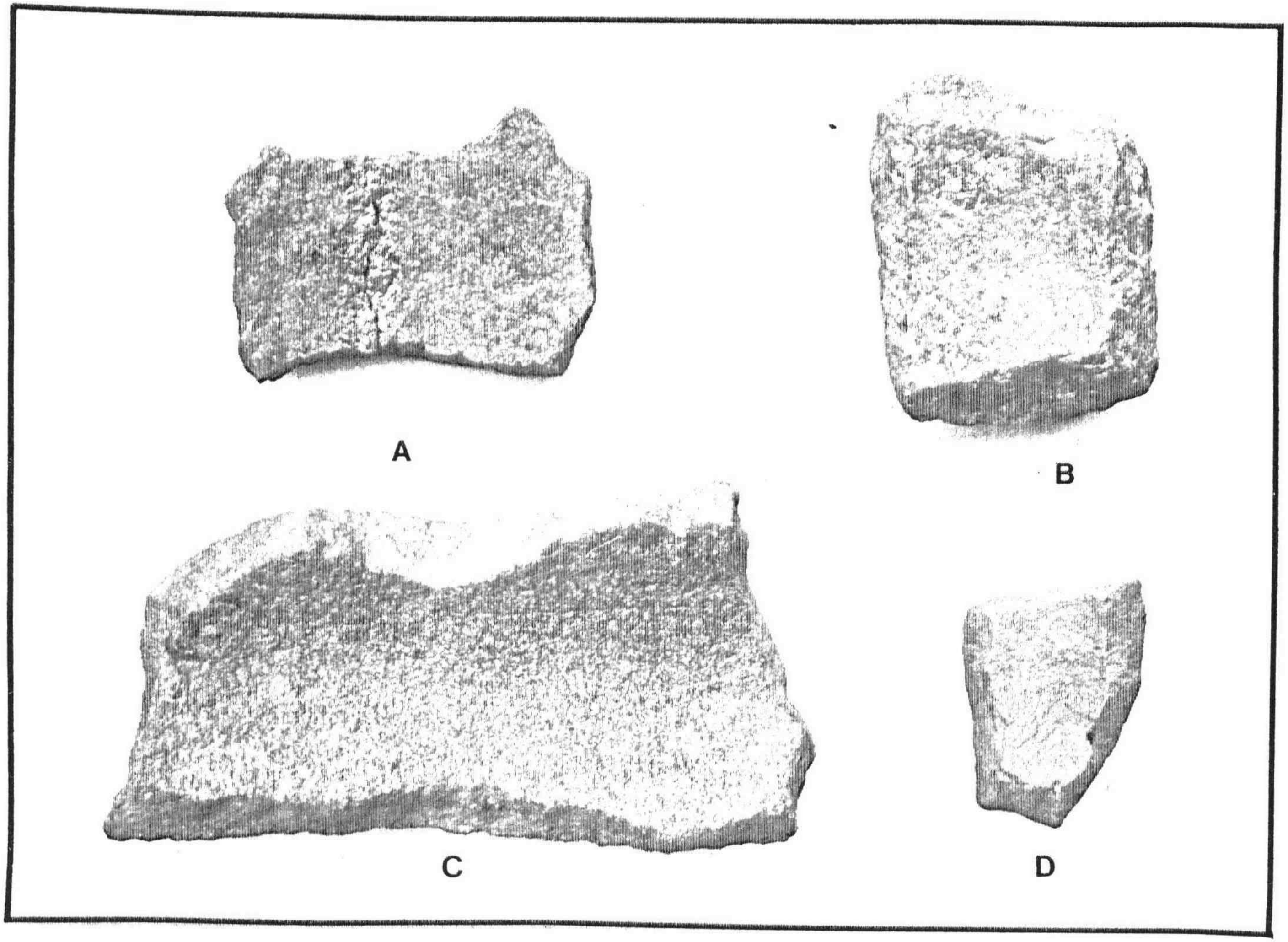

Figure 29. Mortars, 35BE37.

SPECIMEN	TYPE
A	16-01B
B	16-01A

Figure 30. Shaft abraders, 35BE37.

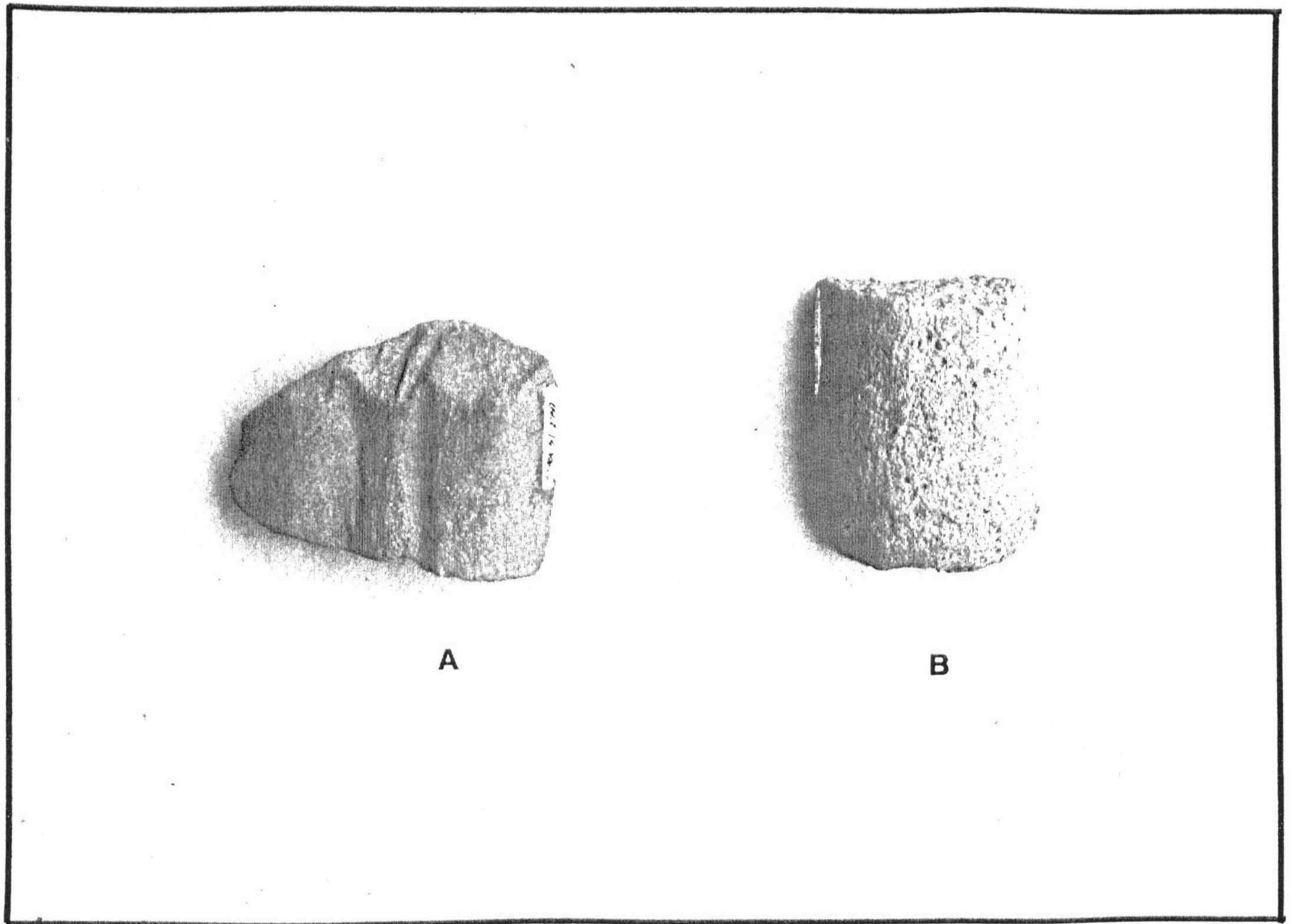

Figure 30. Shaft abraders, 35BE37.

SPECIMEN	TYPE
A-F	17-01A
G	17-02A
H	17-03A
I	17-04A

Figure 31. Manuports, 35BE37.

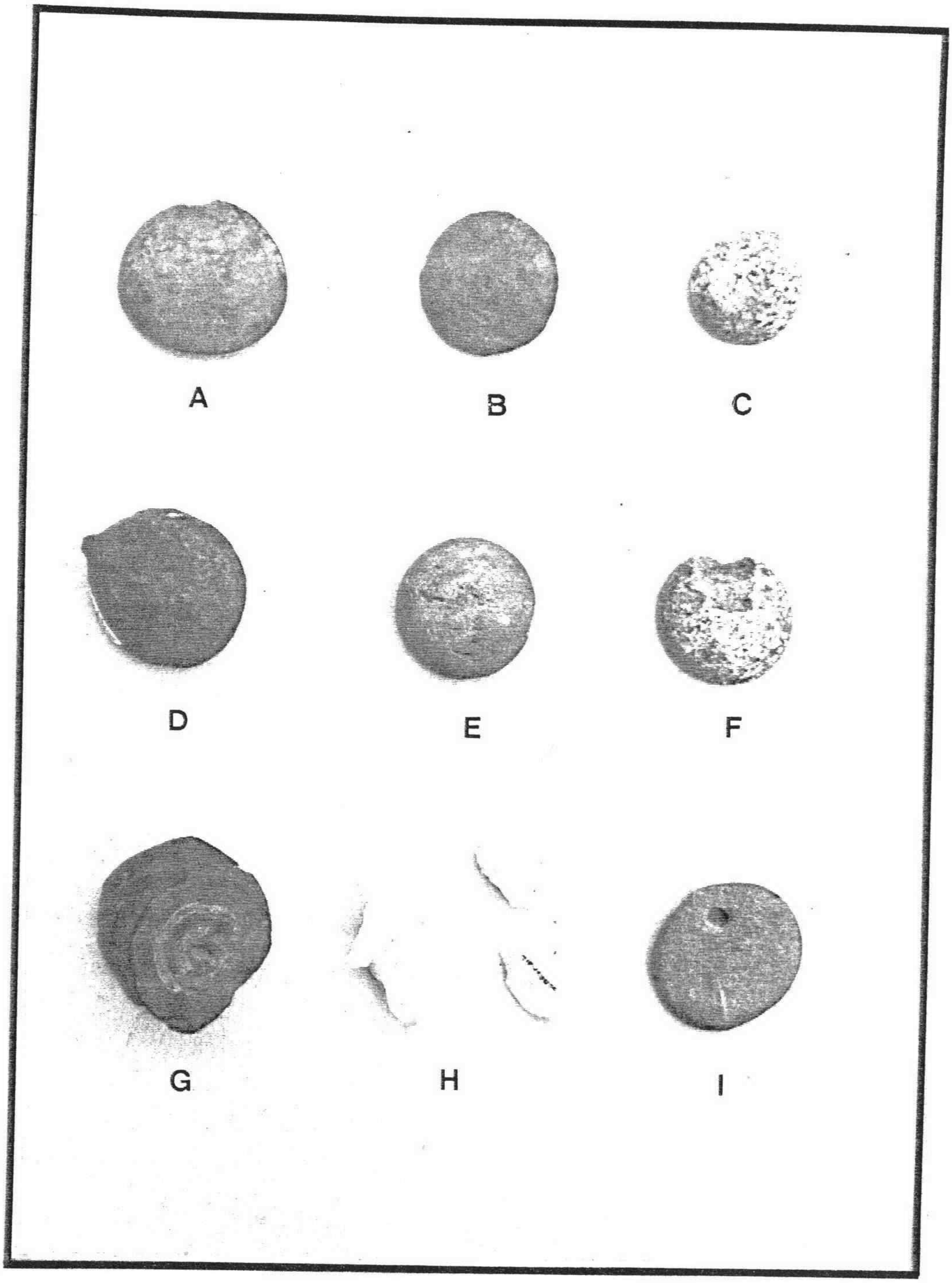

Figure 31. Manuports, 35BE37.

SPECIMEN	TYPE
A	18-01A

Figure 32. Incised bone, 35BE37.

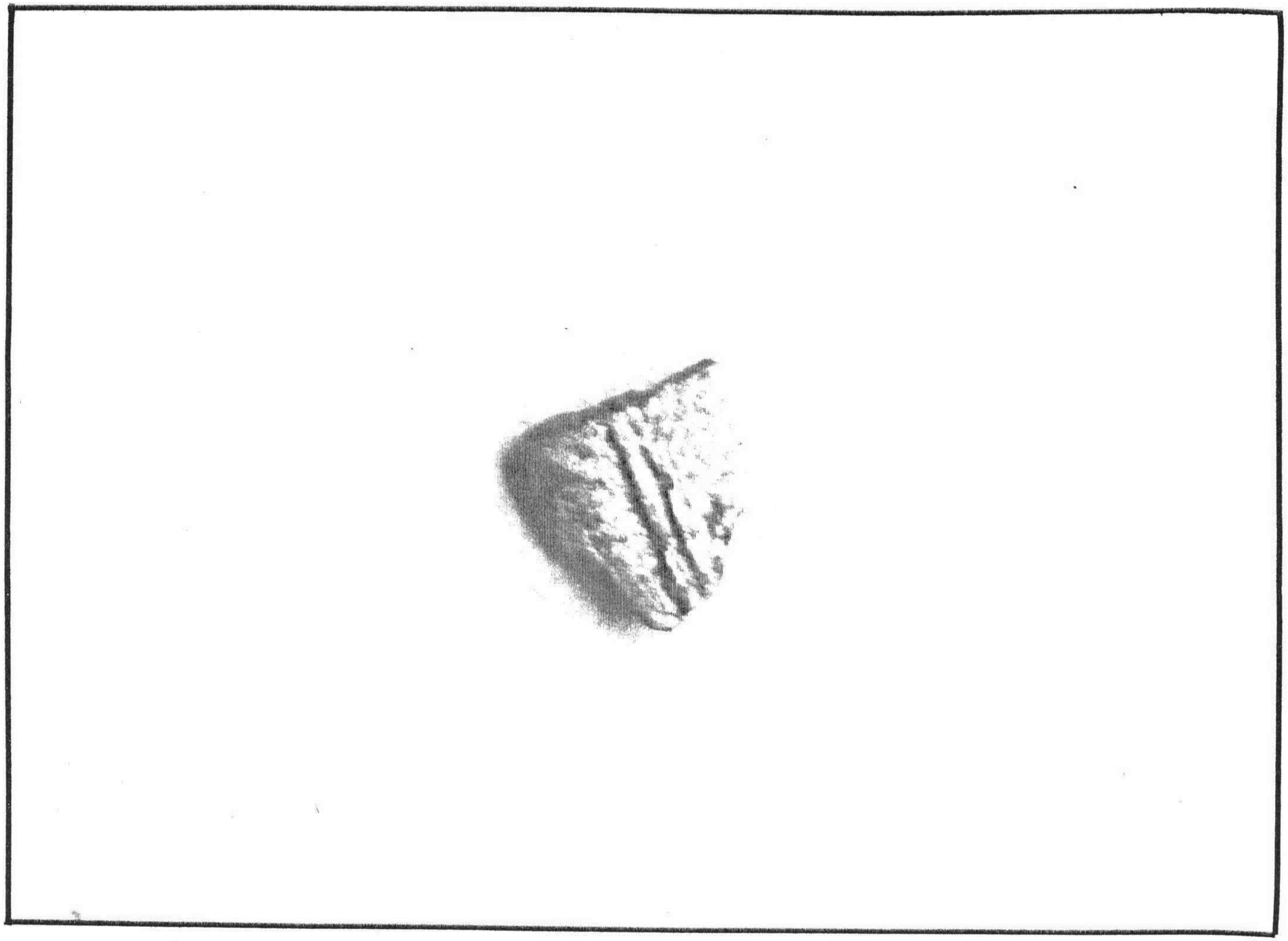

Figure 32. Incised bone, 35BE37.

SPECIMEN	TYPE
A	03-01A
B	03-02A
C	04-03A
D	04-02A
E	04-02A
F-I	09-01A

Figure 33. Drills, gravers, and worked river cobbles, 35BE10.

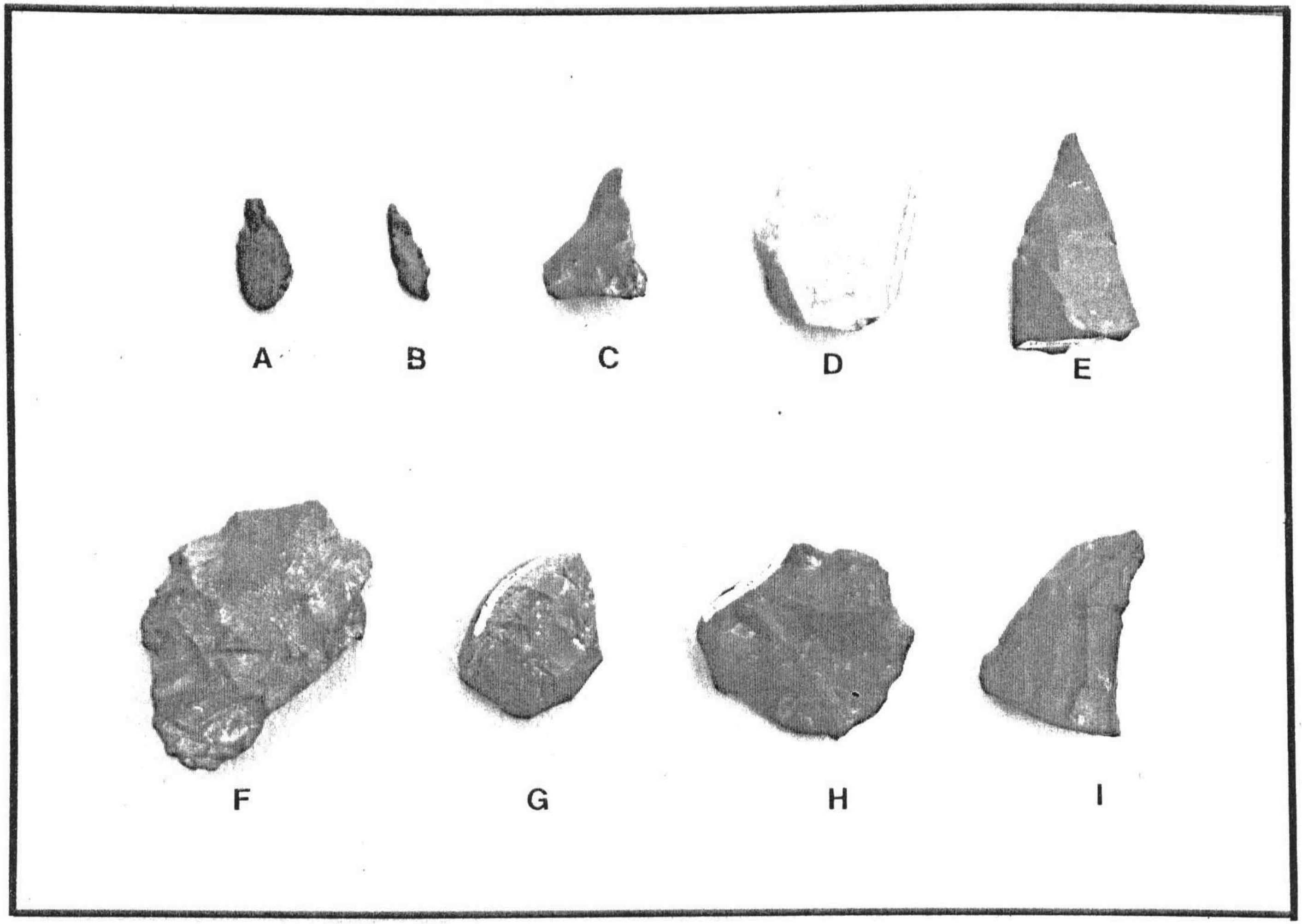

Figure 33. Drills, gravers, and worked cobbles, 35BE10.

SPECIMEN	TYPE
A,C,D	11-01A
B	11-02A

Figure 34. Cobble choppers, 35BE10.

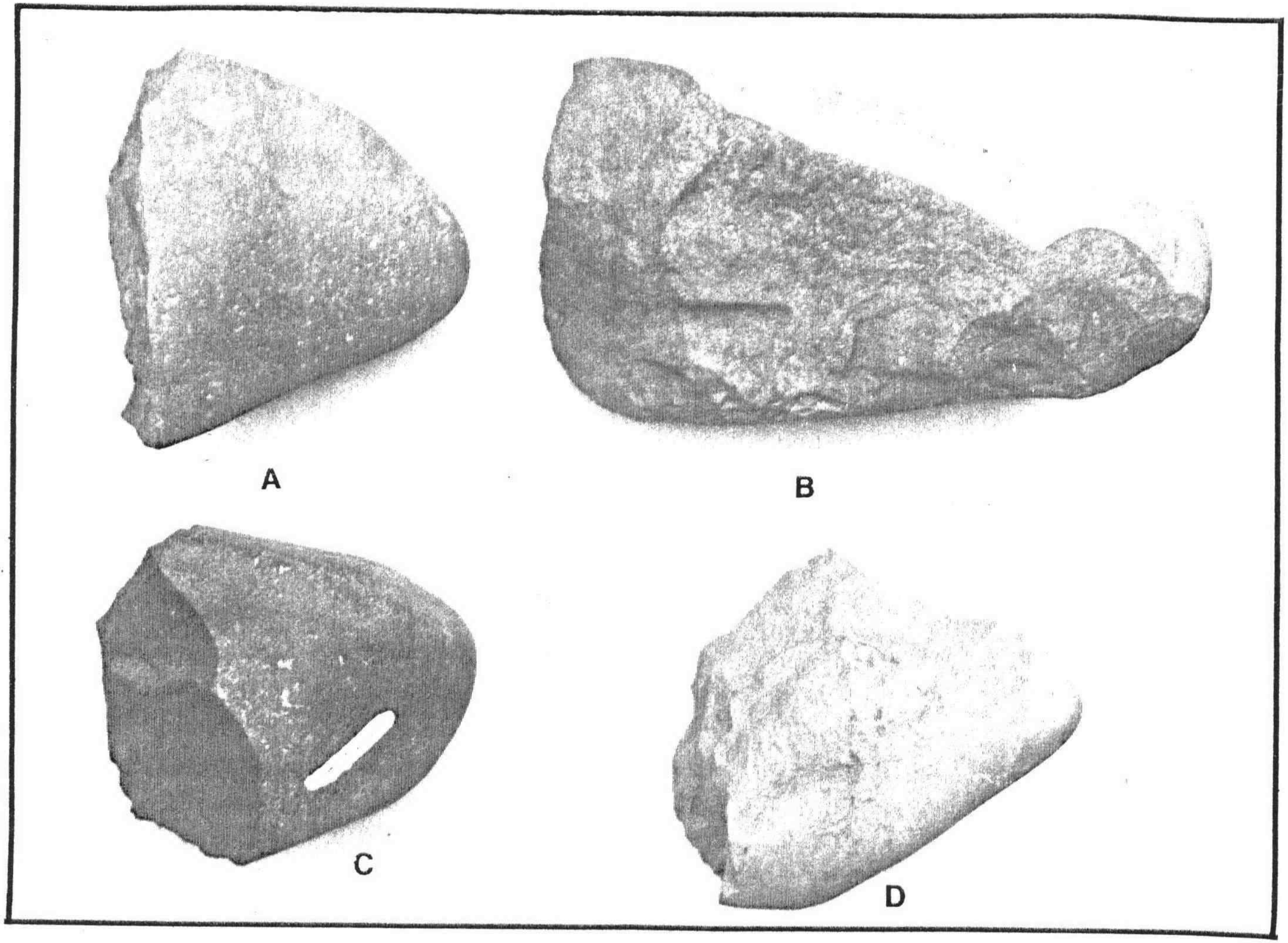

Figure 34. Cobble choppers, 35BE10.

SPECIMEN	TYPE
A	14-01A
B	14-01B
C	12-01B
D	12-02A

Figure 35. Pestles and hammerstones, 35BE10.

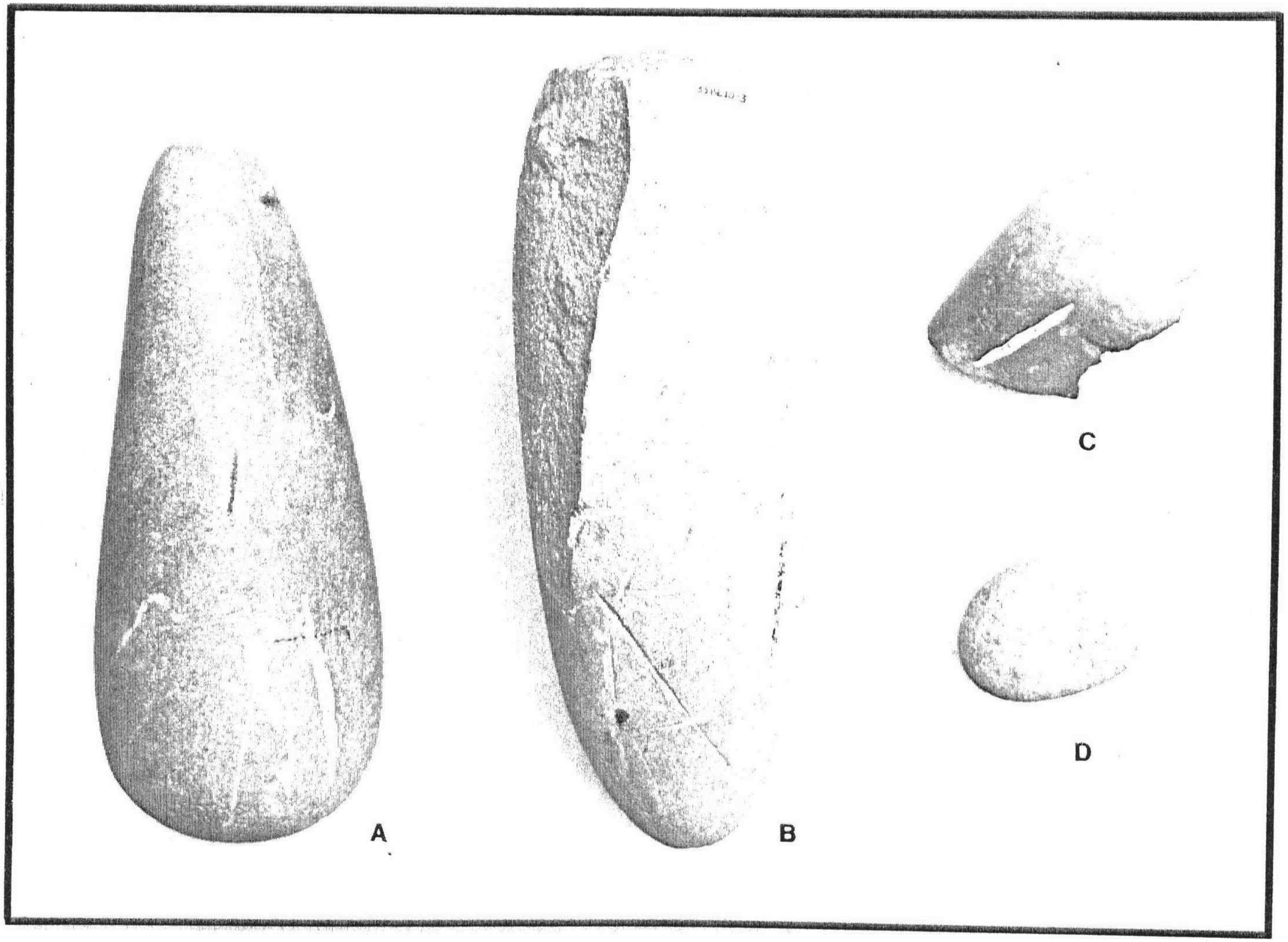

Figure 35. Pestles and hammerstones, 35BE10.

SPECIMEN	TYPE
A-C	05-03A
D, E	04-03A

Figure 36. Graver-perforators and scrapers, 35BE39.

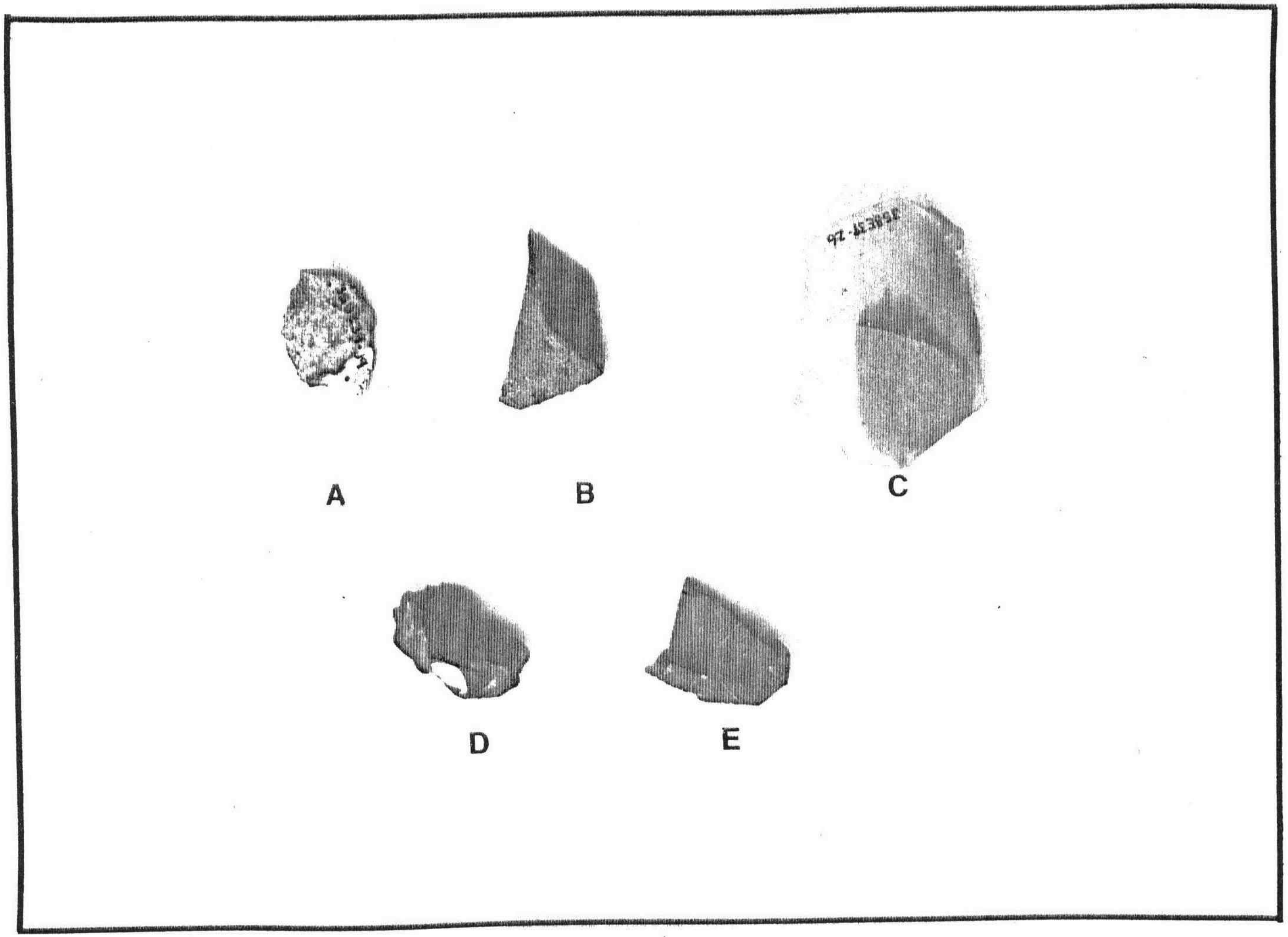

Figure 36. Graver-perforators and scrapers, 35BE39.

SPECIMEN	TYPE
A	10-01A
B	12-01A
C	15-01A
D	09-01A
E	10-02A
F	11-01A

Figure 37. Worked river cobble, edge polished cobbles, chopper, hammerstone, and mortar, 35BE39.

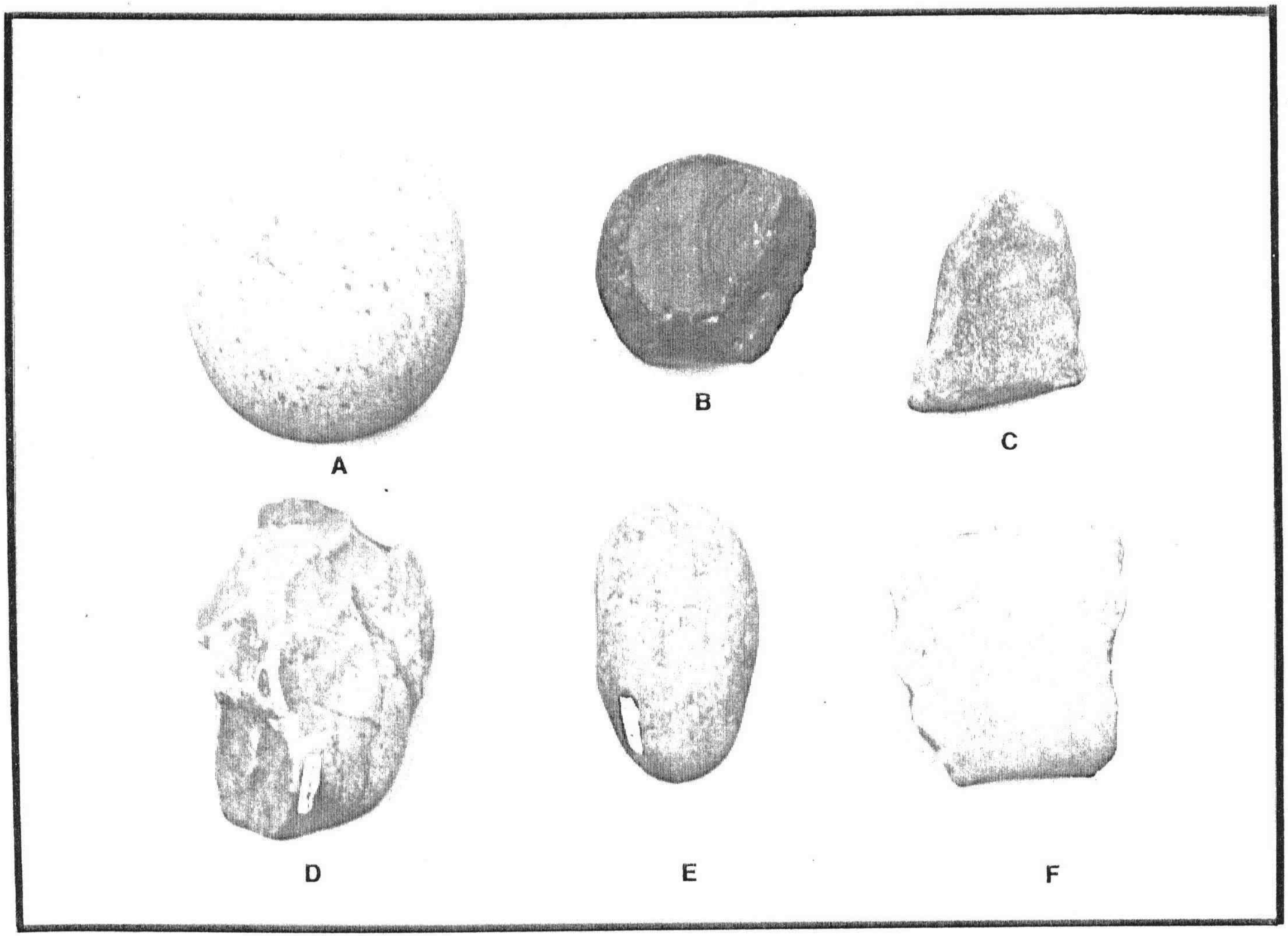

Figure 37. Worked river cobble, edge polished cobbles, cobble chopper, hammerstone, and motar, 35BE39.