AN ABSTRACT OF THE THESIS OF

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Title: Megascopic Plant Remains from Three Housepits along the Applegate River, Southwest Oregon.

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In 1982 a protohistoric archaeological site along the Applegate River in southwest Oregon was excavated by Oregon State University Department of Anthropology. Three housepits and a possible menstrual hut were uncovered with lithic, faunal, and archaeobotanical elements recovered from house floors and hearths. Seven botanical taxa were represented by carbonized seeds in the hearth and house floor soil samples: *Arctostaphylos*, *Quercus*, Compositae, *Pinus*, *Vitis*, *Abies*, and Chenopodiaceae. By far the most abundant was *Arctostaphylos* which was represented in 100% of the sample units.

Data derived from analysis of macrobotanical remains supported hypotheses of season of site occupation, site function, and subsistence resource preferences of site inhabitants, while neither supporting nor refuting hypotheses of chronological placement and trade relationships.

This research has added to the expanding store of information on ethnobotanical practices of aboriginal inhabitants of upland streamside terrace sites in the Applegate drainage where preservation of organic material has been extremely rare. Essentially, protohistoric Native American plant use in this area does not appear to differ substantially from practices described by early ethnographers for the Takelma/Tolowa/Applegate and Galice Creek Athapascans.

Megascopic Plant Remains from Three Housepits along the Applegate River, Southwest Oregon.

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MEGASCOPIC PLANT REMAINS FROM THREE HOUSEPITS ALONG THE APPLEGATE RIVER, SOUTHWEST OREGON

INTRODUCTION

Until recently, little archaeological research had been conducted in southwestern Oregon. Based on ethnographic resources, infrequent surveys, and excavation projects, it has been assumed by most workers (Aikens 1984, Brauner 1983, Cressman 1933, Gray 1985, Kroeber 1920, Lalande 1980) that local regional exploitation-extraction patterns reflected a combination of Northwest Coast hunting, salmon fishing, plant gathering, and California economic adapations, particularly dependence on fall acorn masts. The few archaeological investigations have been particularistic, treating individual sites, especially along river courses, and as such, little regional synthesis has been attempted. Although Nicholls (1983) has summarized a number of archaeological investigations on streamside terraces and uplands in the Applegate drainage. Archaeology of southwest Oregon is still in the descriptive/reconstructive phases, building a body of knowledge from which to derive hypotheses for future testing.

Except for this work and the on-going research by Prouty (1986) and Pettigrew (1988), regional archaeobotanical investigations have been non-existent. Discussion of plant resources has rested on ethnographic assumptions and occasional finds of preserved pine nut beads (Cressman 1933), camas ovens (Hanes 1978), or indirect evidence such as plant processing tools (Moore 1977) or plant-community composition (Appleton and Smith n.d.). Paucity of actual data inhibits development of generalizations relating to patterns of resource exploitation and utilization, therefore, no regional ethnobotanical synthesis has been undertaken here.

The site considered in this research, 35JA42, is located adjacent to the Applegate River in southwestern Oregon. Lying downstream from the Applegate Dam project area, the site was not directly affected by construction activities, consequently, it was slated to be preserved in situ. However, several minor looting incidents and damage resulting from tree removal by Rogue River National Forest personnel made it apparent that wholesale preservation would be difficult. As a consequence, Oregon State University Department of Anthropology was contracted, with David Brauner as principal investigator, to retrieve archaeological material from the site.

During the summer of 1982, the OSU Field School excavated three relatively undisturbed house pits, one looted structure, a possible menstrual hut, and a sample of exterior work areas (Brauner 1983). Centrally located within each of the house depressions was a hearth, two of which were outlined by large discoidal river cobbles and containing sediments 12cm - 15 cm in depth. The remaining hearth was situated on the same plane as the living surface rather than restricted to a pit and lacked the cobble perimeter. It has been suggested by Brauner (1983) that the cobbles from this hearth were scavenged by later occupants of the site. Lithic material, faunal, and floral remains were incorporated in the hearth material from all three structures.

This study has been concerned primarily with archaeobotanically-derived data and its implications, therefore, it was necessary to separate plant remains from other debris. Two methods were employed in the separation process, handsorting and flotation, in order to assess variability or discrepancies in the data and to compare the efficiency and reliabilty of each method. Comparison of these two separation methods was later abandoned as a research goal. Recovered megascopic plant remains, specifically carbonized disseminules, were identified whenever possible and quantitatively evaluated. Botanical material in selected soil samples from house floors was used for comparative purposes.

The underlying purpose of this research was to determine whether the macrobotanical data could be useful in testing hypotheses concerning the nature and use of the site as posited by David Brauner (1983). Briefly, the data obtained from the archaeobotanical material tended <u>not</u> to refute Brauner's conclusions, although it was not possible to test each postulate with such limited data. Certainly, the macrobotanical remains can be seen to provide insight into the subsistence/settlement system of the inhabitants of 35JA42, however, due to the restricted nature of the resource, the data does not illuminate the full range of exploitative-extraction economies. In actuality, the Applegate site (35JA42) is atypical compared to other aboriginal sites in the same drainage (Brauner 1990). Typically, organic preservation is extremely poor due to acidity of soils, alternate seasonal wetting and drying, and a history of hydraulic mining in the area that virtually eliminated all but the most durable artifacts. Because only a single site is considered, it is not supposed that the behavior inferred here typifies the entire spectrum of regional plant-related activities. As Struever (1969:11) has stated:

> Exploitative-maintenance activities are differentially distributed within the geographic area encompassed by a culture and, therefore, no site can be expected to reflect more than a fraction of these activities.

The initial two chapters of this study have been designed to provide background information necessary for viewing the inhabitants of 35JA42 within a human ecological context. King and Graham (1981:128) have suggested that, "it is difficult to study an organism without taking into account its biotic and physical environment." Chapter 1 discusses the physical and environmental attributes of the region which influenced certain unique adaptive behaviors of the native peoples.

The region encompasses a wide physiographic area that extends west of the Cascade Range to the Pacific Ocean, north of the Rogue River, and south to an area surrounding the Klamath River in California (Gray 1985). Based partly on cultural parallels as well as environmental similarities within the region, Kroeber (1920) proposed a Northwestern California Culture Area, including the Takelma and Galice/Applegate Athapascans of southwest Oregon. Chapter 2 discusses cultural characteristics of these aboriginal peoples as recorded by early ethnographers. It has been hypothesized by Brauner (1983) that 35JA42 can be dated to protohistoric times, circa 1750-1830. As such, use of ethnographic analogs when inferring behavior is a relatively reasonable procedure although caution is always advised when explaining the past by the present (Bettinger 1982).

Chapter 3 discusses hypotheses concerning the nature of the site and the people who occupied it as formulated by the principal investigator after six years of intermittent research. Brauner's interpretation has been based on in situ evidence, primarily lithic material and structural elements of dwellings, as well as ethnographic and current regional data. Macrobotanical remains will be seen to contribute to more robust hypotheses by providing supportive material to supplement and corroborate the original core of information. In addition, Chapter 3 outlines research aims and the methods employed in order to meet those goals.

Chapter 4 treats qualitative and quantitative evaluation of macrobotanical remains; cultural vs. non-cultural material; formational, depositional, and taphonomic processes which may have directly influenced the reliability of this research. Minnis (1981) has warned of the pitfalls of neglecting to distinguish between various processes forming the paleoethnobotanical record, therefore, a substantial part of Chapter 4 deals with the formational history of the macrobotanical assemblage in archaeological context at 35JA42.

This study can be seen as contributing to the accumulating body of information concerning extractive-exploitative behaviors of the Galice/ Applegate Athapascans, although not necessarily as representative of those activities. In order to fully assess regional exploitative-maintenance systems, considerably more field work must take place. In this inductive manner each site adds to the regional perspective. However slowly research has been conducted or data have been amassed, each additional study contributes to the reconstruction of culture patterns and eventually to a picture of culture change in southwestern Oregon. In time we can expect to be familiar with regional evolutionary processes and can begin to look for explanations.

CHAPTER I

PHYSICAL SETTING

Geology

The diversity, complexity, and age of geologic features in southwestern Oregon are critical considerations when assessing aboriginal occupation through an ecosystemic approach. Varied geological parent material thoughout the region combined with climatic conditions and plant migratory fluctuations have provided a great diversity of subsistence resources for native peoples. Direct association between subsistence resource diversity and system stability (Minnis 1985) suggests durability of regional cultures.

The Takelma and Galice/Applegate Athapascans, ethnographically- documented peoples of southwest Oregon, apparently occupied a region within the Klamath Mountain physiographic complex which comprises features primarily of pretertiary strata. Baldwin has described this area as having been folded and faulted and "intruded by granitoid rocks and serpentinized masses of ultrabasic rocks" (1976:71). Land masses here are among the oldest in western North America, being part of an arc of massive granitic batholiths stretching from British Columbia to Baja California (Detling 1968). Oregon's oldest known rocks, estimated to be at least 425 million years old, lie along the extreme southern border in the Siskiyou Mountains (Alt and Hyndman 1981). Partly due to its ancient origin, provincial strata has not been submerged since the Cretaceous, evidence of which can be found in fossils of terrestrial plants from the Mesozoic in Jurassic rocks from this region (Detling 1968). Physiographic features bear upon the essential nature of the region. Detling (1968) emphasizes the importance of north-south trend of major physiographic features in western North America relative to plant migrations and evolution. For millions of years, during climatic fluctuations, mountain and basin axes have provided nearly continuous arteries for the north-south movement of plants (Detling 1968). In addition, regional mountain ranges have variably influenced precipitation and temperature regimes by modifying the effect of prevailing westerly winds.

The Rogue-Umpqua region, essentially a trough lying between the Cascade and Coast Ranges, is bounded on the south by the Siskiyou Mountains and to the north by a narrow, westward intrusion of the Cascades (Peck 1925). It was during the Late Cenozoic uplift that the Rogue River began its flow westward across the Klamath Mountains resulting, millenia later, in a steep, narrow drainage with deeply-dissected slopes (Baldwin 1976). The drainage system of the Rogue River contains two principal valleys: the Rogue Valley including Bear Creek Valley; and the Applegate Valley formed by the Applegate River. With its headwaters in the Siskiyou Mountains, the Applegate River maintains a northwest channel to its confluence with the Rogue River near Grants Pass. The upper fork of the Applegate River flowing through the Siskiyou Mountains has created a narrow, steep-sided valley so typical of the region. It is along the banks of the Upper Applegate River that 35JA42 is located (Figure 1).

Climate

Mild, damp winters and hot, dry summers are the rule in southwestern Oregon. Interior valleys in this region are the driest areas west of the Cascade Range (Franklin and Dyrness 1973). Most of the rainfall occurs between October and March, averaging 20 inches annually in the lowlands and increasing with elevation and proximity to the Pacific Ocean (Gray 1985). Snowfall is infrequent in the valleys, but above 4500 ft. can reach considerable depths. At this elevation, snow pack ranges from 60" - 160" usually remaining on the ground from November through April. During the winter and early spring, fog commonly occurs at lower elevations often remaining for several consecutive days. In the summer, diurnal temperatures frequently reach 90 degrees F with occasional extremes of over 100 degrees F.

Vegetation

Southwestern Oregon is vegetatively multifacted; the area is the product of unique geologic and floristic histories. Soils derived from diverse parent material, geography and climate are factors contributing to an "extremely complex region environmentally, floristically, and synecologically" (Franklin and Dyrness 1973). And although the Klamath Geological Province (Cater and Wells 1954) was upthrust before most of the rest of Oregon, volcanism and glaciation have not greatly influenced the area, thus permitting soil and floral development to proceed virtually without interruption (Atzet and Wheeler 1982).

Hansen's (1947) early studies have demonstrated vegetational succession in the Northwest following the maximum advance of the late Wisconsin glaciation approximately 15,000 years ago. Based on pollen profiles, the first aboreal pioneer appears to have been Pinus contorta (lodgepole pine), which was gradually replaced by Pinus monticola (white

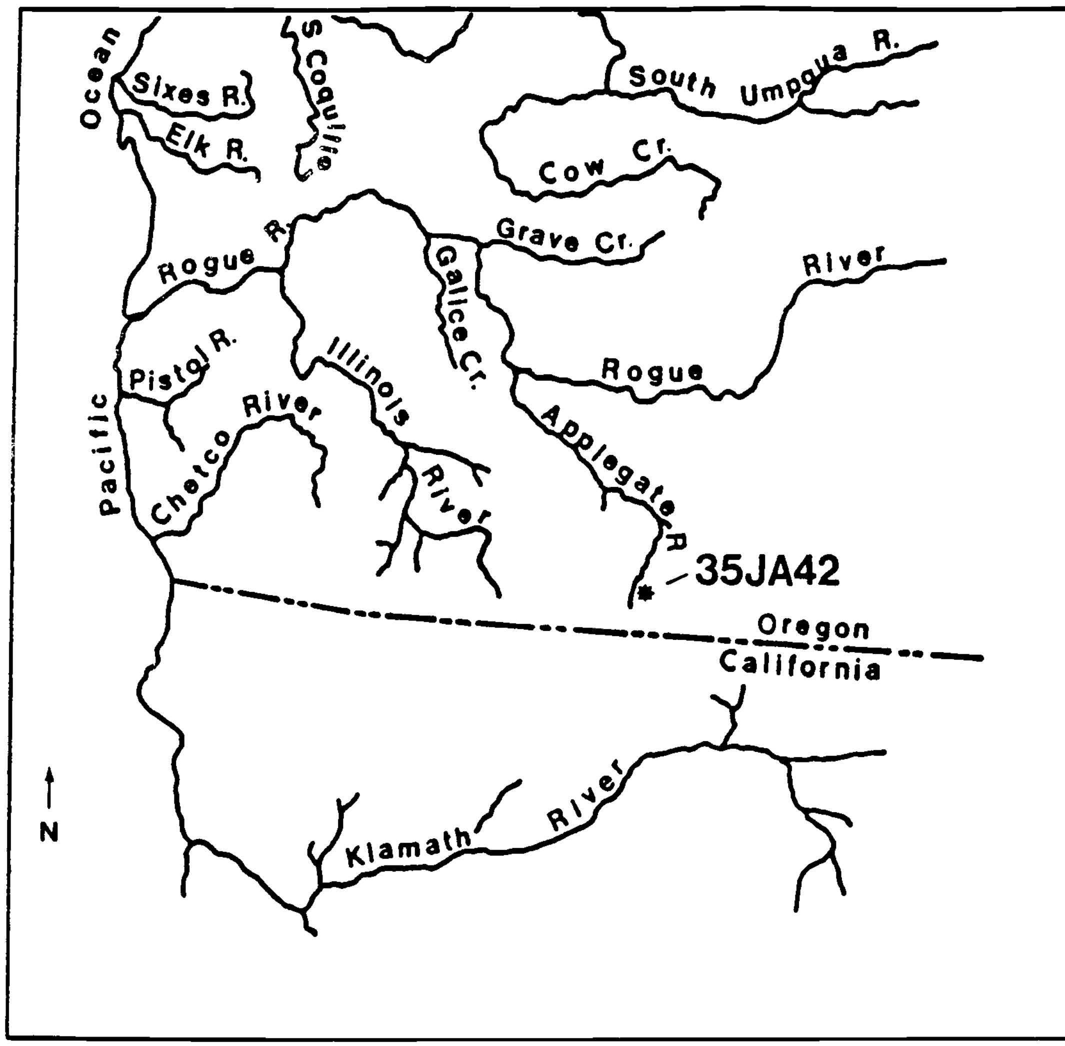


FIGURE 1: LOCATION OF SITE 35JA42
(FROM SCHMITT 1986)

pine), Picea sitchensis (sitka spruce), and Pseudotsuga menziesii (Douglas-fir). Following the Wisconsin maximum, and occurring approximately 13,000 - 10,000 years ago, increasingly warmer and moister conditions permitted the expansion of more mesic species: Pseudotsuga menziesii (Douglas-fir), Picea sitchensis (sitka spruce), and Tsuga heterophylla (western hemlock),. From about 11,000 - 4000 years ago, average temperatures were higher and average precipitation was less than present regimes; Quercus garryana (Oregon white oak), began to dominate inland valleys west of the Cascades. From about 4000 BP to the present, climatic conditions have been cooler and moister, decreasing habitats suitable for Quercus garryana (Oregon white oak), with a concomitant increase in Pseudotsuga menziesii (Douglas-fir), and Pinus ponderosa (ponderosa pine), populations. Aikens (1984) has speculated that expansion of oak woodlands from 11,000 - 4000 BP would have increased possibilities for harvesting acorn resources while reducing camas habitats. He has suggested (Aikens 1984:10) that fauna such as pronghorn antelope and perhaps even bison could have been common in this dry, warm period with deer and elk confined to higher elevations. The trend toward cooler, moister regimes from about 4000 BP to the present would have reversed these conditions. Regional archaeological assemblages should reflect climatic fluctuations through time with differential exploitation of flora and fauna, assuming Aikens' propositions are accurate. Present-day vegetational patterns in southwest Oregon have been influenced by the typically loose, gravelly soil which does not readily retain moisture, providing habitat for more xerophytic species than would be detected from precipitation records (Peck 1925).

A long history of disturbance, primarily by fire (both anthropogenic and naturally ignited) has been a significant factor in the region's vegetational character. Present-day fire suppression practices are causing new vegetative patterns to emerge. The trend appears to be toward climax communities whereas, recurrent fires in the past encouraged the growth of seral species. However, these successional trends are continually disturbed by agriculture, logging, and grazing.

Vegetation communities within southwest Oregon are discussed below for the purpose of describing ecosystemic diversity that may have been available to protohistoric people. Reliance on the principle of uniformitarianism and its derivative -- analogy -- in this case, seems a fairly secure procedure (Leone and Palkovich 1985) primarily due to the relatively neoteric nature of the site (Steward 1942).

Franklin and Dyrness (1973) have divided southern Oregon into five typological zones, (see figure 2); the four below are especially pertinent to this study.

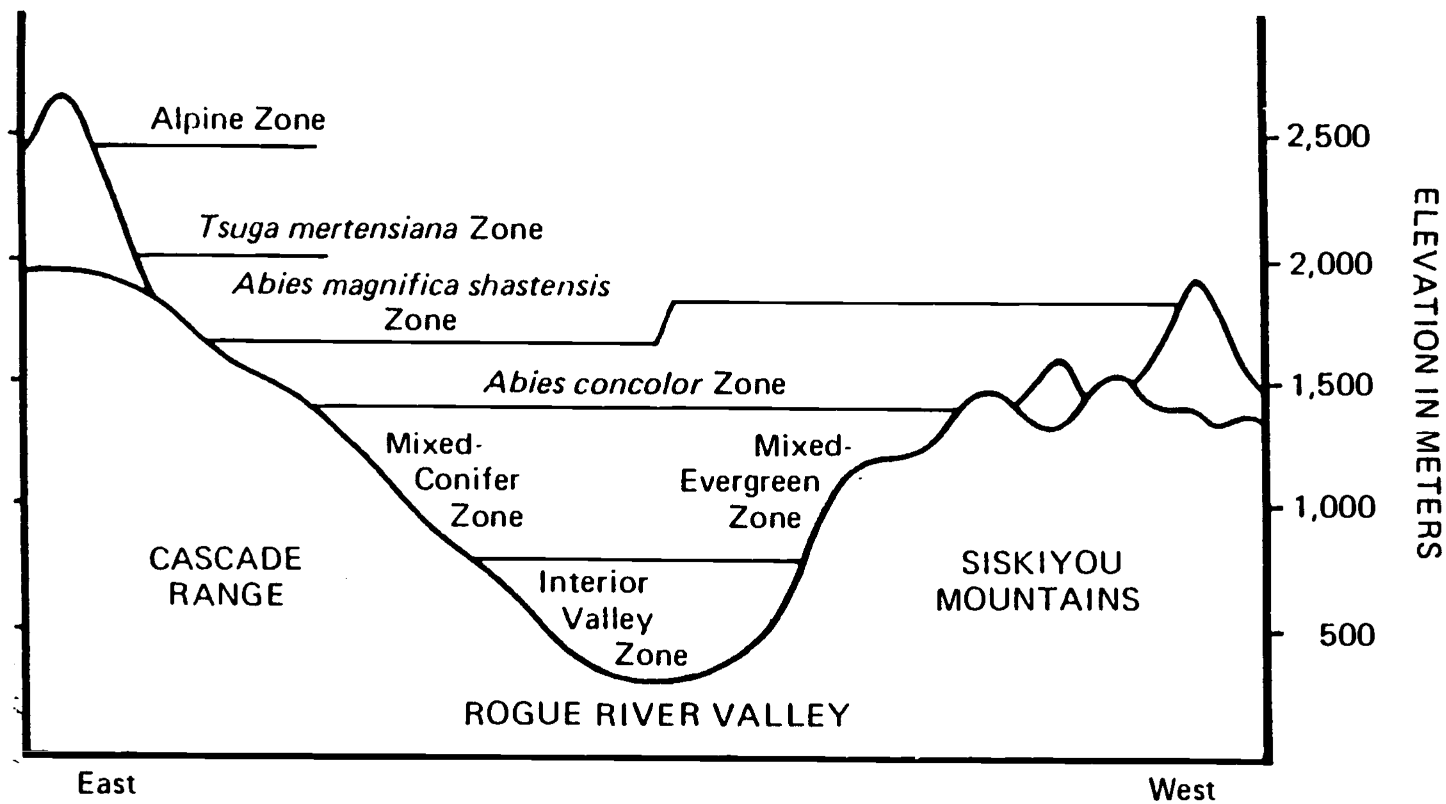


FIGURE 2: ARRANGEMENT OF VEGETATION ZONES IN THE SISKIYOU MOUNTAINS OF SOUTHWESTERN OREGON. FROM FRANKLIN AND DYRNESS 1972.

I. Interior Valley Zone

II. Mixed Evergreen Zone

III Abies concolor Zone

IV Abies magnifica shastensis Zone

Zonal classifications will be discussed in this section, beginning at lowest elevations below 750m (2460') and proceeding to heights above 2000m (6562').

I. Interior Valley Zone (elevation below 750m/ 2460')

This zone comprises the trough of low-lying valleys between the Cascade Range to the east and the Coast Range to the west. Franklin and Dyrness (1973:80) have defined this area as a Pinus- Quercus-Pseudotsuga association which includes "grasslands, Quercus woodlands, coniferous forests, sclerophyllous shrub communities, and riparian species." As part of this same ecosystem, Detling (1968) has identified a chapparal formation focusing on the dense stands of sclerophyllous shrubs with specially-adapted leaves and extensive root systems. Typically, this formation is dominated in the Applegate area by Arctostaphylos viscida and A. canescens.

A. Grasslands

Original vegetative composition of valley grasslands is difficult to define due to heavy disturbance and significant alteration for many years. Native grasses have been superseded in importance by more agressive species introduced as forage for grazing animals. Several grasses which may have been characteristic of undisturbed savannas prior to Euro-American settlement are mentioned by Habeck (1961): Agrostis hallii (Hall's bentgrass), Agropyron caninum (broadglumed wheatgrass), Elymus glaucus (western rye-grass), Festuca octoflora (slender fescue), F. californica (California fescue), F. rubra (red fescue), F. occidentalis (western fescue), F. subulata (nodding fescue), Poa scabrella (pine bluegrass), Sitanion jubatum (big squirreltail), and Stipa lemmonii (Lemmon's needlegrass).

Annual forbs populate inland grasslands today as they must have in the past alongside scattered populations of shrubs such as Rubus spp. (blackberry), Rhus diversiloba (poison oak), and Rosa spp. (rose).

B. Quercus Woodlands

Generally this area is dominated by Quercus garryana (Oregon white oak), and Q. kelloggii (California black oak), both deciduous oaks of major import to ethnographically documented native peoples, and Arbutus menziesii (madrone). The least moist microenvironments here are usually populated by Q. kelloggii (California black oak). Associated understory species are Ceanothus cuneatus (buckbrush), C. integerrimus (deerbrush), Arctostaphylos canescens (manzanita), A. viscida (manzanita), A. patula (green-leaf manzanita). Peck (1925) has listed over 50 species of herbaceous plants typical of the Rogue River basin that annually contribute to the rapidly changing aspect of low-elevation valleys from March through July. It is within this plant community that 35JA42 is located.

C. Coniferous Forests

Franklin and Dyrness (1973:85) have suggested that of western Oregon's interior valleys, the Rogue Valley has one of the most diverse coniferous forests. Pseudotsuga menziesii (Douglas-fir) is extremely important, but other species such as Pinus ponderosa (ponderosa pine), Pinus lambertiana (sugar pine), and Libocedrus decurrens (Incense-cedar) co-occur. These species populate large areas of the foothills adjacent to the valley flatlands or intermix with Quercus (oak), and Arbutus (madrone) stands.

D. Sclerophyllous Shrub Communities/Chapparal

Sclerophyllus shrubs are those that Detling (1968) has suggested dominate xeric habitats at lower elevations. These plants typically have leathery leaves which are often grayish-green in color, are generally evergreen, and have non-showy flowers. Chief constituents of southwest Oregon chapparal as noted by Detling (1968) are: Ceanothus cuneatus (buckbrush), Arctostaphylos viscida (manzanita), and A. canescens. (manzanita), Other species important to this community are: Cercocarpus betuloides (mountain mahogany), Eriodictyon californicum (yerba santa), Garrya fremontii (silktassell), Rhamnus californica var. occidentalis (cascara), Rhus trilobata (squawbush), Amelanchier pallida (serviceberry), and Chrysothamnus nauseosus var. albicaulis (rabbitbrush).

E. Riparian Species

Franklin and Dyrness (1973) have stated that very little research has been done on riparian communities of Oregon's interior valleys. Speaking generally, it can be said that riparian habitats of the Rogue River watershed are considered those inhabited by hardwood stands and are "poorly drained sites subject to annual flooding" (Franklin and Dyrness 1973:89). Typically, a riparian community may be populated by Fraxinus latifolia (ash), Populus trichocarpa (cottonwood), Acer macrophyllum (bigleaf maple), and Alnus rhombifolia (alder) with an understory of Salix spp. (willow).

II. Mixed Evergreen Zone (elevation 750m - 1400m/2460'-4502')

Whittaker (1960) has indicated that in this zone diverse populations co-exist, but with variations in species dominance and occurrence according to soil and parent rock type. However, physiognomy can be said to consist of an upper stratum of conifers and a lower stratum of sclerophyllous hardwoods. Franklin and Dyrness (1973) have proposed that a typical site within average moisture conditions would be dominated in the upper canopy by Pseudotsuga menziesii (Douglas-fir), with Pinus lambertiana (sugar pine) usually co-occurring. The lower canopy of sclerophyllous trees would be dominated by Lithocarpus densiflorus (tan oak) with Quercus chrysolepsis (canyon oak), Arbutus menziesii (madrone), and Castanopsis chrysophylla (chinquapin), in association. Quercus chrysolepsis (canyon oak), Berberis nervosa (Oregon grape), Rubus ursinus (blackberry), Rosa gymnocarpa (rose), and Rhus diversiloba (poison oak), are typical species of the shrub layer. Species composing the herbaceous stratum, which is typically less well-developed than the shrub layer, would be: Whipplea modesta (whipplevine), Achlys triphylla (vanilla leaf),Trientalis latifolia (star flower), Goodyera oblongifolia (rattlesnake-plantain), Pteridium aquilinum (bracken fern), Apocynum pumilum (dogbane), Disporum hookeri (fairy bell), Lonicera hispidula (honeysuckle), Festuca occidentalis (western fescue), and Melica harfordii (oniongrass).

III. - IV. Abies concolor and Abies magnifica var. shastensis Zones (above1400m./4592')

The Abies concolor (white fir) Zone is seen by Franklin and Dyrness (1973) as being the upper limit of the Mixed Conifer Zone, a vegetative community that is more characteristic of the western slopes of the Cascade Range and the eastern Siskiyou Mountains than of the research area. This zone is of limited distribution in the western Siskiyous. It is within and above this stratum that significant snowfall accumulates; the Interior Valley and Mixed Evergreen Zones may be subject to only infrequent amassment of snow. Dominant tree species here is Abies concolor (white fir), occurring in nearly pure stands (Franklin and Dyrness 1973). In association are Pseudotsuga menziesii (Douglas fir), Pinus lambertiana (sugar pine), P. ponderosa (ponderosa pine), and P. monticola (white pine). Moist habitats are usually conducive to Libocedrus decurrens (incense-cedar). In the Siskiyou Mountains understory species vary with Holodiscus discolor (oceanspray), Rosa gymnocarpa (rose), Berberis nervosa (Oregon grape), Corylus cornuta var. californica (hazelnut), Acer glabrum var. douglasii (Douglas maple), Rubus ursinus (blackberry), R. nivalis (snow bramble), Amelanchier alnifolia (serviceberry), and Castanopsis chrysophylla (chinquapin) underlying the tree canopy. Among the herbaceous plants confirmed for the Abies conçolor Zone are: Campanula scouleri (harebell), Lathyrus polyphyllus (leafy peavine), Anemone deltoidea (windflower), Achyls triphylla (vanillaleaf), Trientalis latifolia (starflower), Tiarella unifoliata (foamflower), Galium triflorum (bedstraw), Adenocaulon bicolor (pathfinder), Vancouveria hexandra (inside-out flower), Clintonia uniflora (beadlily), Trillium ovatum (trillium).

The Abies magnifica shastensis Zone can be found in the Siskiyou Mountains between 1800-2200m elevation. Associated with the most important tree species, Abies magnifica shastensis (red fir), are Abies conçolor (white fir), Pinus monticola (white pine), Pinus contorta (lodgepole pine), and Tsuga mertensiana (mountain hemlock),. Less frequently occurring are Pseudotsuga menziesii (Douglas fir), Pinus ponderosa (ponderosa pine), Libocedrus decurrens (incense-cedar), Picea engelmannii (Engelmann spruce), Abies amabilis (silver fir), and Abies lasiocarpa (subalpine fir). Important understory herbs and shrubs documented for the Rogue-Umpqua River divide (Franklin and Dyrness 1973) are: Ribes binominatum (currant), R. viscosissimum (sticky currant), Rubus ursinus (blackberry), Asarum caudatum (wild ginger), Adenocaulon bicolor (pathfinder), Achlys triphylla (vanilla leaf), Rubus parviflorus (thimbleberry), Vicia americana (vetch), Smilacina stellata (false Solomon's-seal), Osmorhiza chilensis (mountain sweet-cicely), Circaea alpina (circaea), Vancouveria hexandra (inside-out flower), Galium triflorum (bedstraw), and Trientalis latifolia (starflower). Franklin and Dyrness (1973) have included Vaccinium membranaceum (big huckleberry), Ribes marshallii (currant), Arctostaphylous patula (manzanita), A. nevadensis (manzanita), and Castanopsis chrysophylla (chinquapin) as especially characteristic of the Siskiyou Mountains at this elevation.

Within these two zones are sparsely occurring wet and dry meadow habitats (Franklin and Dyrness 1973). Species such as Lupinus latifolius (bigleaf lupine), Carex pennsylvanica (sedge), Sitanion hystrix (squirreltail), Stipa occidentalis (western needlegrass), Bromus carinatus (brome), and Haplopappus bloomeri (rabbitbrush goldenweed) often populate these openings.

It is clear from the list of important species and the diversity of habitats within the region of southwest Oregon as delineated above that vegetative patterns are complex and heterogeneous. It can be inferred from the sheer abundance of extant plant resources within this geographic area that protohistoric aboriginal populations must have had a vast store of utilizable plants from which to choose (Nicholls et al. 1983).

Summary

In order to put into perspective systemic similarities among the Takelma and Applegate peoples and their Athapascan kin to the south, north, and west, one must understand the similarities between environments within which these people lived. Franklin and Dyrness (1973) have described the flora of southwest Oregon as a combination of elements of the Californian, north coast, and inland Oregon floras. Chapparal species which dominate the Applegate area, also occur in California's Central Valley, the Klamath Mountains, and the Rogue area. Acceptance of cultural affinities among aboriginal people of present-day southwest Oregon and northern California (Aikens 1984, Drucker 1940, Gould 1975, Gray 1985, Kroeber 1920) is facilitated by noting consimilarities among vegetative types.

CHAPTER II

ETHNOGRAPHIC BACKGROUND

Compared to other aboriginal groups in the Pacific Northwest, some of which have been documented to the point of redundancy, there is little known about the native populations of southwestern Oregon. Violent conflict with Euro-American settlers, disease, and early removal to reservations effectively eliminated viable Indian lifeways by the 1850's. Several ethnographers focusing primarily on linguistic systems managed to record enough pertinent information to provide a glimpse of the cultural variability of protohistoric/historic inhabitants of the Rogue River area. It is thought that regional native peoples belonged to two basic linguistic groups: the Takelman and a somewhat smaller population of Athapascan speakers. Hokan-speaking Shasta people occupied an area to the south of the Athapascans.

The earliest ethnographers were Edward Sapir who, in 1907, studied the Takelma language, and Pliny Earl Goddard, a linguist and ethnologist who collected primary linguistic information on the Galice Creek Athapascans around 1904 (Gray 1985). Working later in the 1930's with Indian informants from the Siletz Reservation, John Peabody Harrington recorded considerable linguistic, ethnographic, and ethnobotanical data. Melville Jacobs, a student of Franz Boas, concentrated during 1938-1939 on documenting the language, myths, and tales of Galice Athapascans while Phillip Drucker included in a larger study published in 1936 an ethnographic survey of the Upland Takelma and Galice Creek cultures.

Data collected by these workers, although limited and influenced by personal biases, as well as the memory of informants, do provide a framework to which can be added information from archaeological investigations and ecological studies. Assuming that plant-use practices of eighteenth and nineteenth century native people had some similarity to those of a more distant past, ethnographic information can aid in the interpretation of archaeobotanical data (Lentz 1984).

Exact tribal boundaries of Takelma and Athapascan peoples have been a matter of debate since the earliest ethnographic studies. Drucker (1936:283) has stated, "The Takelma occupied the upper and middle Rogue River drainage basin including most of the

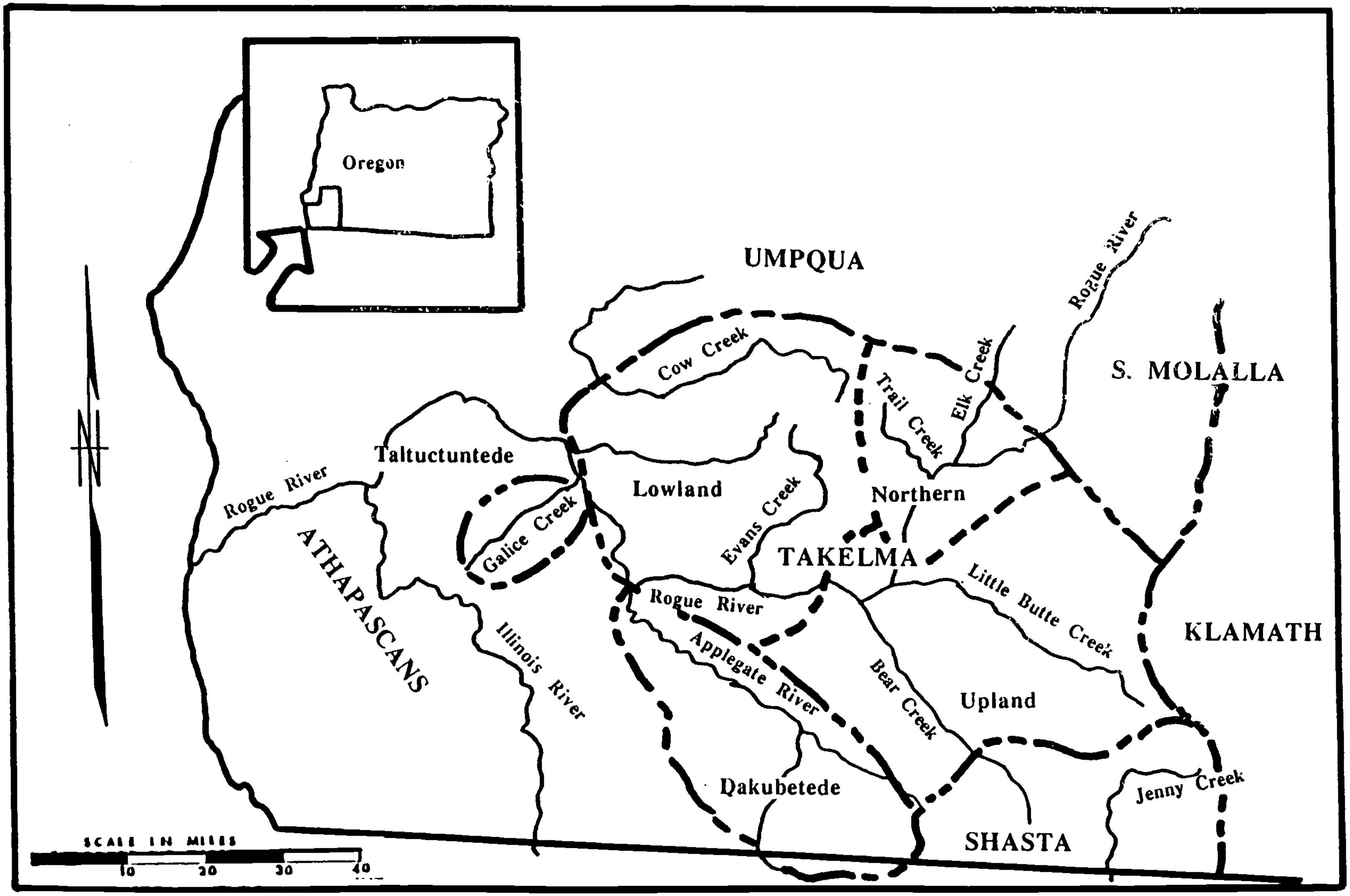


FIGURE 3: DISTRIBUTION OF NATIVE AMERICAN GROUPS IN SOUTHWESTERN OREGON DURING CONTACT PERIOD (FROM GRAY 1985.)

Applegate River drainage." Berreman (1937:27) is more specific in his description of tribal boundaries:

> The Upland Takelma lived on both sides of Bear Creek and on the Rogue River in the Jacksonville and Table Rock region. Below them on the middle Rogue River were the Lowland Takelma. They claimed the Upper courses of Cow Creek, a southern tributary of the Umpqua, the middle Rogue River and, south to include a little territory in California on the headwaters of the Illinois River and Applegate Creek.

Gray (1985) has suggested a central zone of occupation by Takelma speakers north of the Rogue River between the Applegate and Illinois Valleys. Athapascan-speakers of Galice Creek and the Applegate River would have occupied territories centered in their respective drainages with peripheral exploitation zones overlapping that of the Takelma (see map). Of the two Athapascan-speaking groups in the Rogue River region, the Galice Creek band was the most thoroughly investigated. There appears to be consensus among ethnographers that the nuclear territory of these people included the area encompassing the Galice Creek drainage to the point where it joins the Rogue River.

Territory of the Applegate River band is more vague, however, Gray (1985:46) has suggested that their territory probably comprised "almost the complete course of the Applegate River from near its headwaters in the Siskiyou Divide to its confluence with the Rogue River." It is clear that the area occupied by these two southwest Oregon native groups is included within the same ecological province. Commonalities were not confined to ecosystemic aspects, but as Drucker (1936:284) has stated the Athapascan speakers were so strongly influenced by the language and culture of the neighboring Takelma people "that they were often referred to as Takelma."

Since environmental, geographic, and linguistic relationships between the Galice Creek and Applegate River people as well as ethnographic documentation appear to coincide, it is assumed that cultural systems of the two groups would have been very similar. Material aspects and adaptive patterns of the Takelman-speakers must have closely resembled those of their Athapascan neighbors. Therefore, the following section is based on a body of knowledge that includes little specific information relative to the Applegate Athapascans, but is primarily from accounts of Takelma and Galice Creek ethnography. In addition, the following is only a partial account of regional ethnography in that the main focus is on Takelma/Athapascan exploitative- maintenance and settlement systems. Other cultural aspects such as sociopolitical or ideological elements are covered in detail outside this paper (see Berreman 1937, Brauner 1978, 1983, Dixon 1907, Dorsey 1890, Drucker 1940, 1963, Goddard n.d., Gray 1985, Harrington 1981, Jacobs n.d., Sapir 1907a

1907b, 1909).

Generally it has been assumed that Takelma/Athapascan peoples of southwest Oregon were central-based wandering bands subsisting on seasonally-available plant and animal resources (Brauner and Honey 1977). Apparently subsistence pursuits required dividing efforts primarily between uplands and the rivers. No specific mention is made of interior valleys which had the potential for providing significant varieties and amounts of food resources, but it is assumed that riverine-centered activities would have co-occurred with exploitation of valley zones. Winter villages, generally located on alluvial terraces adjacent to the Rogue River or a major tributary, consisted of semi-subterranean plank houses with gabled roofs usually constructed of Pinus lambertiana (sugar pine). Holt (1946:308) has said:

> There were a few villages up from the river, on the high hills, among the oaks. These were situated near large springs. The houses were similar to those of the river people but built of heavier timbers and more deeply buried.

Winter subsistence items included staples such as acorns or camas which would have been procured earlier and processed for storage, and animal resources such as dried or fresh anadromous fish, deer, elk or bear, and various small mammals. Harrington (1981 frame 141) has noted that there "used to be lots of steelhead at Applegate."

According to ethnographic reports, the return of warmer weather in the spring apparently saw the Athapascan people moving into less substantial upland camp sites where runs of migrating fish provided an abundant protein source. Summer camps where shelters were constructed of brush traditionally were located in the uplands where plant foods were harvested and hunting would have taken place. (Although, contrary to ethnographies, the phenology of known ethnobotanical species suggests that native people would occupy valley locations in the spring and early summer in order to exploit available food plants.) At approximately this time or earlier, large congregations of Athapascans could be found at the mouth of the Applegate River dipnetting salmon (Jacobs n.d.). During the early autumn the Applegate people "stayed in a summer camp at the foot of the mountain to snare deer" (Jacobs n.d.). Harrington (1981) has suggested that this particular mountain was called *Naattlntcha* which Lalande (1984) has identified as Red Buttes and other peaks along the crest of the Siskiyous or the area around Squaw Lake. Large group deer hunts occurred in the late fall (Nicholls et al. 1983). Acorns ripening in early fall drew the people into the hills where they would leave "old people in the village, put up their bark houses, and set about gathering the year's supply of acorns" (Holt 1946:312).

In summary, location of economic pursuits was dictated by seasonal availability of terrestrial and riverine resources. Precise descriptions of subsistence activities and locations are wanting. However, several dietary resources are mentioned in the ethnographic literature as having been utilized by Takelman or Athapascan peoples; usually their particular habitat or phenology must be based on present patterns. An account of Takelma/ Athapascan ethnobotanical practices follows.

Ethnobotany is considered here as encompassing the whole range of man-plant relations. Jones (1941) has stated that ethnobotanists should be concerned not only with native use of specific plants for food, clothing, shelter, implements, utensils, and medicines, but with the ecological aspects of man-plant interactions (See also Griffin 1978, Butzer 1982). Plants are classified below according to their use.

Clothing and Personal Decoration

Sapir (1907a) has noted that round twined basketry hats made from white grass were worn by Takelma women during warm seasons. He had mentioned that these hats were obtained from the Shasta (Sapir 1907a) while Drucker (1940) has proposed the Karok as a source. During winter months knee-length deerskin shirts were worn by the women; those of wealthier individuals were fringed with tassels of white grass. Grass was also used during cold seasons to line and insulate moccasins. Body adornment included red and black facial paints commonly used by both men and women (Sapir 1907a). Harrington (1981) has mentioned that black paint was made by burning pitch on a flat rock then mixing the residue with grease. Tatooing for men, women, and girls was accomplished with a bone needle and charcoal.

Basketry and Domestic Implements

Many of the implements and utensils employed by the Takelma were twined basketry items ranging from large hazel or willow open-work burden baskets to large storage baskets; small basket plates; round, open bucket-like baskets; cup-sized baskets used for drinking; large baskets made of rushes; and basket cradles (Sapir 1907a). The art of basketry manufacture was indispensible to the lifestyle of southwest Oregon aborigines since pottery, although known in the area during the late protohistoric (Brauner and Lebow 1983, Mack 1979), was apparently used to a lesser extent (Sapir 1907a). Wooden box containers and vessels, so well-known in the Pacific and Canadian Northwest are mentioned nowhere in southwest Oregon ethnographic literature. Basketmaking techniques have been described by Sapir (1907a:26):

> The ordinary twined basket was built up on a bottom of four short hazel twigs perpendicular to four cross-pieces and the twining was done with some root or grass on a warp generally of hazel or willow.

Generally, sugar pine roots were used for twining until after relocation of native survivors to the Siletz Reservation when it became commonplace to use spruce roots (Harrington 1981). Basketry dyes for woof elements were made from black clay which yielded a black stain on plant materials left in it and alder bark which produced a red dye. White design elements were obtained by using an unspecified straw-like grass.

Other maintenance tools mentioned by Sapir (1907a) were spoons constructed of wood and a wooden stirring paddle used to prevent scorching of food during the stone-boiling process. A stick about a foot in length tipped with bone was used as a twirler in a fire-drill kit. The bottom board or hearth was usually about two feet long with a hole drilled in it which was filled with finely shredded cedar bark tinder. Sewing tools included needles made of hardwood sharpened to a point with twisted sinew thread passed through the eye. Various other domestic items included combs made from a split stick with porcupine quills for teeth (Harrington 1981), and pipes for smoking tobacco made of straight wood approximately a foot long.

Plant-food Gathering and Preparation

There are some instances in the ethnobotanical literature where identification or uses of Takelma/Athapascan subsistence-related plants appears inaccurate. This could be attributed to the age of the informants and their lack of personal knowledge of old lifeways. The bulk of ethnobotanical information comes from Sapir who gathered his data approximately 50 years after relocation of native peoples to the Siletz Reservation, and Harrington who interviewed Takelma informants almost 80 years after the old ways had ceased to be viable. Confusion or misinformation relative to Indian uses of plants could also be due in part to lack of communication or understanding between the ethnographer and his informant. In addition, debatable issues may be attributed to the gender of the informant. For instance, Hoxie Simmons, a male, was a primary informant for Harrington, Jacobs, and possibly Drucker (Gray 1985), concerning the Galice Creek and Applegate Athapascans. As knowledge and use of plant materials fell generally within a woman's sphere of experience, it may have been impossible for Simmons to relate an accurate picture of plant-related subsistence activities. Another factor may have been the ethnographer's prime area of interest; the majority of the ethnographers were linguists intent on gathering language-related information, but perhaps not so motivated to collect reliable ethnobotanical data.

Information concerning vegetable resources of Galice/Applegate Athapascans is relatively scarce. However, it appears that camas bulbs and acorns were considered staple foods with a type of wild radish (the greens of which were eaten in the spring, Jacobs n.d.), tarweed seeds, sunflower stalks and a carrot-like plant (Harrington 1981) also important in the Athapascan diet (Gray 1985). Drucker (1940) mentioned pine nuts and grass seeds as dietary items as well. Subsistence information relative to Takelma peoples is more abundant with later studies by Card (1966) and Dickson (1946) augmenting early ethnographic material. Botanical resources traditionally utilized by the Takelma include acorns, chinquapin, hazelnuts, blackcaps, blackberries, salmonberries, red huckleberries, manzanita, kinnickinnick, Brodiaea, squawgrass, Pacific yew, and willow (Hopkins et al. 1976).

Referring to Takelma subsistence activities, Sapir (1907a) considered acorns to be the staple plant food. Farrington and Urry (1985) have defined a staple food as one which provides the carbohydrate bulk for a population for a large portion of the year. Acorns are only slightly lower in carbohydrates and proteins than barley and wheat, but higher in fat and fiber (Bean and Saubel 1972, Derby 1979). In addition, they contain large amounts of magnesium, calcium, and phosphorus (Crowhurst 1972). Koenig (1979) has determined that each Q. kelloggii (California black oak) acorn contains 4.75 Kcal while acorns from Q. chrysolepis (canyon oak) contain 5.08 Kcal. Acorns have the potential, therefore, of occupying the role of a "staple" dietary item.

Several species of oaks are indigenous to the region, however, the "black acorn" (Sapir 1907a:257) was the preferred species. According to Sapir (1907a:257), "the first acorns appeared in the early spring, at which time they were gathered and prepared by the women." This statement probably is inaccurate, at least based on today's schedule of acorn ripening. Agriculture Handbook No. 450 (1974:695) states:

> The staminate flowers are borne in catkins, and the pistillate flowers solitary, or in 2-to many-flowered spikes in the same tree, in the spring (February to May) before or with the leaves. The fruit, an acorn or nut, matures in one year (white oaks) or two years (black and red oaks). Fruit ripening and seed dispersal occur in the autumn, from late August to early December.

It is highly unlikely that Quercus phenology has changed drastically in 150 years. Most probably Sapir's account of spring acorn-gathering activities is merely misinformation which has implications for the reliability of the remainder of his botanical data.

Gathered acorns were prepared for consumption by the Takelma by pounding them on a flat rock in order to shell them. The nutmeats were then mashed with either a stone tool approximately two to three feet in length or with a shorter stone implement about a foot and a half long. Acorns were confined to the work area by a hopper basket, a funnel-shaped basket wider at the top and open at the base. The pounded meal was then placed in a shallow circular basketpan where it was sifted. This shallow basket would then be placed on carefully washed sand where boiling water was poured several times over the meal to leach out bitter tannins. The acorn dough could then be boiled in a bucket-basket constructed of hazel shoots and split roots the usual Pacific Coast method of applying hot stones into the basket being employed. The final result was a sort of mush that here, as farther south in California, formed the most typical article of food" (Sapir 1907a:258).

The second most important regional dietary item was camas (Camassia spp.) bulbs which were retrieved from valley grasslands with digging sticks by the women. Sapir (1907a:258) has described digging sticks as being "sharp-pointed, peeled-off stick of a hardwood bush and neatly fitting at the upper end into a deer's horn to serve as a handle." Camas bulbs, like acorns, were available in abundant quantities, relatively simple to collect and could be processed then stored for consumption over an extended period making them an extremely valuable resource. Preparation of camas bulbs required baking in earth pits which Sapir (1907a) has stated were filled with alder bushes on which were placed a layer of stones. The stones were heated by firing the alder brush. Bulbs were layered on top of alder foliage which had been placed on hot stones presumably to prevent scorching of the foodstuffs. Dirt was thrown over the top of the earth oven where the bulbs would bake a day or two. The soft and fibrous cooked bulbs, were often mashed into a dough, shaped into large cakes, and stored for winter use.

Sapir (1907a) has described manzanita (Arctostaphylos) berries as being a favorite food of the Takelma. They were pounded into flour, mixed with sugar pine nuts and stored for future use. An alternate way of utilizing manzanita berries was to mix the pounded berries with dried salmon and animal fat then stored for winter use.

Other plant foods utilized by Takelma people included seeds of an unspecified species of sunflower. After the plants had gone to seed they were beaten with a stick releasing the seeds into a funnel- shaped deerskin pouch, wider at the mouth than at the base. When the sunflower was young and more tender the stalk was also eaten.

Similarly, tarweed seeds (Madia spp.) were gathered, but only after the plants had been "burnt down to remove the pitchy substance they contained" (Sapir 1907a:259). After being collected the seeds were apparently parched and ground into flour. Water was not used in grinding either tarweed or other sunflower seeds. Sapir (1907a) has listed madrona and pine nuts as exploited vegetable resources.

Apparently, the only plant cultivated by regional aborigines prior to Euro-American intrusion was tobacco (Nicotiana sp.). It was planted by native men on land that had been cleared by burning (Card 1967).

The vascular cambium of sugar or white pine was utilized as a source of food (Harrington 1981). The outer bark was stripped off revealing the inner cambium which was cut off and chewed. It has been suggested (Harrington 1981) that spring was the season when this particular resource was harvested as the cambium tissue would be enriched with accumulating sugars. Aboriginal men would utilize this foodstuff while on hunting trips. Newberry (1887:46), while traveling through Oregon and California in 1859, observed that "the trees of Pinus ponderosa may be seen stripped of their bark for a space of three or four feet near the base of the trunk." Whether the cambium layer was survival food or harvested habitually regardless of availability of other plant foods is unclear (Swetnam 1984).

Harrington (1981) and Drucker (1940) have provided specific information relative to the use of pine nuts saying that sugar pine nuts were harvested near present day Grants Pass by employing a pole ladder with tied cross rungs and a long pole with a hook. Sugar pine nuts were roasted in earthen pits (Harrington 1981), mixed with the flour of pounded manzanita berries and, when mixed with water were used as a winter food source (Sapir 1907a).

Red and white wild plums were gathered as well as wild parsnips which were collected in a swampy area between Jacksonville and Forest Creek (Harrington 1981). Dogwood berries may have been collected in the fall.

Plants/Plant Products Associated with Other Subsistence Resources

Salmon, an important source of protein for early southwest Oregon people, was roasted on spits of split hazel branches stuck into the ground (Sapir 1907a). Baskets were used to store the roasted salmon for winter consumption. Fish other than salmon were often caught using a hook and line, the line manufactured of hand-rolled grass fibers. This same grass was used to construct semicircular traps into which deer were driven by aboriginal men accompanied by dogs (Harrington 1981). Black and white caterpillars that populated ash trees (Fraxinus sp.) were harvested and eaten.

Transportation and Trade

Sapir (1907a) has noted that the method of river travel differed between the Upland and Lowland Takelma. Upland people used log rafts lashed together with hazel withes, while the lowlanders relied on wooden canoes.

Trade-related plant items mentioned in ethnographic literature were twined basket hats mentioned above and a variety of baskets made by the Karok who lived near Happy Camp, California (Drucker 1940).

Games and Music

Sapir (1907a) has described a game where Indian women of the region used two four-inch pieces of wood tied together with about six inches of buckskin as a substitute for a ball. This object would be tossed about with a long pole and thrown through a goal designated by two branches stuck in the ground.

The only musical instrument mentioned ethnographically was a flute made from the stem of a wild parsnip (Sapir 1907a).

Habitations

The typical Takelma winter house was constructed from split sugar pine boards (Sapir 1907a). At the corners of the house were four upright posts to which, on top, were four connecting crossbeams lashed on with hazel fiber. Apparently, "the poorer people had to content themselves with a house constructed of pine bark instead of lumber" (Sapir 1907a:263). Beds consisted of cattail rush mats (Sapir 1907a). Spring and summer dwellings were simple brush shelters with a central hearth.

Recent archaeological research augments available ethnographic information. Brauner (1983) found charred wood and bark fragments on the floors of three house pits at 35JA42. The wood fragments from House l, identified by Shelly Smith, were predominantly Douglas fir (Pseudotsuga menziesii) with incense cedar (Calocedrus decurrens) and ponderosa pine (Pinus ponderosa) also present. Leonhardy (1967) has determined that pine bark was used as house covering in the region. However, whether the wood and bark fragments found in House 1 relate to domicile construction materials is not known. In House 2 at 35JA42, the majority of identified wood or bark fragments were Douglas fir with ponderosa pine and incense cedar occurring less frequently. It was in House 3 at the same site that Brauner (1983) uncovered irrefutable evidence of dwelling construction materials. The lower 10-20cm of the wall planks had been charred in a fire that destroyed most of the rest of the structure. The majority of the planks were Douglas fir with the bark remaining on one side; the bark side faced the exterior. Two small vertical posts were identified as Douglas fir. Ponderosa pine bark fragments were also associated with the house although it has not been assumed that they were part of the superstructure.

CHAPTER III

RESEARCH AIMS AND METHODS

Botanical material considered in this research was originally recovered during 1982 field excavations at 35JA42 under the direction of David R. Brauner. Although three intact houses, one looted structure, and a possible menstrual hut were investigated by Brauner and his crew, only archaeobotanical material from the three house structures has been analyzed. In the center of each house was a hearth, each of those in Houses l and 2 being surrounded by a ring of large discoidal river cobbles and filled to a depth of 15 cm (House l) and 12cm (House 2) with ash and minute cultural debris. The hearth in House 3 was not bordered by cobbles but "was the same size as the previous houses and tightly contained, as if it had been confined by a stone ring or contained in a pit. The ash was situated on the same plane as the floor, not in a pit" (Brauner 1983:53). Upon discovery of the hearth pits, all of the hearth debris was recovered, bagged, and set aside for later analysis. As excavation of the three structures proceeded, crew members were instructed to collect bulk soil samples from house living surfaces. All excavated soil was water screened through a series of sieves of varying mesh sizes (1/4", 1/8", 1/16"); whenever botanical residues began occurring with increased frequency in the 1/16" screen, bulk samples would be obtained from that specific area (Brauner 1986). Bulk sample weights ranged from 4904.55 gms to 89.00 gms. In addition, visible concentrations of water-screened botanical material from the smallest screen size were air dried, bagged and set aside. In some cases, archaeobotanical residues were of sufficient size or density to be visible in situ during digging operations. For example, in House 3 several relatively large charred fragments of acorn shell were hand collected by Shelley Smith, field ethnobotanist. Also in House 3, a rodent seed-cache was uncovered and hand collected.

Back in the laboratory after the termination of field operations and prior to this research some bulk soil samples from house floors were sieved through a series of six nested screens with mesh sizes ranging between 6.3mm - .250mm. The different fraction sizes were then handsorted, botanical residue removed and identified. All other botanical evidence which had been hand collected in the field or reserved in the 1/16" mesh after waterscreening was also identified. However, by far the majority of bulk soil samples both from the hearths and house living surfaces were not processed until this research was undertaken.

Drawing upon data derived from lithic, structural, ethnographic, faunal, historical and macrobotanical material, Brauner has developed a series of hypotheses concerning the nature and use of 35JA42. Very briefly, the main points forwarded by Brauner (1983) are:

1. 35JA42 dates to protohistoric/early contact periods (ca. 1750-1830 AD)

2. The site was occupied by a single nuclear family or a small extended family.

3. The three intact house structures were occupied over several successive winter seasons rather than simultaneously.

4. Native peoples occupying the site maintained trading relationships either within an aboriginal trading system or directly with Euro-Americans, or both.

5. The site was occupied by the same family or families.

6. Occupants of the site were Applegate Athapascans and culturally similar to neighboring Takelma people.

The primary goal of this research was to determine if the macrobotanical remains from the three house structures at 35JA42 could be useful in testing Brauner's hypotheses as listed above. Specific test implications derived from the hypotheses are:

1. It was expected that macrobotanical remains in the hearth and comparative sediments would be composed primarily of indigenous taxa. A relatively small number of introduced taxa may also be present.

2. It was expected that testing a proposal of occupation by a single nuclear family or small extended family would be extremely difficult based on analysis of macrobotanical remains. Original distribution of plant remains across house floors may have indicated social organization, however, location of samples, non-random collecting methods, and formational processes probably have obscured original patterns.

3. It was expected that macrobotanical remains would be representative of plant resources that had been available either in the immediate environment during the fall and winter or of those procured elsewhere at a different time or location and processed for storage.

4. Plant assemblages across structures should display relative homogeneity, assuming similar taphonomic histories. Apparent congruity in utilized plant resources

could indicate a consistency in preference maximally reflective of adaptational similarity rather than familial similarity. Relative heterogeneity of plant assemblages could indicate site occupation by adaptationally dissimilar people, differing taphonomic histories, environmental perturbation, sampling biases, occupation during differing seasons, etc.

5. Evidence of a trade network might appear in any or all of the plant assemblages with identification of taxa unavailable within the culture area of the occupants, taking into account biogeographic variation. Traded botanical items would logically have to be from low-perishability or processable, transportable taxa.

6. Plant resources utilized by occupants of the site, as represented in archaeobotanical assemblages, should reflect what is known ethnographically of aboriginal ethnobotanical practices. Disparities between assemblages and ethnographic data could be explained by a number of factors including ethnographic inaccuracies, sampling problems, various perturbations, differential preservation, etc.

The final objective of this research concerns interpretation of the ethnobotanical practices of the native inhabitants of 35JA42 based upon the macrobotanical remains recovered from the site. It has been assumed that these relics would not represent the full range of floral resources exploited by the aboriginal people.

Charred whole or relatively complete fragments of seeds were the single class of botanical elements considered here. All other megascopic plant material such as wood fragments or charcoal were curated for analysis at another time. Minnis (1981) has stated that there are two primary sources of seeds in an archaeological context: modern and prehistoric processes. Modern seeds exist in archaeological soils due to regional seed rain, site-specific seed rain, rodent burrowing, or contamination during excavation and sampling procedures. Prehistoric seeds are introduced into a site by prehistoric seed rain during or following occupation or as a result, either directly or indirectly, of aboriginal use of plants. A basic assumption here is that "man selects from the biota plants that reflect and support his needs in any given cultural context and at any level of technological achievement" (Bates 1985:241).

Following Minnis (1981), it was assumed that charred seeds found in hearths and on house floors at 35JA42 were evidence of prehistoric utilization of plants while uncharred were considered the result of modern processes. Keepax (1977) has stated that only under special circumstances, such that might occur in specially arid or water-saturated deposits, will fresh, uncharred seeds be preserved and generally it is appropriate to reject "uncharred

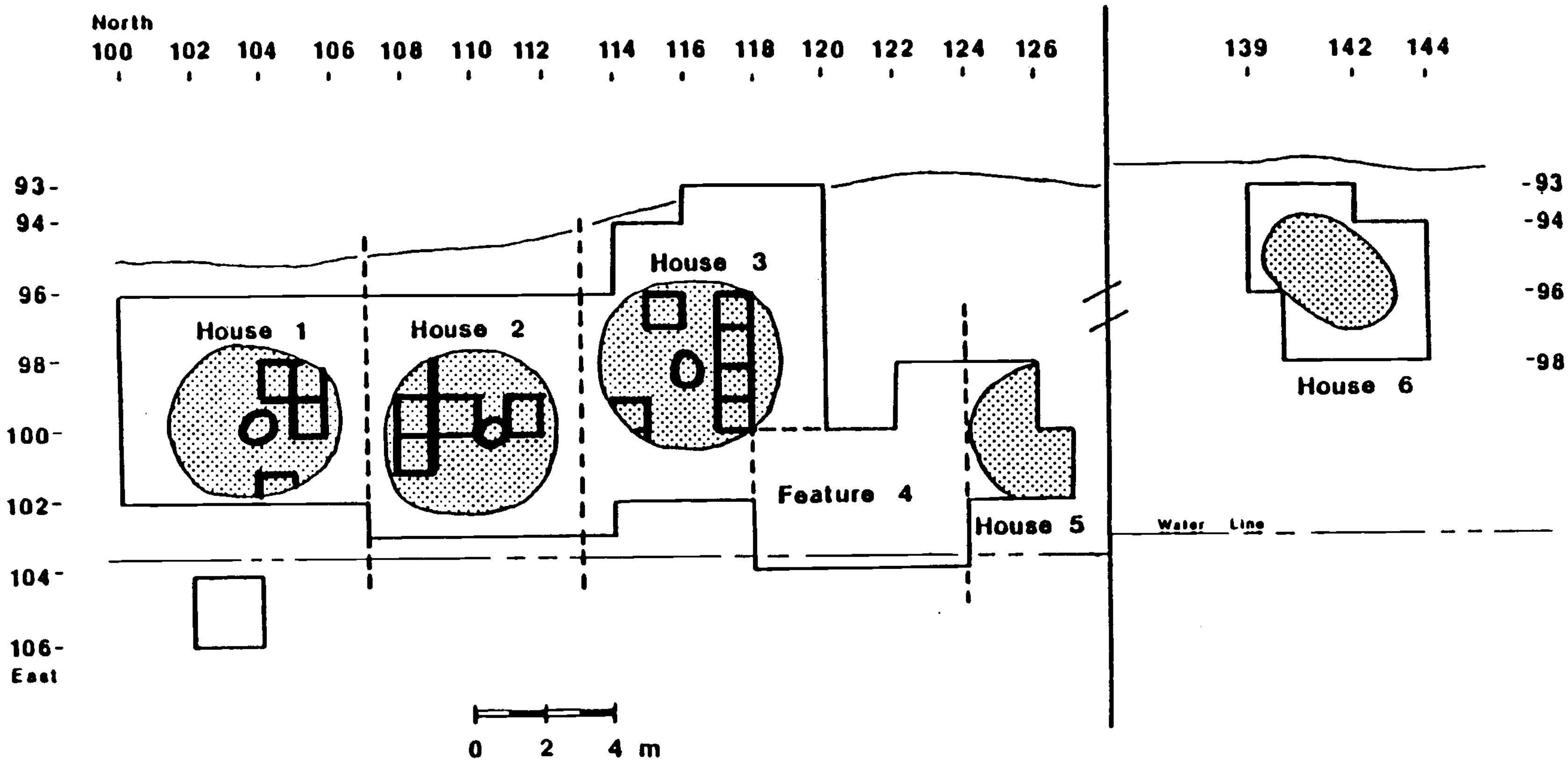


FIGURE 4: RELATIONSHIP OF SELECTED MACROBOTANICAL SAMPLING UNITS FROM FLOORS AND HEARTHS AT SITE 35JA42.

seeds as modern in origin and to retain only the charred material as genuine" (Keepax 1977:226). Special conditions necessary for long-term preservation of non-carbonized seeds do not appear to have existed at 35JA42, an open, relatively shallow and unprotected site. Neither was there evidence, with one exception, of processes such as recurrent forest fires that may have carbonized seeds deposited by non-cultural processes. However, a modern trash burning pit was discovered located 10-15cm above the floor of House 2 in the center of the house depression. The pit, filled with 5-10cm of ash and burned wood (Brauner 1983), contained cultural material from the base of the burn pit to the floor. It is entirely possible that charred modern seeds from waste debris burned in this pit could have contaminated the archaeobotanical record and are being interpreted here as aboriginal in origin.

Consistent with original research goals of comparing the results of seed extraction methods, two 10% samples by weight were obtained from each bulk sample of hearth debris: one to be processed by flotation and one to be handsorted. Each bag was thoroughly mixed by hand then 10% random samples were removed, bagged and labelled. Although hearth material was the main focus, soil from house floors was utilized for comparative purposes. Comparative samples were subjectively selected based upon assumed stratigraphic integrity, preservational qualities, and decreased probablilities of contamination. It was desirable to collate floor and pedestal material that was contemporaneous with hearth deposits therefore, all comparative samples were from Level 2, 15-20cm below surface. Below this level in the houses, sterile soil had been encountered. The above criteria and provenience of original samples restricted choices of bulk samples from house floors. Limitations of data obtained from samples are discussed below.

The weight of each 10% soil sample was recorded. Hearth samples to be handsorted were then processed through graduated USA Standard Testing Sieves with mesh sizes ranging from 6.3mm -.250mm, each fraction being bagged separately in envelopes and labelled. The largest-sized fraction (6.3mm) was visually inspected for botanical elements using a magnifying glass. The remaining fractions were examined with the aid of a 10x hand lens. Originally, all charred seeds from 100% of the sample matrices were set aside in separate containers. Fraction sizes of .250mm and below were initially inspected, but handprocessing of these sediments was very time consuming as soil particles are extremely fine and charred plant remains infrequent. Subsequently, a nested sampling strategy was designed to accelerate this phase of operations: 100% of 6.3mm fraction of each 10% sample was examined, 75% of the 3.35mm fraction, 50% of the 2.00mm fraction, 25% of the 1.18mm fraction, while sediments of .250mm size and below were removed from consideration altogether. One of the difficulties encountered with hand sorted material was the character of the hearth soil. Generally, sediments coated all particles, organic and non-organic alike, with a fine "ashy" film making components indistinguishable and possibly biasing the results.

Subsequent to hand-processing, flotation samples of 10% of the hearth debris and 10% of the comparative floor material were obtained. Each 10% sample was floated in water made denser with the addition of a commercial dispersing agent which also served to remove some of the ashy film coating the botanical elements. The light fraction was poured off into a .250mm mesh sieve then gently washed onto paper towelling. Remaining heavy sediments were agitated and floated once more. Both light and heavy fractions were air-dried, bagged separately and labelled. The light fractions were sifted through the same standard graduated sieves employed in handsorting. An identical nested sampling strategy was applied to flotation samples; e.g., visually inspecting 100% of the 6.3mm fraction, 75% of the 3.35mm fraction, etc. Recovered charred whole or nearly whole fragments of seeds were removed, bagged, labelled, and set aside for identification and quantification. Relative seed densities for each taxon were obtained by dividing absolute numbers of seeds for each sample by sample matrix weights. During the course of processing soil samples, it become extremely clear that handsorting was far too time consuming and tedious. Therefore, the original goal of comparing extraction methods and results was abandoned.

Following extraction by handsorting and flotation, charred seeds were tentatively identified by the researcher by comparison to the Oregon State University Herbarium seed collection. Corroboration was generously provided by Ruth Post of the Oregon State University Seed Laboratory.

Sampling Issues

It became clear during the process of writing this paper that by far the most significant determinants of the reliability of data were sampling strategies during field operations and in the laboratory. A discussion follows which explores the limitations of these strategies, then more optimum strategies are offered for application in future investigations.

Both in the field and in the lab, limits of the sampling universe (total material available for sampling), choices of sampling locations, and matrix processing methods have been instrumental in determining the archaeobotanical assemblage from 35JA42. In the field, sampling methods and locations were based on a research design which for Brauner was primarily concerned with mitigating, through data recovery, the destructive effects on the site by potential vandalism, and the determination of eligibility for nomination to the National Register of Historic Places, relatively generalized research goals. Generalized sampling strategies will result in generalized samples which may remove some analytical options later in the laboratory.

One of the basic issues here is the representativeness of the archaeobotanical assemblage. As stated above, in the field bulk soil samples were obtained from a specific floor location whenever botanical material began appearing in the screen in sufficient concentrations or when morphologically "seed-like" in appearance and visible to the eye. In other words, the archaeobotanical assemblage probably represents discoverable material rather than the total range of culturally deposited material. For example, it is highly probable that acorn shell or other seed fragments were passed over as woody debris. It is equally probable that infrequent or rare seeds, or those not "seed-like" were undetected in the screens. In the lab, representativeness of the seed assemblage has been affected by subjectively-chosen soil samples. Selected soil samples were perceived as having the least contamination by non-cultural soil and greatest integrity based on level rather than being randomly chosen, undoubtedly, influencing the resultant patterns of seed distribution, diversity, and density.

Suggested Sampling Strategies

The usefulness and research potential of derived data depend on sampling strategies which in turn, rest on pre-excavation research questions. In order not to eliminate research options, data should be as representative and non-biased as archaeologically possible. The following discussion presents an idealized sampling prescription oriented toward open, seasonal habitation sites similar to 35JA42. Many of these techniques were those employed by Brauner.

1) Pre-excavation Phase

   a) The extant botanical population, both on-site and off-site should be inventoried and comparative seed samples obtained.

   b) Regional ethnobotanical literature search.

   c) Volumetrically consistent samples of surface soil, both on-site and off-site should be obtained in a systematic fashion.

d) History of site location should be investigated including: geologic, climatic regimes; site disturbances, non-Indian impacts.

2) Excavation Phase

a) Hearth remains should be completely collected, and bagged separately, noting the volume, context, and condition of the deposits.

b) Systematic, volumetrically consistent, unprocessed (no screening, wet or dry) soil samples should be obtained from every unit, at every level, across house floors.

c) Unprocessed soil samples should be obtained from exterior areas adjacent to and between houses, either from randomly chosen sampling locations or along transects laid out along cardinal axes.

d) Unprocessed, random, volumetrically consistent off-site subsurface soil samples should be obtained for comparative purposes.

e) The location and context of stone tools assumed to be associated with plant processing should be noted and mapped. The tools should be handled as little as possible, bagged as soon as removed from context, and reserved for analysis of surface residues.

f) Contents of rodent caches and other features, such as storage pits, should be completely collected, location noted.

g) All detectable large botanical material from house floors should be hand collected with context and provenience noted.

3) Laboratory Phase

1) Consistent (by weight or volume) random samples of hearth material should be obtained after thoroughly mixing hearth contents.

2) Consistent (by weight or volume)samples from each sampling unit across floors, outside houses, and off-site should be processed. Alternatively, samples can be obtained from randomly selected units across the site.

3) Processing should be consistent; flotation has been proven as most efficient.

Nested screens can be used to facilitate separation of seeds from other debris.

4) A nested sampling strategy of different-sized sample fractions reduces processing time.

CHAPTER IV

QUALITATIVE AND QUANTITATIVE ANALYSIS

Qualitative and Quantitative Data

At first glance, there appears to be a paucity of diversity of botanical data as represented in the archeological assemblage from 35JA42. However, due to the absence of botanical data from similar sites within the region (Prouty 1988, Steinfeld 1986), it is difficult to make valid comparative statements. Carbonized whole and nearly whole seeds were recovered from the three hearths and corresponding house floors; in all, seven genera are represented across the site with variable distribution and frequency among houses. Arctostaphylos (manzanita) seeds were ubiquitous, occurring in all three hearths and on all three floors. Other taxa recovered from soil samples were: Compositae, (sunflower family), Pinus, (pine), Quercus (oak), Chenopodiaceae (goose foot family), Vitis (grape), and Abies (fir). Final corroborative identification was made by Ruth Post of the Oregon State University Seed Laboratory. In most cases, identification was limited to tentative classification at generic or family levels due to the physical state of the seeds. Location and nature of the botanical evidence and ethnographic documentation are recorded below.

I. Fagaceae — Beech Family

Quercus L.— Oak

Many relatively large, charred fragments of acorn shells were hand-collected by Shelley Smith from the housepits as excavation was taking place in 1982 (see Figure 15). Smaller pieces were recovered from soil samples processed later in the laboratory. As there is consensus among ethnographers (Card 1967, Chestnut 1902, Moerman 1977, Sapir 1907a) that acorns were, by far, the most important plant food item in the regional aboriginal diet, it has been assumed that these carbonized samples directly represent aboriginal dietary resources. Acorns, which ripen in the fall, could have been easily collected and stored or processed for immediate use. Several species of Quercus are abundant on or near the site today: Q. kelloggii Newberry, Q. garryana Dougl., Q. chrysolepis Liebm. Protohistoric natives may have been drawn to this area in part due to the availability of acorns.

Acorn fragments were found in Hearths l and 3 as well as from the floors of Houses 1 and 3. Shell fragments in House 3 were large enough to be visible during digging operations, as mentioned above. Shell fragments in House 3 were spatially associated with a hopper mortar base while some of the fragments in House 1 may be associated with a grinding stone. If a "Pompeiian" point of view (Binford 1981) is adopted, then it can be inferred that these tools were utilized in processing acorns into a usable product.

Table 1. Acorn shell fragments from 35JA42

House	Location	# of fragments	Recovery Method
1	Hearth	1	handsort
		1	flotation
	Floor	4	flotation
3	Hearth	1	flotation

II. Ericaceae — Heath Family

<u>Arctostaphylos</u> Adans. — Manzanita

Carbonized manzanita seeds were ubiquitous at 35JA42, occurring in all three hearths and on all floors. Because of this universal occurence in all samples, <u>Arctostaphylos</u> data was used for comparative purposes throughout this research.

Table 2. Arctostaphylos seeds from 35JA42

House	Location	Number of Seeds	Recovery Method
1	Hearth	16	handsort
		57	float
		145	hand collected in the field
	Floor	158	float
2	Hearth	65	handsort
		81	float
	Floor	52	float
3	Hearth	7	handsort
		0	float
	Floor	782	float
		1476	hand collected in the field

Several species of manzanita currently occupy the site including A. patula Greene and A. viscida Parry. Hybridization between species commonly occurs (Johnston 1985), therefore, identification to the species level was not attempted.

Manzanita fruits were an important dietary item to local aborigines according to ethnobotanical literature (Card 1966, Dickson 1946, Sapir 1907a).

III. Chenopodiaceae — Goosefoot Family

Only one tentatively identified charred seed from the Chenopodiaceae family was recovered, through flotation, from 35JA42. It was located in the northwest quadrant of the floor of House 1, associated with one acorn shell fragment and several manzanita seeds. As with Vitis (grape) and Compositae (sunflower family) the potential for supporting or refuting Brauner's hypothesis of protohistoricity of the site was unfulfilled by lack of species identification. Had the seed been confirmed as an introduced species, a qualified case based on botanic evidence may have been forwarded concerning the age of the site, assuming that the seed was deposited by aboriginal people. Nicholls et al. (1983) do not mention Chenopodiaceae in their vegetational survey of the site area, however, several species within the family are known as typical of this habitat type (Hitchcock and Cronquist 1973). And, although Chenopodiaceae are not often mentioned as a food resource for early inhabitants of southwestern Oregon (Sanford 1983), this family contains well documented dietary items for other native groups, particularly in eastern North America (Asch and Asch 1977, Smith 1984, Smith and Cowan 1987), therefore, its edibility is assumed. Pettigrew (1988) found a high percentage of the total seed assemblage from Elk Creek sites were lamb's quarters, Chenopodium spp.

IV. Pinaceae — Pine Family

Pinus L. — Pine

Four species of pine presently occupy the site and its vicinity (Nicholls et al. 1983): Pinus sabiniana Dougl. (digger pine), P. attenuata Lemmon (knobcone pine), P. ponderosa Dougl. (ponderosa pine), and P. lambertiana Dougl. (sugar pine). Regional ethnobotanical resources refer primarily to P. ponderosa and P. lambertiana as important food items, although Brauner (1983) recovered ponderosa pine bark fragments associated with the superstructure of House 3 as well as three sugar pine nut beads in Houses 2 and 3. It has been assumed, on the basis of botanical and documentary evidence, that charred pine seeds recovered from 35JA42 could represent either subsistence resources or artifacts of some other cultural behavior.

Table 3. Pinus seeds from 35JA42

House	Location	Number of seeds	Recovery Method
1	Floor	1	Float
3	Floor	3	Float

V. Pinaceae — Pine Family

Abies Mill. — Fir

A single carbonized fir seed was recovered during flotation of floor samples from the northeast section of House 3. It was spatially associated with a dense concentration of manzanita nutlets as well as Pinus seeds and the rodent cache, mentioned above. Interestingly, there are no ethnobotanical references to Abies being used as food source, however, there is mention of it being exploited as a raw material and for medicinal purposes (Duncan 1961, Gunther 1945, Mead n.d., Mahar 1953, Moerman 1977). Fir branches were woven into baskets for carrying meat or into mats used in leaching acorn meal; the bark was employed as trays for food or as siding for shelters. Medicinal uses included applying pitch to wounds or drinking an infusion of needles to treat colds and tuberculosis. Brauner (1983) has mentioned that true fir has been identified as a structural material in House 3, but it is possible that the Abies and Pinus seeds found in House 3 were remnants of cultural behavior such as use of fir branches as sleeping mats or non-cultural factors such as rodent burrowing. Leaching of acorn meal probably would not have occurred within the house itself, but had Abies mats been employed during the leaching process a single fir seed could have been introduced into the living environment when the meal was cooked and/or consumed within the shelter.

VI. Vitaceae — Grape Family

Vitis L. Grape-vine

A single grape seed, tentatively identified, was recovered by flotation from soil samples taken from the northwest section of House 1 floor. Of the sampled units in House 1, the area where the Vitis seed was located also contained the densest concentrations of manzanita seeds and evidence of Pinus (pine), Quercus (oak), and Compositae (sunflower family). A stone pestle was found spatially associated with this same fruit. Perhaps this unit was located in a food preparation area as suggested by the abundance and diversity of evidence. Based on distributions of fire-cracked rock, bone fragments, pestles, and grinding stones, Brauner (1983) has postulated that the primary food-processing area in House 1 was in the northwest quadrant.

Southwest Oregon is suitable habitat today to several species of grapes, both cultivated and native: V. vinifera was cultivated in North America in 1648 (Rehder 1977); V.riparia was first cultivated in 1928; V. californica is a native berry typical of northern California and southwest Oregon. It is extremely difficult to distinguish grape species from

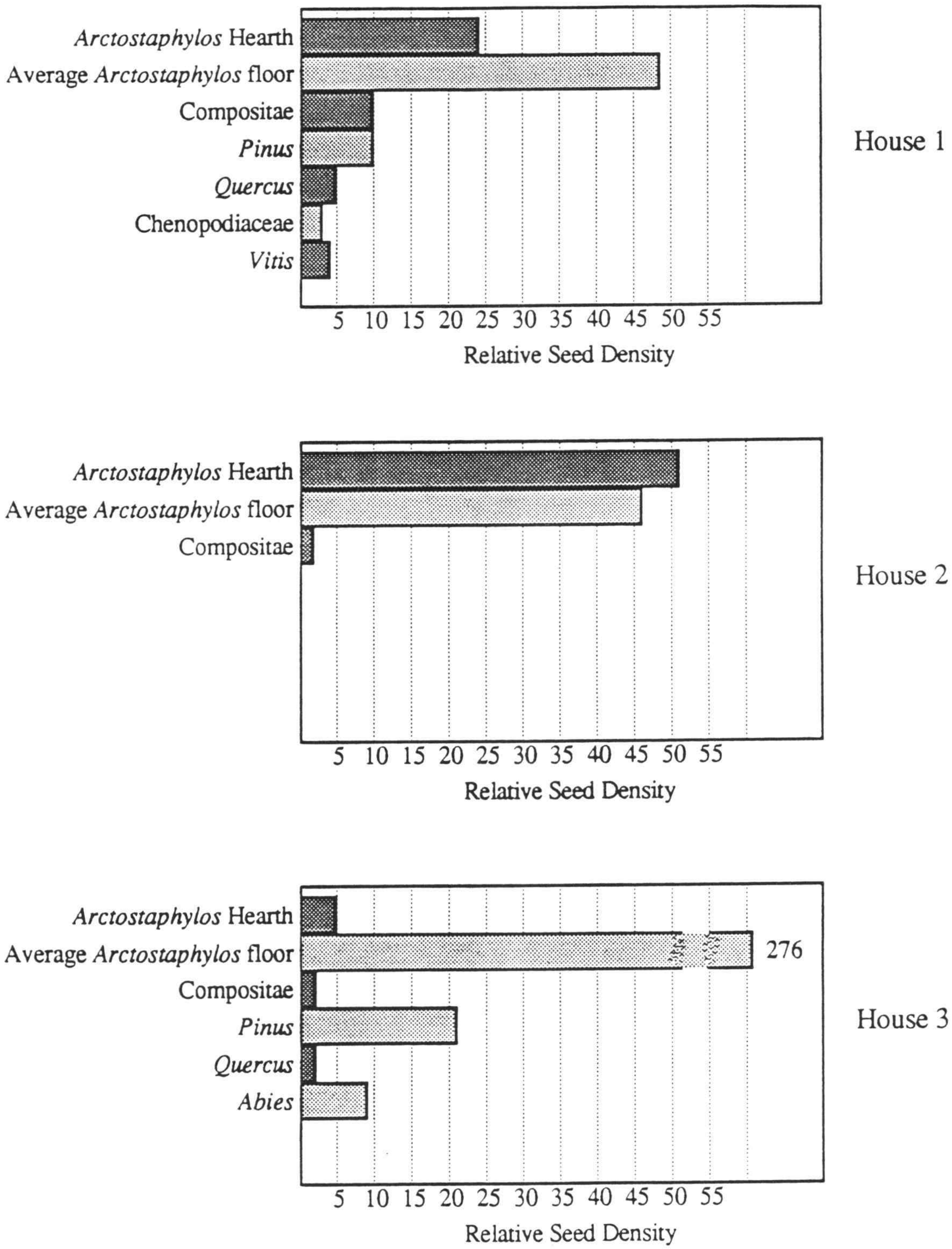


Figure 5. Relative Seed Density (per 1000 gm. of matrix) and Diversity from 35JA42.

the seed (Johnston 1990), therefore, inferences based on grape seeds concerning chronological placement of the site cannot be drawn. If the site is protohistoric (1750-1830) then the only possible species would be V. californica. Although V. vinifera was cultivated approximately 200 years prior to site occupation, it rarely escaped into southwest Oregon. Ethnobotanical literature mentions grapes as a food resource; the berries were used fresh or dried and in combination with manzanita berries. Vines were used as a raw material in making baskets; leaves were used to wrap other food items (Chestnut 1902, Dubois 1935, Duncan 1961, Heizer 1978, Merrill 1923, Yanovsky 1936). Whichever the species, as with the rest of the carbonized seeds, it is assumed that the occurence of a grape seed within the housepit was the result of aboriginal cultural processes.

VII. Compositae — Sunflower Family

Madia Mol. — Tarweed; Madia

Flotation samples from the hearth in House 3 revealed a single charred specimen of a compositae seed, possibly Madia species. Several hundreds of species of sunflower exist today in Oregon, including eight species of Madia.

One of the most frequently cited regional ethnobotanical practices is the burning of expanses of Oregon's interior valleys in order to, among other reasons, remove the pitchy substance from stalks and seed heads of tarweed, making harvest possible. Card (1967:15) has stated that the seeds were gathered, "further parched, then ground for usage." Sunflower seeds may have been collected from lower elevation interior valleys in late summer and transported to the higher elevation site within the Mixed-Evergreen Zone. It is equally possible that Compositae seeds were collected within the vicinity of the site. Any inference concerning aboriginal behavior based on the evidence of a single seed is extremely tenuous.

Distribution of Taxa and Relative Seed Densities

The range of relative seed densities across houses is illustrated in figure 5 below.

The distribution and diversity of seeds across houses and hearths, including the relative densities for Arctostaphylos only, are shown in the following figures. Distribution of stone tools which may have been used to process plant foods is also illustrated.

As stated above, manzanita nutlets occurred thoughout all samples and had, by far, the greatest relative density. Comparison of hearth-floor densities is shown below.

Table 4. Average Relative Seed Density-Manzanita

	Hearth 1	Hearth 2	Hearth 3
Hearth density	23.8	51.1	5.3
Floor density	48.25	45.88	276.32

Roughly, ratios of hearth to floor relative density are: House 1, = 1:2; House 2 = 1:1; House 3 = 1:55.

The greatest equity between hearth and floor occurs in House 2, while the most incongruity occurs in House 3. Houses 1 and 2 are similar to each other relative to overall seed density while House 3 stands out from them both.

Comparison of hearth-floor diversity also reveals a similar pattern of congruity between hearth and floor in House 2.

Table 5. Number of Taxa Represented in Samples

	House 1	House 2	House 3
Hearth Diversity	2	2	3
Floor Diversity	6	1	5

It can be seen that the highest hearth diversity occurs in House 3 with House 1 and House 2 being co-equal. Highest floor diversity is very close in Houses 1 and 3. Again, the greatest equity between floor and hearth occurs in House 2.

Discerning Patterns

It has been suggested (Cordell et al. 1987) that when dealing with archaeological remains from any site, archaeologists are concerned with discerning patterns in the record and then looking for explanations for those patterns. Several patterns emerge from comparing within-and between-house data for botanical diversity, relative seed density, and distribution of botanical material.

1) Botanical diversity: As seen in Figure 5, the greatest diversity occurs in House 1, followed by House 3 and House 2. Greatest equity in diversity between hearth and floor occurs in House 2 with greatest disparity occuring in House 1.

2) Relative seed density: By far the greatest relative density is found in the occurrence of manzanita nutlets. This is contrary to expectations of greatest relative density for acorn remains based on ethnographical documentation of primary reliance on acorns as a staple plant food. Comparison of relative densities across houses and hearths can be seen in Figure 5.

3) Distribution of botanical material: Botanical material was recovered from every soil sample processed. As manzanita occurred universally thoughout, it has been used for comparative purposes. As seen in Figure 6, the greatest concentration of manzanita for House 1 occurred in the northwest quadrant correlating in the same unit with the greatest botanical diversity. Greatest density of manzanita in House 2 occurred in the southeast quadrant, spatially opposite the greatest concentration of plant processing tools. The north half of House 3 is the location of the greatest concentrations of manzanita influenced somewhat by the mass of Arctostaphylos seeds in the rodent cache.

It can be seen in the discussion that follows that when data from the three house floors and hearths are compared on various attributtional levels, House 3 shows the greatest incongruity. Explanations for this disparity have been forwarded by Brauner (1983), Schmitt (1986), and Gray (1985). Archaeobotanical material suggests explanations essentially similar to this earlier work, but allows additional insights into aborginal behavior and post-abandonment events that may have influenced the record.

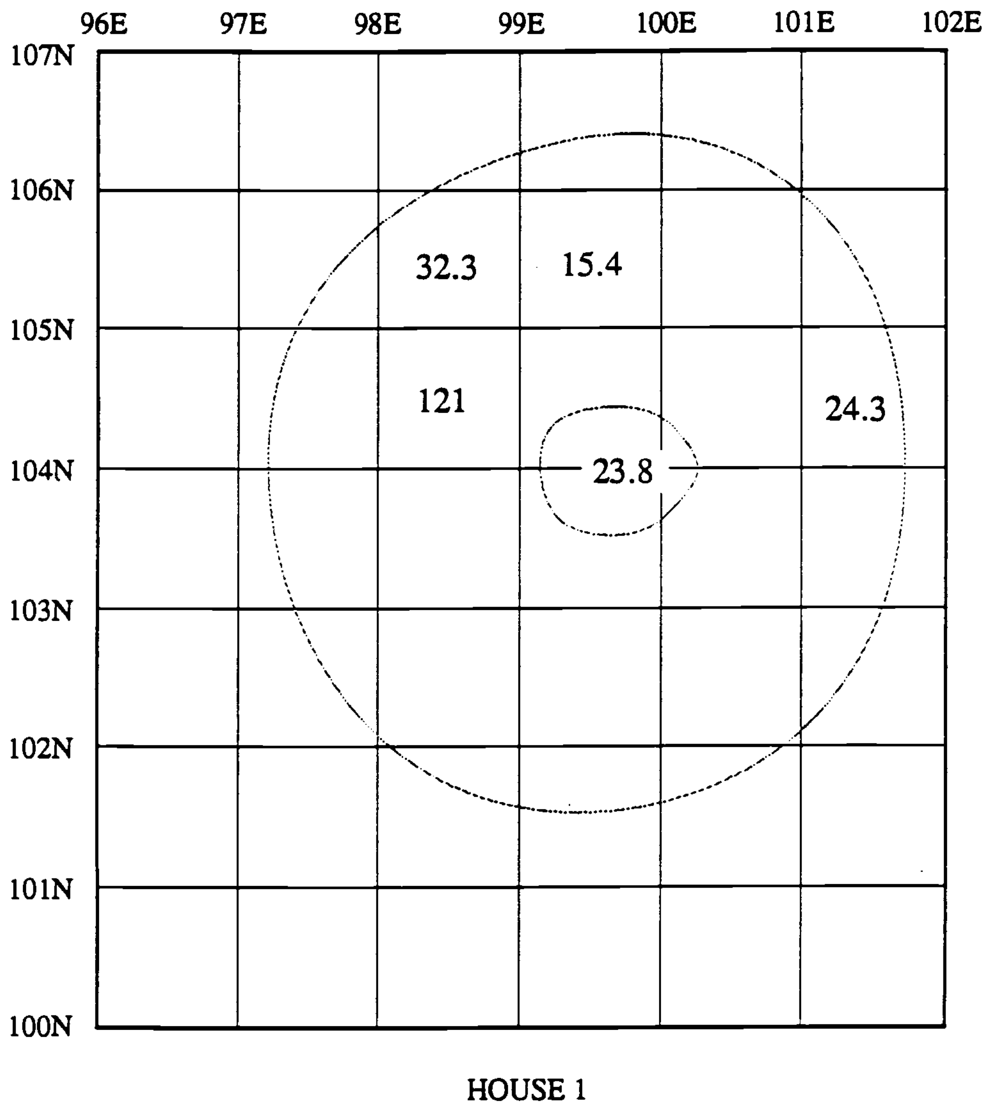


Figure 6. Relative seed density for *Arctostaphylos* (manzanita) in House 1. Relative densities determined by dividing absolute seed counts by matrix weight.

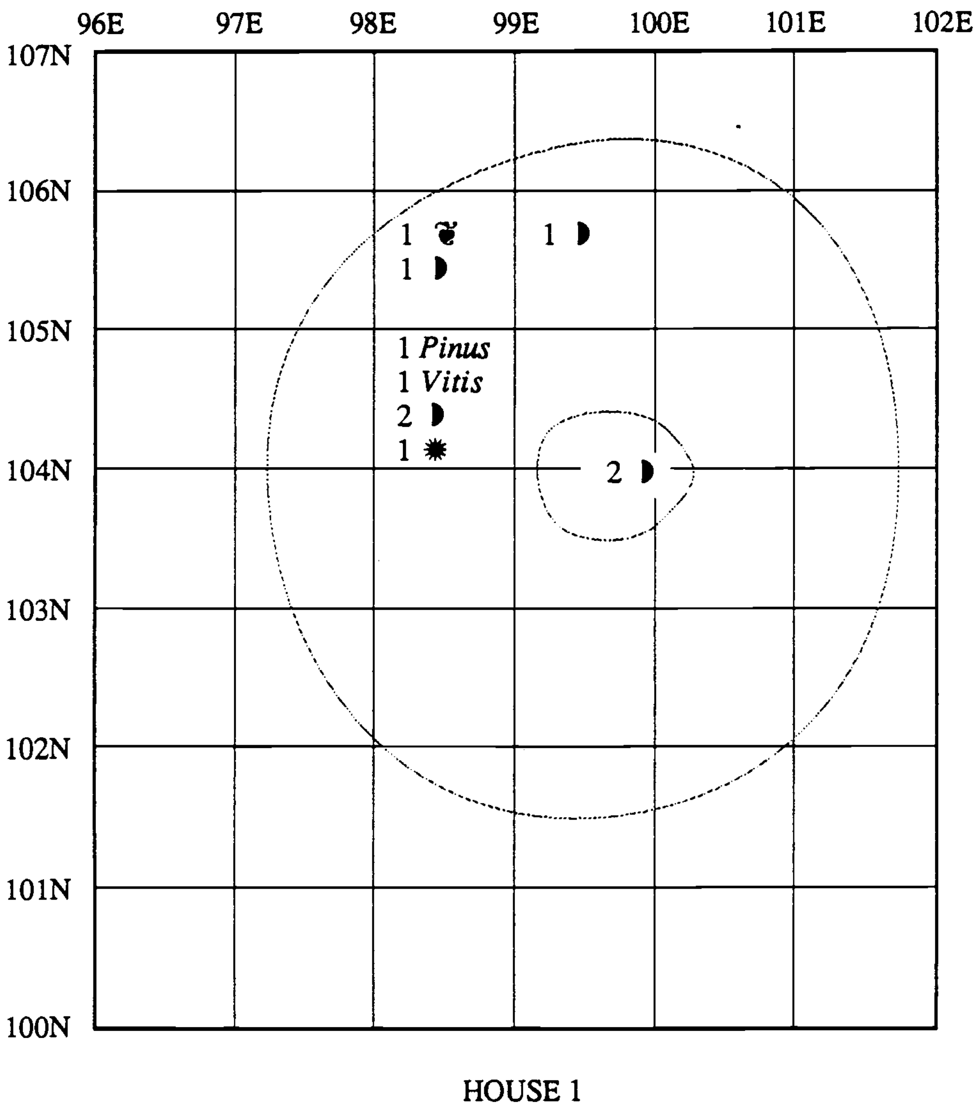


Figure 7. Distribution of taxa other than *Arctostaphylos*. Absolute counts, House 1.

◗ acorn fragment
Ꝧ Chenopodiaceae
✸ Compositae

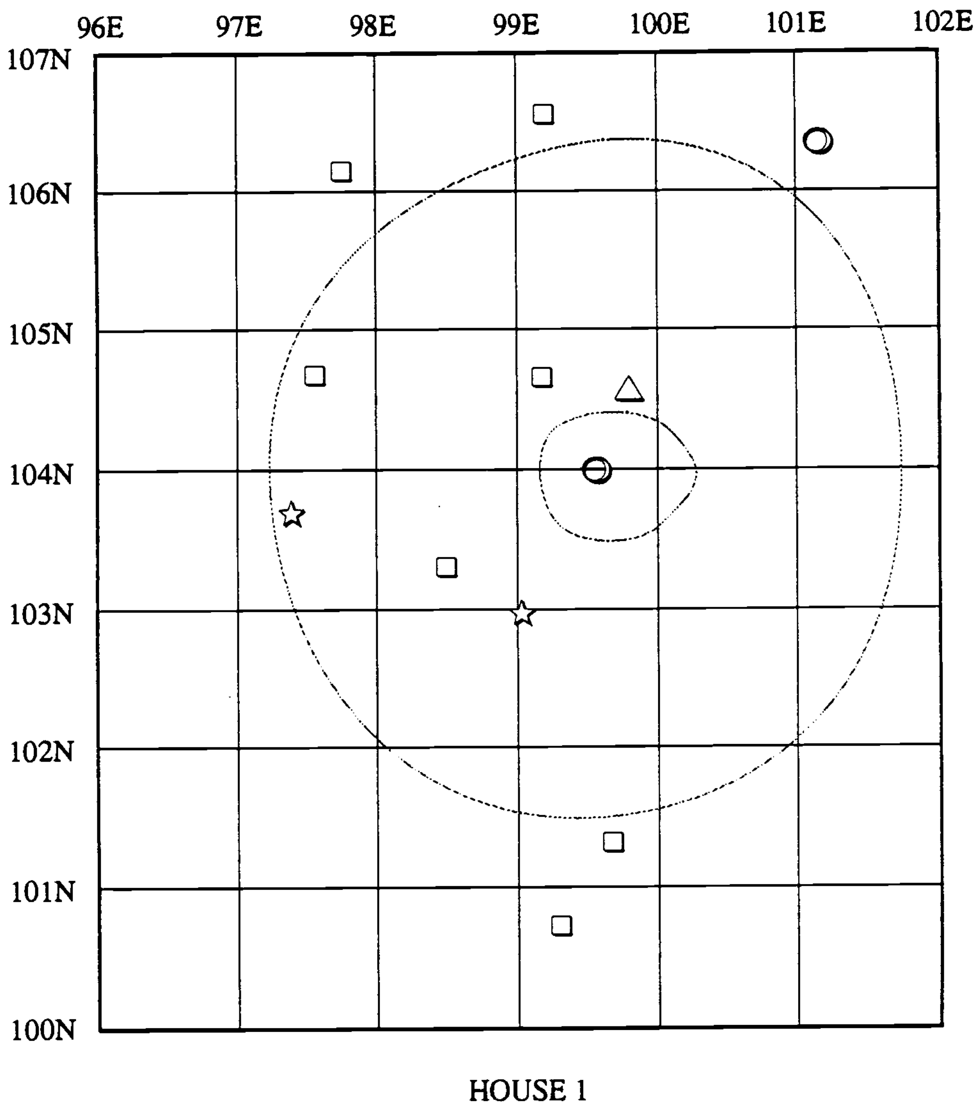
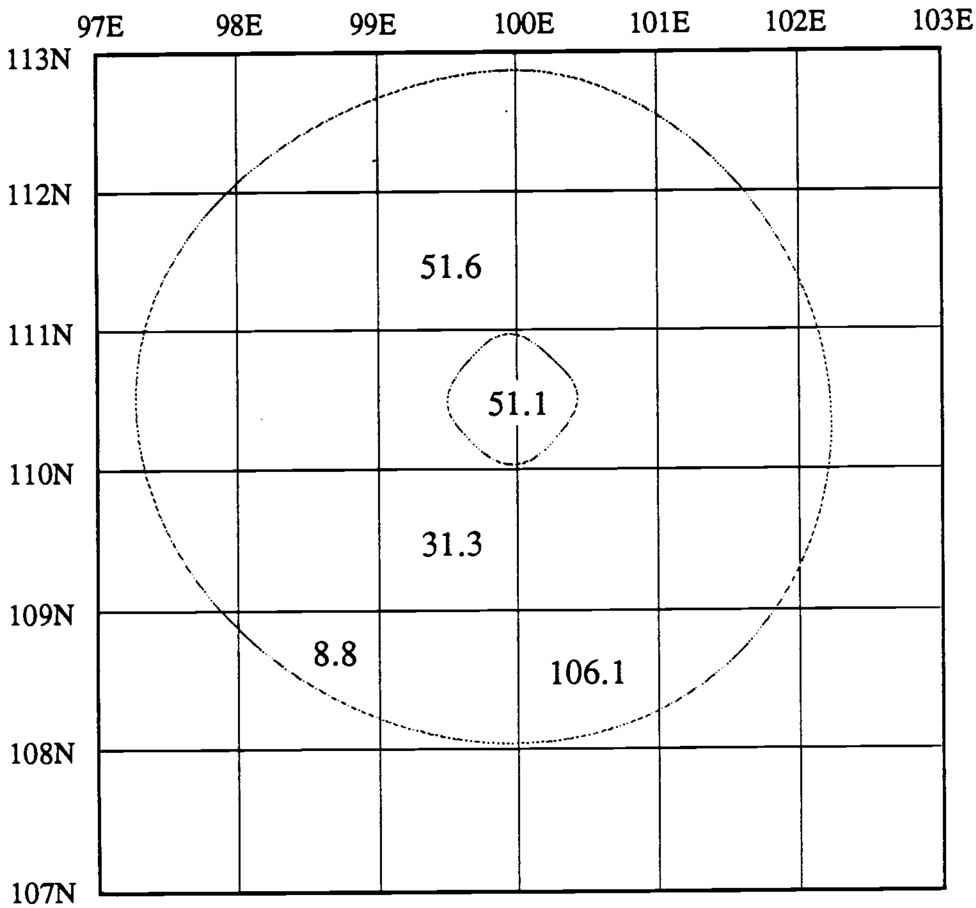


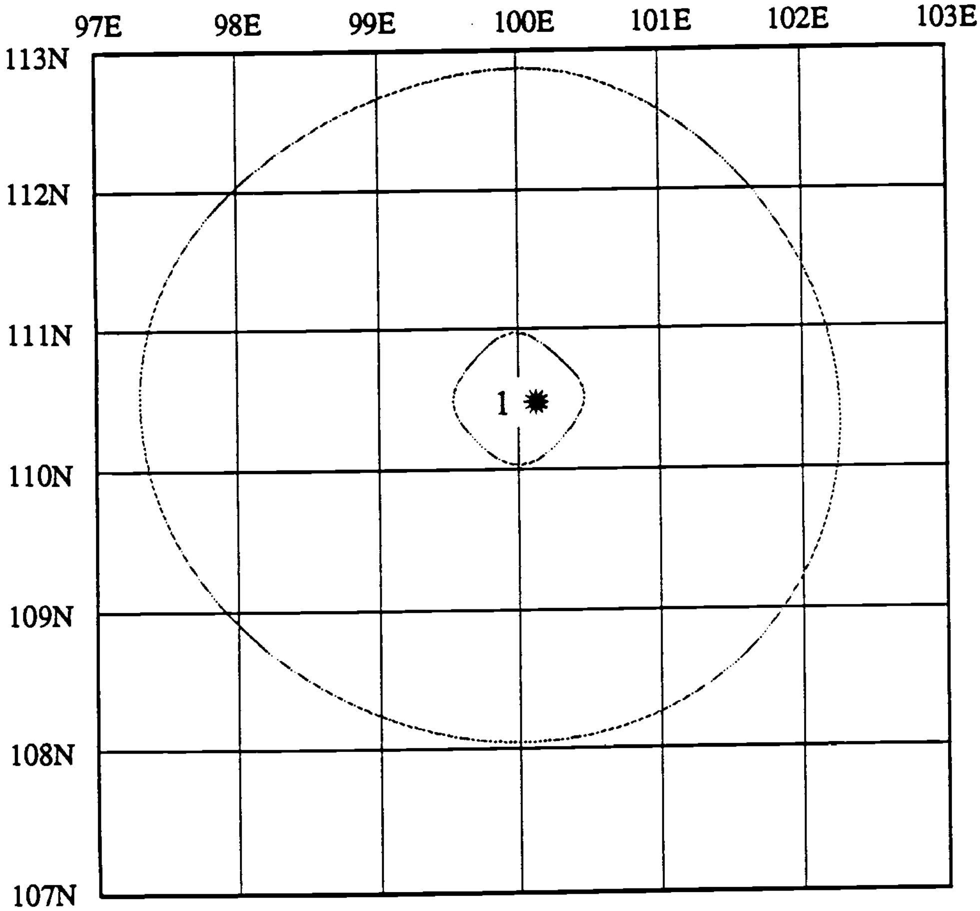
Figure 8. Distribution of plant processing tools, House 1.

□ Grinding Stone
△ Hoppermortar base
☆ Pestle
○ Edgeground cobble (mano?)



HOUSE 2

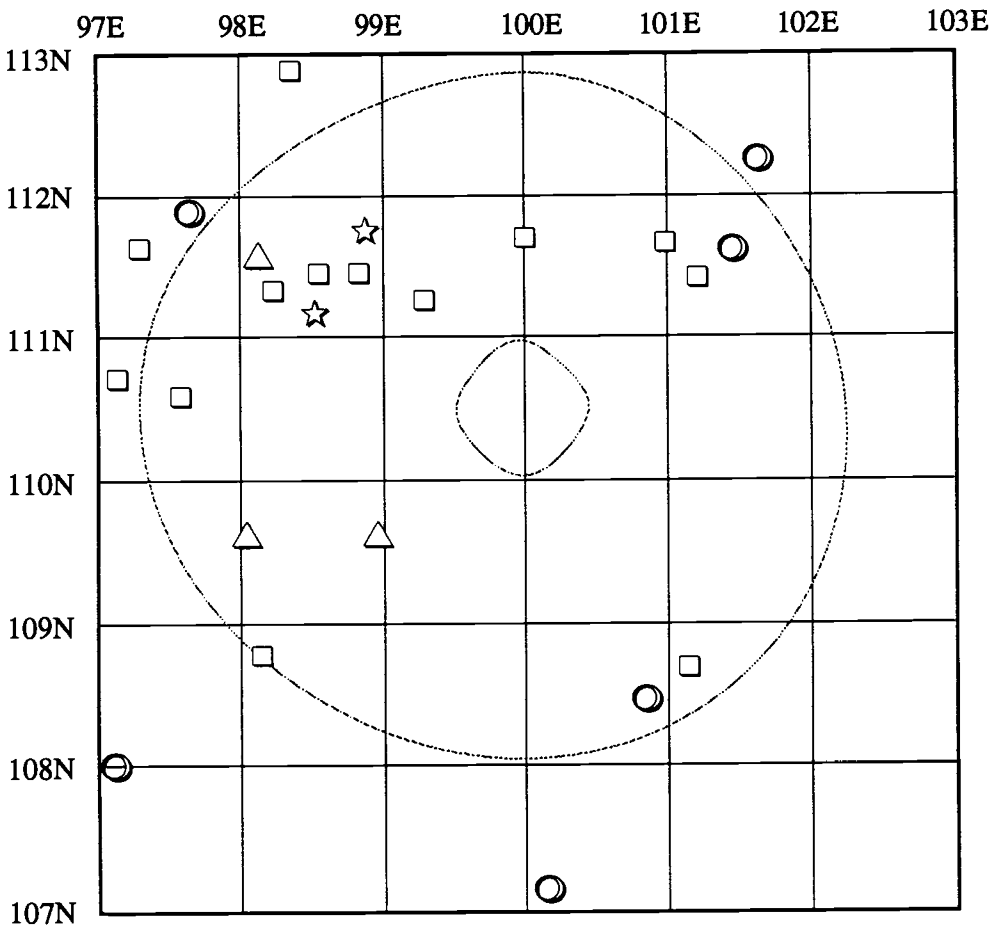
Figure 9. Relative seed density for *Arctostaphylos* (manzanita) in House 2. Relative densities determined by dividing absolute seed counts by matrix weight.



HOUSE 2

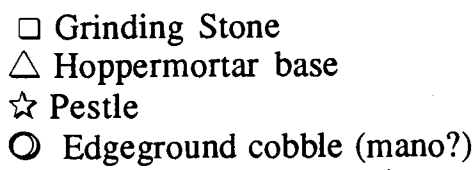
Figure 10. Distribution of taxa other than *Arctostaphylos*. Absolute count, House 2.

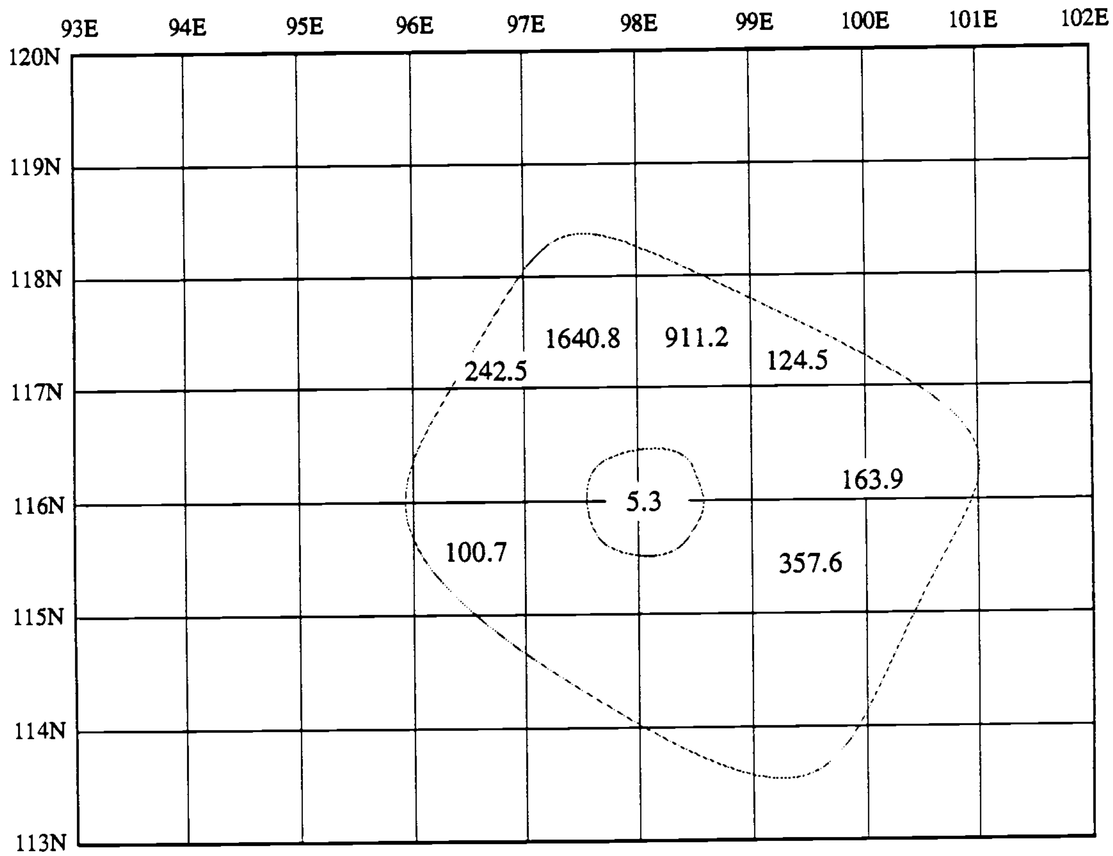
◗ acorn fragment
❦ Chenopodiaceae
✷ Compositae



HOUSE 2

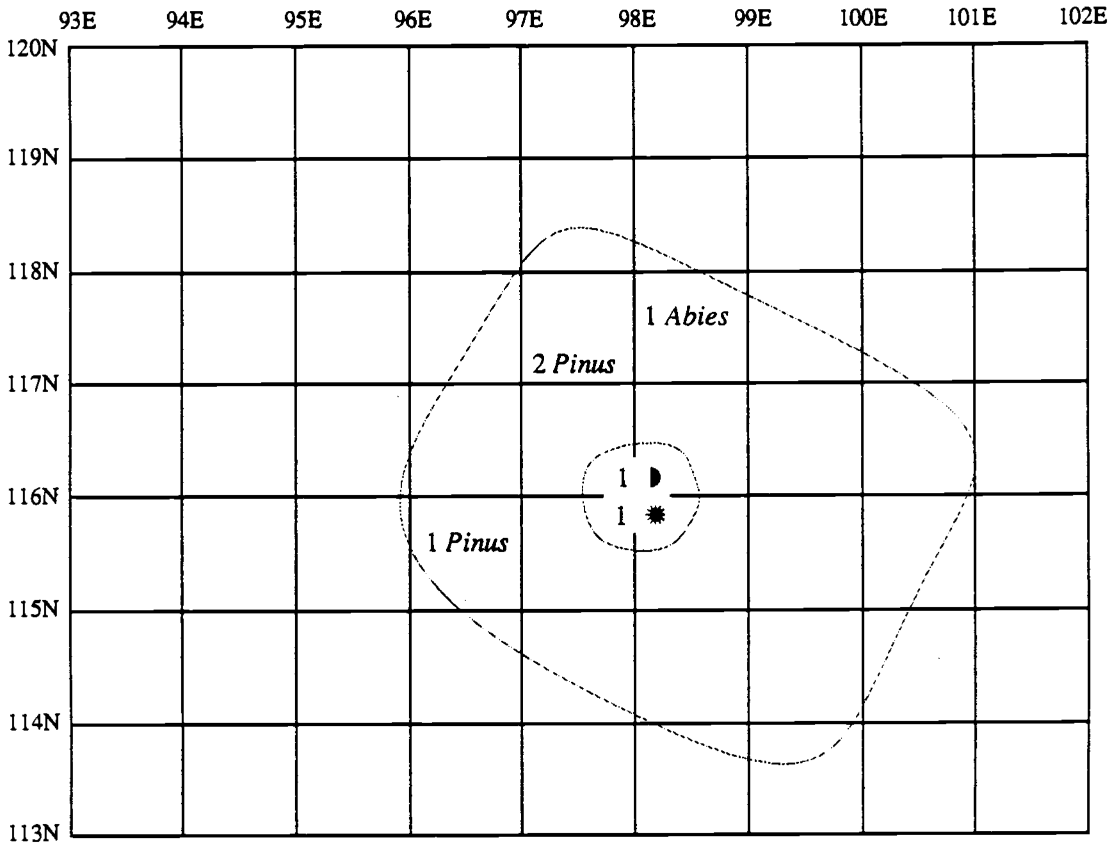
Figure 11. Distribution of plant processing tools, House 2.





HOUSE 3

Figure 12. Relative seed density for *Arctostaphylos* (manzanita) in House 3. Relative densities determined by dividing absolute seed counts by matrix weight.



HOUSE 3

Figure 13. Distribution of taxa other than *Arctostaphylos*. Absolute count, House 3.

◗ acorn fragment
❦ Chenopodiaceae
✹ Compositae

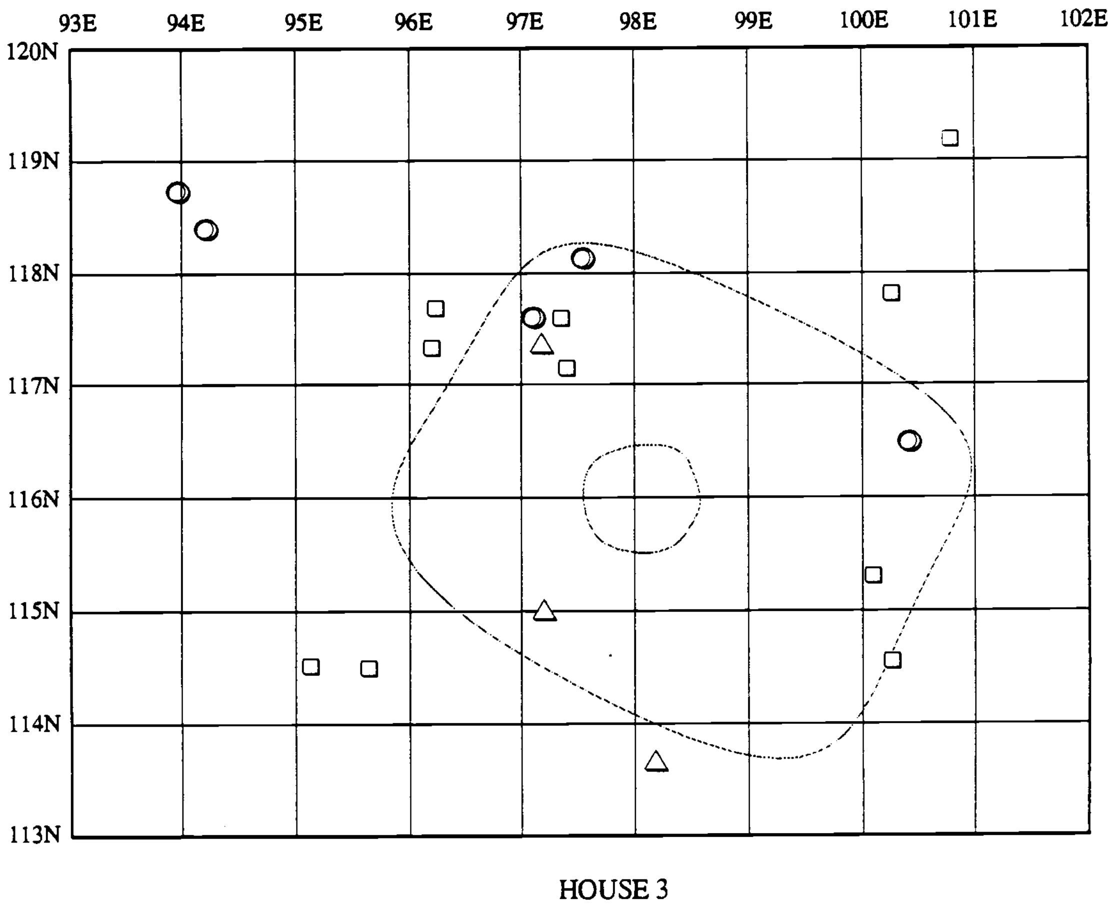


Figure 14. Distribution of plant processing tools, House 3.

□ Grinding Stone
△ Hoppermortar base
☆ Pestle
○ Edgeground cobble (mano?)

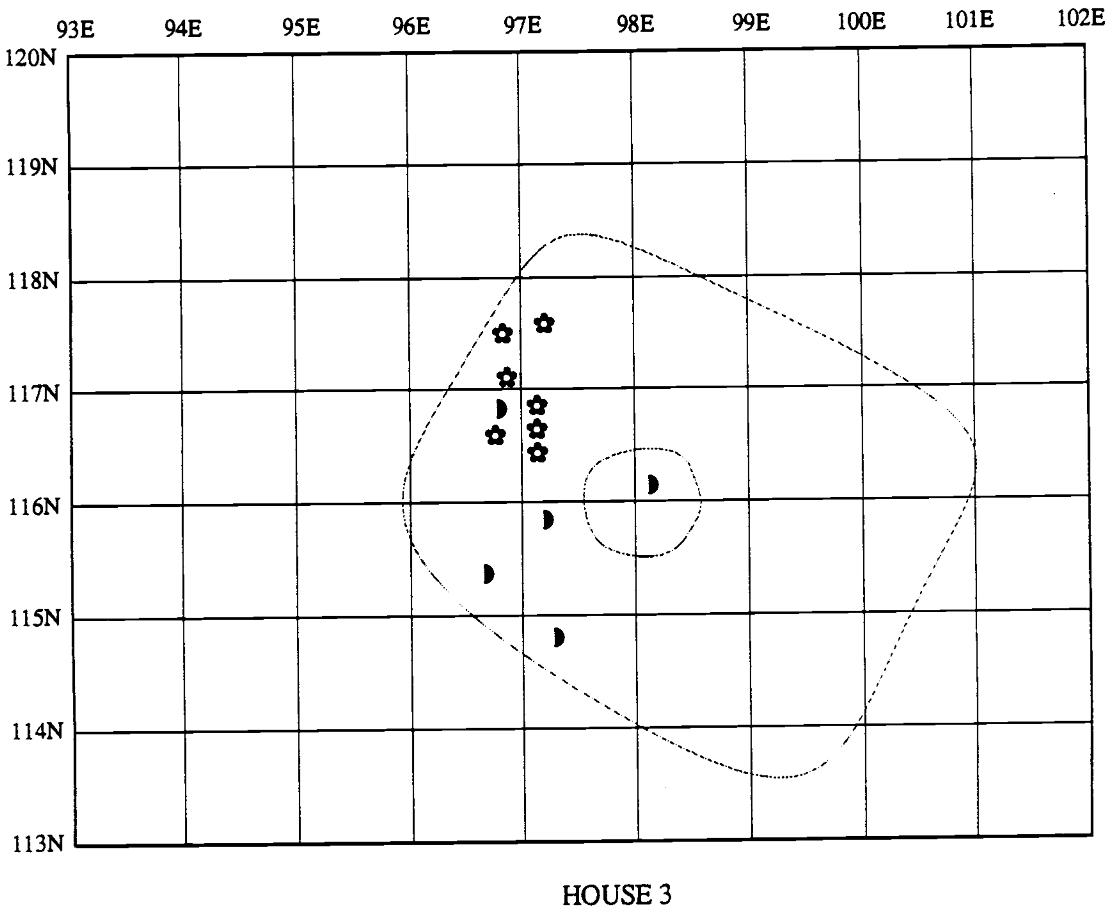


Figure 15. Distribution of archaeobotanical material hand-collected by Shelley Smith.

◗ acorn shell fragments
✿ *Arctostaphylos* seeds

Explanations for Patterns

It has been suggested that when dealing with archaeological remains from any site, archaeologists are concerned with discerning patterns in the record resulting from three processes: taphonomic, cultural behavior, and human behavior (Cordell et. al. 1987). Cordell suggests that human behavior can include sampling schemes which can influence inferences about cultural behavior (1987:569). Therefore, analysis of ethnobotanical remains from 35JA42 rests on assumptions that patterns occurring at this site have been derived from aboriginal cultural behavior, taphonomic processes, and sampling strategies, and other post-depositional events.

This section pertains to identification of those depositional and transformational processes, both cultural and non-cultural, that may have influenced the archaeobotanical record at the Applegate River site. Approaches to reconstruction of formational processes include reference to ethnoarchaeological studies which may provide insight into phenomena pertaining to human behavior (Gould and Watson 1982) and "working back" from the archaeobotanical assemblage to the composition of the original depositional population using evidence obtained from the assemblage and the surrounding matrix as well as general tenets of formative operations (Olson 1980).

According to Ascher (1968) the archaeological record is the result of processes during three phases:

1. inhabited
2. post-occupational or "ghost"
3. archaeological

Ascher (1968) has suggested that continuous ordering and re-ordering of material constituents is realized during the inhabited phase. Subsequent ghost and archaeological phases are seen as links in a unidirectional entropy-producing progression.

Cultural formational processes and non-cultural transformational processes can be seen as dynamic effectuations operating within the ecosystem through time. More specifically, the interaction of bio-physical and behavioral variables (Schoenwetter 1981, Butzer 1982) can be interpreted within a human ecological context. Decoding of behavioral processes and non-human processes that have impacted the empirical data can lead to more robust inferences relative to past cultural systems.

Developmental Phases/Formational Processes

I. Pre-Occupational Phase

Although Ascher's (1968) description of three sequential phases of site ontogeny has application to all archaeological circumstances, the research questions considered here require addition of a pre-occupational phase. Prior to human impact on the environment, interaction among natural agents can leave characteristic signatures. Of particular interest here is the seed population embedded in a site as a result of seasonal dispersal which may be pre-existent to human occupation. Annual seed production for a localized area can number in millions of disseminules. By way of example, only Amaranthus graecizans, an annual tumbleweed, may produce up to 6 million seeds per plant (Quick 1961). Clearly, the potential existed for an autochthonous seed population at the Applegate site becoming integrated into the cultural context upon utilization of the environment by aboriginal people. Given the apparent recent protohistoric creation of the site, it may be impossible to distinquish autochthonous seed populations which might have been carbonized from those culturally deposited, especially in House 3 which was destroyed by fire.

II. Inhabited Phase

Processes influencing the character of the inhabited phase of 35JA42 are, perhaps, the most complex and difficult to decode. It has been hypothesized that the three habitation structures, although part of one site, were not occupied simultaneously, but over successive winters (Brauner 1983). It cannot be assumed that affective events, whether cultural or non- cultural, were identical for each structure. Cultural formational processes which may have influenced interstructural ethnobotanical variability include, but are not limited to, the following:

A. Length of occupation

B. Seasonality

C. Function of Structures

D. Differential Preservation

A. Length of occupation

Based on lack of stratigraphy in each house, it is assumed that each pit house was occupied one time only. Length of occupation, although varying only by a matter of weeks, could influence the interstructural archaeobotanical record. Duration of occupation may bear upon the range of subsistence-related botanical remains represented at the site. Yellen (1974) has suggested that decreasing periods of occupation will be correlated with decreasing chances that the entire range of debris-producing activities will occur at a given location. If Yellen is correct in his suppositions then House 2 may have been occupied for a shorter period of time than the other two houses. On the other hand, assuming equivalent number of occupants and that occupational refuse accumulated at approximately the same rate across houses when the co-equality of volume of depositional fill within structures is noted, equivalent terms of occupancy for all three structures is suggested, in spite of interstructural archaeobotanical variability.

B. Seasonality

Certainly the season during which a site is inhabited will influence composition and diversity of the archaeobotanical record (Gasser 1979, Jackson 1986). Brauner (1983) has proposed winter habitation for the Applegate River site based upon ethnographic and archaeological data. Due to the occurrence in the assemblage soley of taxa with fruits and seeds ripening from late summer through late fall (see Seasonal Availability of Fruits and Seeds Table 6), 35JA42 was probably occupied beginning as early as late summer through winter. Ethnographic sources (Drucker 1940, Harrington 1981, Sapir 1907) have noted that manzanita berries and acorns were gathered, processed, and stored for utilization through the winter when other plant foods would have been scarce or unavailable. It must be remembered, however, that the botanical assemblage consists only of seeds (which in general ripen late summer — fall) as a consequence of sampling design. In addition, seeds being comparatively dense plant organs, tend to have an increased chance of preservation; fleshy foods with high water content such as tubers and greens, which were generally available during early spring-summer, have decreased probabilities of being preserved (Begler and Keatinge 1979, Minnis 1981, Thomas 1986). Shackley (1981) has noted that most resistant phases of the reproductive cycle, i.e., fruit and seeds as opposed to flowers or leaves, are far more likely to survive in the environment. Therefore, subsistence items such as tarweed, grass, or pine seeds would have a longer depositional life than, say, clover or the inner bark of resinous trees. Location of 35JA42 within the Interior Valley Zone (Franklin & Dyrness 1973) which is typified by the presence of Arctostaphylos viscida, (manzanita), Quercus kelloggii, (California black oak), Q. garryana, (Oregon white oak), Arbutus menziesii (madrone), and other sclerophyllous species, provides supportive evidence toward a fall-winter utilization. It is reasonable to suppose that Applegate Athapascans would have inhabited this locale in order to procure and process available plant foods, assuming relative congruity between plant communities in the present and the recent past.

Ford (1979) has stated that generally human and animal utilization of plants is predictable and correlated with the phenology of each species. Traditionally, Takelma-Athapascan people have been classified as adhering to a central-based wandering subsistence-settlement system (Brauner and Honey 1977), based partly on the assumption that subsistence resources were differentially available throughout the year and within the region. Aboriginal people would have been dependent on various ecosystems for seasonal production of botanical resources. Exploitation of the Interior Valley Zone for procurement of such staples as acorns and manzanita fruits could have been coordinated with hunting deer and elk which would have been available in the uplands. Schmitt (1986) has found that faunal remains from 35JA42 suggest winter occupancy. Although biases introduced by sampling design and differential preservation of botanical remains have surely influenced the archaeobotanical assemblage from the Applegate site, when taken in concert with other lines of evidence; e.g., ethnographic, ecological, faunal, and archaeological data, fall-winter occupancy is suggested. In order to test the central-based wandering hypothesis, subsistence data should be obtained from archaeological sites throughout the region, located within the full range of ecosystemic variety. One would expect to find distinct assemblages reflecting specific vegetation communities and commensurate evidence of seasonality. (This may be difficult to accomplish due to poor organic preservation at most southwest Oregon sites.)

Table 6. Seasonal Availability of Fruits and Seeds from Taxa Represented at 35JA42

Taxa	Phenology	Seeds Counts/lb.	Reference
Abies spp.	A. concolor - seeds dispersed Sept. - Oct. A. magnifica shastensis- seeds dispersed mid-Oct.	A. concolor - 11,100 A. magnifica var. shastensis - 7300	USDA Handbk. 450, 1974
Arctostaphylos spp.	Fruit ripens summer - fall	58,000 separate nutlets A. patula	USDA Handbk. 450, 1974
Chenopodium spp.	Flowers March-		Munz, 1959
Madia spp.	Flowers June - Sept.		Hitchcock & Cronquist 1973
Pinus spp.	P. lambertiana - seeds dispersed Aug.-Oct.	P. lambertiana - 2100	USDA Handbk. 450, 1974
Quercus spp.	Acorns ripen late August -early December	Q. garryana - 85 Q. kelloggii - 95 Q. chrysolepis - 150	USDA Handbk. 450, 1974
Vitis spp.	Fruit ripens Aug.-Oct.	Vitis spp. 15,000	USDA Handbk. 450, 1974

C. Function of Structures

Binford (1982) has discussed within-site variability as a consequence of function. It is not inconceivable that all three structures were utilized for different purposes, thus, producing incongruous archaeobotanical assemblages. However, based on similarities among lithic, faunal, and floral assemblages, morphology, and location of structures as well as ethnographic data, identical function as seasonally occupied domestic residences has been assumed. Therefore, interstructural archaeobotanical variability is probably a consequence of other factors.

D. Differential Preservation

Variable rates of botanical decay bear upon our ability to quantify the relative importance of plant resources (Dennell 1979), to assess the range of resources exploited and, generally, to present robust hypotheses concerning plant-man interaction (Jones 1941). Although the taphonomy of archaeobotanical assemblages elucidates what is essentially unknowable, unravelling of diagenetic processes (Lawrence 1979) including differential preservation can shed light on ecosystemic operations (Gifford 1981). Many workers (Asch and Asch 1975, Asch et al. 1979, Dennell 1976, Minnis 1981, Pearsall 1983) routinely emphasize that due to biases from differential preservation one must use caution when assessing the relative importance of botanical resources represented in a seed assemblage.

In an archaeobotanical context, any population of plant remains has been determined by absence of or resistance to decay either due to physiological attributes or preservation by carbonization, mineral replacement, or due to special circumstances (Shackley 1981). Those subsistence-related plants most likely represented in archaeological circumstances are those with low-perishability constituents which were deliberately or accidentally charred and/or those ethnobotanical resources remaining through some fortuitous accident of preservation.

Resistance to Decay

Munsen et al. (1971:422) have categorized plant remains according to decreasing chances of preservation:

1) subsistence items with dense inedible components (maize cobs, nutshells);

2) plant remains that are "somewhat dense", but entirely ingested;

3) non-dense plant foods, such as tubers or roots and greens, with a high water content.

Carbone and Keel (1985) are more explicit in their assessment of variable resistance to decay. Depending on the environment, Carbone and Keel's (1985:6) scheme of decay, with those plant components least resistant to degradation listed first, is as follows:

1) soluble parts, such as sugars and starches;

2) proteins and starches that are easily converted to soluble substances;

3) cell walls, composed mostly of cellulose;

4) substances deposited in and among plant cells for physical and structural purposes, such as lignin, cutin or suberin.

Of course, special depositional circumstances such as arid caves or rock shelters (Harper and Alder 1970, Bruier 1977, Ford 1979, Sanford 1983, Thomas 1979) or water-saturated environments (Gleeson and Grosso 1976, Odum 1965) can allow preservation of otherwise perishable remains. Open-air sites such as 35JA42 in an environment with alternately wet winters and hot summers generally afford far less than optimum conditions for preservation (Carbone and Keel 1985, Fritz 1984, Gifford 1980, Roosevelt 1984, Smith 1985).

It is assumed that seed longevity in archaeological circumstances is correlated with resistance to decay and increased probabilities of chance preservation (e.g. exposure to accidental carbonization, etc.). In other words, once a seed is no longer viable, when embryonic structures within a seed have broken down, degradation will proceed uninhibited in the absence of agents of preservation (Minnis 1981). It follows that comparison of longevities of ethnobotanically-reported seed resources may reveal the maximum seed age within a depositional context and possibly disclose the effect of differential preservation on the 35JA42 archaeobotanical assemblage assuming that all taxa would have had an equal chance of occurring at the site. Harrington (1972) has stated that as an individual seed ages, it moves along a continuum of deterioration with increasing susceptibility to attack by microorganisms. The primary environmental factors influencing the rate of disseminule degradation are atmospheric relative humidity and temperature which affect seed moisture content and the rate of biochemical processes. For example, in experiments with deterioration of Hopi corn, pumpkin seeds, pinyon nuts, red, white and kidney beans and sunflower seeds through exposure to varying moisture and temperature regimes, Gasser and Adams (1981) found that the average annual loss of original mass was 7.8%. They have concluded that at this rate, the entire seed assemblage would be lost in 13 years. Optimal depositional circumstances would provide low relative humidity and low temperature, certainly not the situation at the Applegate site. Variation among species in seed longevity, under deficient depositional conditions like those at 35JA42 must have affected attrition rate of ethnobotanical species in the archaeobotanical assemblage. Harrington (1972) has said that Quercus spp. have a short-lived seed, implying propensity toward comparatively swift degradation (USDA 1974). Hard seeds, those that dry down to 4% seed moisture are often long-lived (Harrington 1972). Seed longevities of plant species mentioned in ethnographic literature as subsistence resources are compared below. Information was not available for all ethnobotanical species and there are several instances where longevity may have to be inferred from comparison of related genera.

From the data presented in Table 7, comparatively rapid rates of deterioration are suggested for Quercus spp., those seeds with abundant proteins and starches which could be converted rapidly to soluble substances. The relative absence of Quercus remains in the Applegate site is probably a function of low resistance to decay, among other factors. Most likely Camassia spp., the other staple food item, would not have been represented by seeds. Arctostaphylos spp., on the other hand, have a comparatively long-lived seed suggesting increased decay-resistance, perhaps, a mechanism explaining Arctostaphylos ubiquity across samples. Other ethnobotanical resources such as tarweed seeds, sugar pine nuts, Abies or Chenopodium seeds have longevities surpassing that of manzanita. It is clear that the relative scarcity of these taxa and the absence of others with superior longevity, such as clover, at 35JA42 must be attributable to factors other than decay-resistance.

Table 7. Seed Longevity of Selected Ethnobotanical Resources
(*including those seeds identified from 35JA42)
(Harrington 1972)

Ethno-botanical Resource	Taxon	Longevity (years)	Reference
*Acorns	Quercus ± 300 spp.	3 yr. max.	Johannsen, 1921
Blueberries, *manzanita berries and madrone, salal	Ericaceae	12 yrs.	Heit 1967
Grass seeds	Avena sativa Bromus hordeaceus Festuca rubra	32 yrs. ±18 yrs. soil storage ± 50 yrs. soil storage	Haferkamp et al. 1953, Peter 1893, Chippendale & Milton 1934
*Tarweed seeds or sunflower	Madia angustifolia	40 yrs. - lab storage	Schjelderup - Ebbe 1936
*Sugar pine nuts	Pinus lambertiana	15 yrs.	Schubert 1952
Clover	Melilotus alba	77 yrs. dry storage ±10 yrs. field enviro.	Ewart 1908 Muenscher 1955
Pond lily	Nymphaea gigantea	16 yrs.	Ewart 1908
Kouse	Daucus carota	31 yrs. dry storage 20 yrs. buried	James et al. 1964, Madsen 1962

Table 7, continued

Ethno-botanical Resource	Taxon	Longevity (years)	Reference
Hazelnut	Corylus ± 15 spp.	2 yrs.	Koopman 1963
Berries:salmon-berry, blackberry, raspberry, etc.	Rubus spp.	12 yrs. dry storage ± 65 yrs. forest environ.	Heit 1967, Livingston and Allesio 1968
Mustard	Brassica kaber	10 yr. dry storage 26 yr. buried	Kjaer 1940, Madsen 1962
Tobacco	Nicotiana tabacum	20 yrs. lab storage 39 yrs. buried	Schloesing and Leroux 1943, Toole and Brown 1946
*Abies	Abies concolor, A. grandis, A. magnifica A. nobilis	16 - 21 yrs.	Schubert 1952, Barton 1953
Wild onion	Allium cepa	22 yrs.	James et al. 1964
*Chenopodium	Chenopodium album	Soil storage 39 yrs.	Toole and Brown 1946
Purslane	Portulaca oleracea	Soil storage 40 yrs.	Darlington and Steinbauer 1961

Carbonization

The above discussion considered probabilities for seed preservation in the absence of carbonization, mineral replacement, or unique conditions. However, it is obvious that charring as a preserval agent acted on the seed assemblage at 35JA42. It is assumed that carbonization of subsistence-related disseminules would have occurred as a consequence of:

1. Accidental burning. These plant-food items would not normally necessitate exposure to intense heat prior to consumption or storage.

2. Deliberate exposure to fire. Subsistence items in this class would have required parching, roasting, drying, boiling, or some alternate method of preparation using intense heat prior to consumption or storage.

It follows, based on the above assumption, that quantitative differences in seed densities across available taxa could be expected depending on mode of carbonization with greater relative density of those taxa deliberately exposed to fire during preparation, thus, increasing chances of preservation through carbonization.

Ethnobotanical literature can supply general ideas concerning plant-food preparation techniques, however, specific data pertaining to Applegate Athapascans is scarce. Therefore, it has been assumed that the inhabitants of 35JA42 were culturally similar to neighboring Takelma and Tolowa (Drucker 1940, Gray 1985) and consequently, ethnobotanical practices would have been congruous. It can be seen from Table 8 that those botanical elements reported to have required some sort of deliberate exposure to intense heat would have been acorns, camas bulbs, tarweed seeds, pinenuts, roots or leaves of clover, pond lily seeds, fern, cattail and roots. Those resources apparently eaten uncooked were manzanita berries, cambium layer of pine trees, edible roots, berries and greens, and sunflower stalks. Narrowing this list even further and considering only seeds, it would be expected that acorns, tarweed, pine, and pond lily seeds would occur in greater densities than manzanita or various berry seeds which would not have been deliberately exposed to intense heat during preparation. Although acorns were shelled before further preparation, Munson et al. (1971) have stated that subsistence items with dense, inedible waste products such as nut shells (e.g. acorns) or fruit stones were often processed near a fire where waste could have been used for fuel. Degree of carbonization would have determined occurrence in the archaeobotanical assemblage. Of those resources represented at 35JA42, Vitis and Chenopodiaceae are not mentioned specifically in the ethnobotanical literature from southwest Oregon. However, Vitis fruits are mentioned elsewhere as having been dried over fires (Speck 1909) or eaten raw (Elsasser 1981) and there is a plethora of references regarding utilization of chenopod resources in other areas of North America (Fritz 1984, Smith 1984, Yarnell 1976) therefore, palatability and edibility are assumed although preparation method is unspecified.

Table 8. Ethnographically-reported Plant-food Preparation Techniques (*Reported as Staple Foods)

Resource	Sci. Name	Mode of Preparation	Group/s	Reference
*Acorns	Quercus spp.	Shelled, mashed, leached, stone-boiled or stored in shells until needed.	Tolowa, Lower Rogue River, Upper Coquille River, Upland Takelma, Takelma	Drucker 1940, Card 1967, Gould 1975, Sapir 1907
*Camas bulbs	Camassia .	Roasted in earthen pits; stored in cakes.	Tolowa, Lower Rogue River, Upper Coquille River, Upper Takelma, Takelma	Drucker 1940, Card 1967, Gould 1975, Sapir 1907
Tarweed seeds	Madia spp.	Habitat burned; seeds collected, parched and ground.	Tolowa, Takelma	Sapir 1907
Pine nuts	Pinus spp.	Roasted in pits; mixed with manzanita flour; stored for winter.	Takelma	Harrington 1981
Grass seeds	Gramineae Family	(Assumed parched and ground)	Tolowa, Upland Takelma	Drucker 1940
Manzanita berries	Arctostaphylos spp.	Mixed with pounded salmon, animal fat	Takelma	Sapir 1907 Card 1967

Table 8, continued

Resource	Sci. Name	Mode of Preparation	Group/s	Reference
		pounded into flour: mixed with sugar pine nuts and stored.		
Cambium layer of pine tree Harrington 1981	Pinus spp.	Outer bark stripped off, Cambium layer removed, pounded while still damp and eaten without cooking.	Takelma	Card 1967.
Kouse Wild parsnip	Umbelliferae Family	(Assumed boiled or bake.)	Tolowa, Takelma	Gould 1975, Card 1967
Clover (leaves or roots)	Trifolium spp.	Boiled or eaten raw.	Takelma	Card 1967. Turner and Kuhnlein 1982
Pond lily roots and seeds	Nuphar polysepalum	Roots stored; seeds ground and made into cakes or parboiled.	Takelma	Card 1967, Hitchcock and Cronquist 1973
Fern roots	(Information unavailable)	Scorched, peeled, pulverized, mixed with salmon eggs and dried fish.	Tolowa	Drucker 1940
Other edible roots and berries, greens	(Information unavailable)	Not preserved; eaten uncooked.	Tolowa	Drucker 1940

Table 8, continued

Resource	Sci. Name	Mode of Preparation	Group/s	Reference
Cattail roots and shoots	Typha	Roasted roots, served "plain" or boiled, pounded made into cakes.	Takelma	Card 1967
Sunflower, stalks & seeds	Compositae spp.	Stalks eaten raw.	Takelma	Sapir 1907
Wild plums	Prunus	(Information unavailable)	Takelma	Harrington 1981 Hitchcock and Cronquist 1973
Skunk cabbage root	Lysichitum	(Information unavailable)	Tolowa	Drucker 1940

In summary, seed densities do not conform to predicted patterns; Arctostaphylos occurs in greater density across the site than would be expected from a supplemental resource that apparently incurred carbonization only by chance. However, it has been established that longevity rates for manzanita seeds surpassed those of Quercus thus, reducing attrition and increasing numbers of seeds available for carbonization, either deliberate or accidental. Other factors that may have influenced increased densities of Arctostaphylos nutlets compared to the rest of the seed assemblage are:

1. Differential location of processing, consumption, and storage: relative to a systemic context. Ford (1979:300) has stated, "the pattern of cultural activities on a site produces a non-random distribution of remains. The location of plant preparation, consumption, and disposal results in a mosaic of plant parts."

2. Quantification considerations. It has already been established that there is a proportionally greater number of manzanita nutlets per pound compared to other ethnobotanical resources represented on the site, again increasing number available for carbonization (See Table 6).

Underrepresentation of Quercus remains was a phenomenon noted in archaeological sites in northwest Kansas (Fritz 1984) and at Salts Cave (Watson and Yarnell 1966) where shell fragments were so minute as to preclude estimates of amounts of actual food represented. Rather, based on distribution across samples, Yarnell and Watson inferred that Quercus resources were utilized to a greater extent than is apparent from abundances. If, following this method, acorn distribution rather than density is compared at 35JA42, then acorns must have been an important subsistence item for the Applegate River people: Quercus fragments occur in two out of the three structures or 28% of the units sampled. (Although if handcollected material is included, acorns occur in 50% of the test units in Houses 1, 2, 3.)

In summary, it has been demonstrated above that variable resistance to decay; differential preparation, consumption, storage, and disposal techniques and locations; increased preservation through accidents of carbonization may have biased the archaeobotanical assemblage. However, even after formational, taphonomic, and sampling variables are weighed, overwhelming occurrence of manzanita nutlets in the housepits of 35JA42 leads one to conclude that the aboriginal inhabitants were relying heavily on Arctostaphylos resources.

III. Post-Occupational Phase

Ascher (1968) has referred to the ghost or post-occupational phase as an additional period in the history of an archaeological site when various formational processes, both cultural and non-cultural, can affect the depositional assemblage.

Following abandonment, as many as 150 years passed before the site was excavated (Brauner 1983). During this time several pedoturbative processes (see Wood and Johnson 1978) had the potential for upsetting occupational phase intrasite relationships as well as having the capacity for removing or modifying botanical remains. Of greatest relevance here are non-cultural processes such as faunal and floralturbation, and more recent cultural events.

A. Faunalturbation

Wood and Johnson (1978:318) have defined this disturbance process as "mixing of the soil by animals." Burrowing mammals and various insects are probably responsible for the majority of faunalturbative effects of the Applegate site. Of course, disturbances of this type can be coterminus with occupation. However, Wood and Johnson have implied that most disturbances by animals occur upon disuse of a site. The effect of seed hoarding by Peromyscus sp. has been discussed above relative to House 3. What remains unknown is the effect of rodent activity on Houses 1 and 2 during habitation and on all three structures following habitation. Charred and uncharred small-mammal feces, similar to those identified for Peromyscus sp., were universal throughout samples suggesting that animal activity has been significant (see also Sanford 1983).

Comparisons between rodent nests and rodent caches at Walpi (Gasser and Adams 1981) revealed that nests which contain few seeds are not good indicators of preferred food types. Analysis of a rodent cache at Walpi which was in a small subfloor depression, however, uncovered 1468 seeds of 15 genera and a large amount of rodent feces. Composition of the seed assemblage from the rodent cache at Walpi differs dramatically in the number of genera present from the cache at 35JA42. The cache within House 3 at the Applegate site consisted exclusively of Arctostaphylos nutlets suggesting that manzanita nutlets were the preferred food type. (Brauner 1983).

Experiments with feeding native rodent species (Perognathus spp. and Dipodomys spp.) domesticated seeds determined that native rodents would accept all types of seeds presented but might prefer small or medium-sized disseminules if resources were particularly plentiful (Mares and Williams 1977, Rosenzweig and Sterner 1970). Of those seeds represented at 35JA42, only acorns might be considered outsized when whole. If during or following occupation, rodents had been scavenging seeds from within Houses 1 and 2 and depositing them elsewhere this could have introduced a serious bias. Conversely, rodents may have been harvesting seeds from within the site radius, depositing them within the shelter of habitations thus interposing non-cultural botanical elements into the systemic context.

Gasser and Adams (1981) determined that rodent and insect chewing of botanical elements decreased as the length of exposure of the plant assemblage increased. At Walpi they found that insect and rodent gnawing occurred on 48% of all the seeds in a storeroom which had been exposed for 10 years, on 16% of the seeds exposed for 25-35 years and only 9% of the seeds exposed for 65 years. Therefore, it is concluded that the most significant impact by rodents on the seed assemblages at 35JA42 would have occurred immediately following abandonment. If rodent caches are indicative of dietary preference as Gasser and Adams (1981) have suggested then it can be assumed that rodents at the Applegate site selected manzanita berries or nutlets over other available foods. Further assumptions are that an adequate supply of manzanita fruits was available either as stored goods within the structures, as waste products littering floor surfaces, or from exterior sources such as plant-food processing areas, or as a result of vegetative community composition. It is difficult to derive greater significance beyond confirmation that Peromyscus preferentially selected Arctostaphylos resources which were available as a consequence of cultural operations or botanical availability. However, it is implied by Peromyscus foraging habits that the recoverable Arctostaphylos nutlet population from the archaeological context may have been far greater in the absence of rodent activity, suggesting that cultural reliance on Arctostaphylos resources may have been even more significant than indicated by seed counts.

Based on the frequency within samples of insect chitons, insect activity appears nearly as pervasive as small animal behavior. Insects may have non-randomly selected out certain resources, consequently, influencing the archaeobotanical assemblage.

B. Floralturbation

As Wildesen (1982:55) has said the transfer and/or removal of elements affects the integrity of a site and the validity of cultural inferences based on description or location of those elements. Therefore, the effects that plants may have had through mechanical mixing of the soil on the integrity of 35JA42 must be considered. Brauner (1983:53) has noted "the root systems of four ponderosa pine trees (20-40 years old) which were growing in the depression" of House 3. Certainly, extensive root growth could have displaced or eliminated small botanical elements from archaeological context biasing the archaeobotanical record by obscuring stratigraphy or confusing relationships.

Keepax (1979) has noted that root holes and drying cracks can penetrate archaeological strata thus, providing an avenue for contamination of cultural fill by contemporary plant elements. Given the shallow nature of depositional fill at 35JA42 and the extensive root systems typical of second-growth conifers, potential effects on the integrity of the archaeobotanical assemblage from House 3 could have been considerable, although the extent of floralturbation cannot be controlled for at this stage of research.

C. Historic Events

Several relatively contemporaneous events, initiated within the last decade or so may have affected archaeobotanical deposits.

1. A segment of the site was impacted when USDA Forest Service personnel removed several insect-damaged pine trees (Brauner 1983). Tree removal with heavy equipment, unless executed with utmost care, can differentially depose the upper several centimeters of soil (Silvermoon 1988). Wildesen (1982) has stated that damage can be variable depending on number of trips across the site, percent slope, bulk density of the soil, size and number of logs, size and shape of cultural elements themselves. None but the last of these factors are known although it is assumed that carbonized botanical remains would be among the most fragile items in the archaeological assemblage. Brauner (1990) has stated that there was minimal evidence of disturbance of cultural deposits by tree removal operations. Some minor damage was reported along the rim of one of the houses, but not within the interior.

2. At one time a former land owner of the site area deposited sandy loam and additional forest litter on a major portion of the site to provide a bedding medium for landscape plantings. Brauner (1983) has suggested that this event had a positive affect in that cultural deposits underlying the imported soil were protected and buffered by the culturally-sterile stratum. Potentially more adverse impacts may have resulted from the following two considerations.

3. Brauner (1983:19, 35) has stated that exotic shrubs were planted in the depressions of Houses 1 and 2. Damage to cultural deposits was believed to be minimal. However, considering the shallowness of cultural sediments (maximum 25 cm), it is assumed that locating nonindigenous shrubbery within house depressions would have

required penetration into cultural strata. Dislocation or destruction of aboriginally-deposited botanical elements may have resulted from these planting activities. The "exotic shrub" types are unknown; probably none of the taxa represented at 35JA42 is non-indigenous although uncertainty concerning the exact species of grape leaves an element of doubt.

4. Potentially the most detrimental impact instigated by recent landowners was the practice of burning trash and vegetable refuse in the depression of House 2. Brauner (1983:35) has written, "Excavation revealed a 5-10 cm layer of ash and burned wood in the center of the depression, 10-15cm above the house floor. Cultural debris was noted from the base of the trash burning pit to the floor." Clearly, non-aboriginal carbonized residues from refuse burning could have intruded cultural sediments. Since no exotic carbonized seeds were recovered from House 2, it is assumed that if contemporary charred plant material had penetrated archaeological sampling units it must have consisted of indigenous species. The possibility exists that naturally-deposited seeds of Arctostaphylos or Madia could have become carbonized during occasional refuse burning and interposed into cultural strata when soil was disturbed during planting of non-indigenous shrubs. If seed counts for House 2 have been artificially increased in this manner, implying that cultural inventories were fewer than it appears, the paucity of material is even more striking.

IV. Archaeological Phase

Ascher (1968) has written of the pedoturbative effects that excavation can have on cultural deposits. Although he was referring generally to disruption of spatial relationships among artifacts, techniques of excavation, screening, and processing can have object-modifying or destructive potential.

Smith (1985) has suggested that the brittle nature of carbon can contribute to destruction of charred plant elements through mechanical pressure by human treadage during prehistoric times and to further destruction or modification during extraction from archaeological contexts. Further, Smith has stated that the structure of carbonized plant material appears to remain intact as long as it remains suspended in soil with a constant moisture level. Extraction from the matrix, with subsequent drying, often results in fracturing and splitting. Interestingly, Smith (1985:110) has found that "dense tissue is more intensely affected than porous tissue" indicating that the Arctostaphylos seed population may have incurred greater loss through breakage than other genera upon removal from cultural deposits.

Brauner (1983) attempted to avoid loss of microdebitage and other megascopic elements at 35JA42 by passing all sediments through a series of three nested screens ranging from 1/4 - 1/16". In addition, cultural elements were separated from soil matrices by water screening. Wagner (1985:3) has observed that:

> During waterscreening small artifacts are often forced through the screen along with the dirt,and only larger and harder artifacts will be retained. One may expect to recover lithics, bone and, pottery down to the size of the smallest screen mesh or its diagonal. Shell and botanical remains are damaged and usually lost by this process.

Wagner recommends that soil samples not be screened (wet or dry) at all before flotation. Several workers (Roosevelt 1984, Smith 1985, Yarnell 1963) have noted that the mechanical abrasion of water screening can fragment plant remains by causing splitting and cracking. Contrary to Wagner, Haberman (1984) has stated that significant numbers of carbonized tobacco seeds from two archaeological sites in South Dakota were obtained through waterscreening, apparently without substantial attrition of the seed assemblage. The effect, then, of wet screening archaeobotanical remains from the Applegate site is unclear, although Brauner saw little evidence of any destruction of macrobotanical remains.

Other recovery and processing techniques may have influenced the composition of Applegate seed assemblages. For example, the decision to retain living floor soil samples from differing screen sizes may have inadvertently biased the record. In other words, there was no consistency in which sediment fractions (1/4", 1/8" or 1/16") were reserved for later processing in the lab. Forty-five percent of the floor samples deemed appropriate for further analysis from House 1 were labelled "3rd screen" indicating they were from the 1/16" screen. Sixty-six percent of the analyzed samples from House 2 were "3rd screen." Soil samples from House 3 included 55% from the 1/16" fraction. Interestingly, numbers of taxa represented in a house pit are inversely correlated with percentage of soil from the 1/16" screen. (Table 9). It is suggested that such high proportions of smaller sediments could have biased the assemblage against larger and more frequent botanical elements, such as acorn shell fragments.

Table 9. Correlation between screen size and botanical diversity.

	House 1	House 2	House 3
% soil samples from "1/16" screen	45	66	55
number of taxa	6	2	5

Ideally, the full range of sediment sizes would have been available for lab analysis in order to obtain the maximum possible representation of plant elements.

Further Explanation

Although the factors outlined above have undoubtedly influenced the archaeobotanical record and the data derived from it several explanations warrant special attention.

I suggest that variability among and relationships between floor and hearth botanical diversity and relative seed density may have been primarily influenced by the following:

1.) mode of structural degradation

2.) refuse disposal and housekeeping practices.

3.) degree of disturbance.

1. Mode of structural degradation

Greater density of Arctostaphylos nutlets and Quercus remains in House 3 relative to other dietary evidence may have transpired due to mode of structure degradation. Houses 1 and 2 must have degraded "naturally"; House 3 was destroyed by fire, thus, preserving greater quantities of botanical debris. Brauner (1983:56) has said, "House 3 had definitely burned. Most of the superstructure had completely burned but the lower 10-20cm of many of the wall planks had only been charred and were thus preserved."

In other words, Houses 1 and 2 represent that population of Arctostaphylos, Quercus, and other ethnobotanical remains which were preserved through accidental exposure to intense heat or deliberate exposure during the food preparation process. Had these elements not been carbonized, it is likely that they would have ultimately disappeared from the archaeological record as a result of decay, insect and rodent predation, and crushing by human treadage (Hally 1981). Breternitz (1983) has suggested that a catastrophic abandonment mode, as hypothesized here for H3, permits optimal preservation of materials. Manzanita, acorn shell fragments, and four additional taxa in House 3 represent, primarily, a population of disseminules consisting of two parts:

1) those seeds and shell fragments that were charred accidentally or deliberately during food preparation, as in Houses 1 and 2:

2) those additional seeds that would have degraded naturally, but were preserved through structural burning.

Most ethnographic sources mention that manzanita berries were prepared for consumption by being pounded into a flour and combined with another plant product such as pine nuts, then mixed with water into a mush (Sapir 1907, Card 1967). It is not clear whether manzanita berries were deliberately exposed to intense heat as part of the preparation process. Assuming they were not roasted or parched, carbonization must have occurred through accidental exposure to intense heat (Hally 1981). Catastrophic fire could certainly account for the greater concentrations of Arctostaphylos seeds.

Hally (1981) has applied the same general assumptions concerning carbonization of subsistence-related species to a site in northwestern Georgia, finding that structure degradation through fire preserved many plant elements that would have otherwise been removed from the archaeobotanical record by decay. Similarly, Dennell (1976) has reported that due to burning of a large area of Chevdar, a considerable volume of plant remains were preserved. If this hypothesis is accepted then it follows that House 3 more closely reflects the actual population of seeds littering the living surface than do assemblages from Houses 1 and 2. Despite the possibility of more accurate representation of the target population in House 3, non-randomness of formational processes as discussed above still inhibits inferences beyond listing culturally exploited botanical resources (Pearsall 1983).

With regard to Quercus, absolute counts for this taxon in House 3 are greater than those for the same taxon in Houses 1 and 2. This is based partly on recovery and identification of acorn shell fragments from House 3, level 2, during the 1982 field season. Relative density of these specific fragments cannot be calculated as there is no record of matrix weight or volume. Suffice it to say that relatively large, charred acorn shell fragments occurred with greater frequency in the west half of House 3 than any other location across the site, assuming all possible specimens were collected; again, increased frequency may be an artifact of catastrophic fire.

Housekeeping and refuse disposal practices.

Brauner (1983:61) has suggested that "there is no evidence for past abandonment refuse disposal" in House 3; however, it is possible that effects of disposal practices are not apparent except through analysis of micro-evidence. Schmitt (1986) has concluded, based on the abundance of butchered bone in the house fill that House 3 was the site of refuse dumping. Macrobotanical evidence for House 3 tentatively supports Schmitt's conclusions:

1) Relative density of manzanita seeds is dramatically higher in the floor sampling units than in the other two houses.

2) Floor diversity is high in H3, when contrasted to H2, and practically equal to H1. Hearth diversity is greatest in H3.

3) A rodent cache within H3 suggests the presence of abundant food detritus coupled with minimal human disturbance, i.e. lack of human occupation.

Housekeeping practices particularly in H2, may have contributed to the increased botanical evidence in H3 or at the very least, to the paucity of macrobotanical material in H2. Low diversity in House 2 (2 taxa) with relatively greater diversity in House 3 (5 taxa) may suggest periodic clearing of the middle structure with dumping taking place in House 3. In addition, Brauner (1988) has suggested that the relative paucity of fire-cracked rock from the floor of House 2 compared to Houses 1 and 3 may denote recurrent clearing of H2. Begler and Keatinge (1979) have proposed that scarcity of subsistence remains may suggest intermittent clearing of floors as detected within rooms at Cerro la Virgen. Recovery of larger, more numerous acorn shell fragments from H3 floor, concomitant absence of Quercus remains from H2, and the reduced fragment size of acorn shells in H1 may suggest refuse dumping/housekeeping behaviors.

O'Connell (1987:74-110) has suggested that the density of refuse items in an activity area should be in inverse proportion to the efficiency of the clearing technique.

If House 3 had been used as a refuse dump then it would be expected that represented botanical taxa from either House 1 or 2 should be a subset of that represented in House 3. The seeds from House 1 include Chenopodiaceae and Vitis, two taxa that do not appear in House 3; however, only Arctostaphylos and Compositae were recovered from House 2, making it a subset of House 3.

Alternatively, the reduced seed density of House 2 may be an artifact of subjectively chosen soil sample locations. Soil samples for House 2 were mainly from the south half of the floor about which Brauner has said, "The floor area south of the hearth was almost devoid of cultural material. A low frequency scatter of cultural debris characterized most of the southeast floor area as well. This may have been a storage, lounging, sleeping area." (1983:52). Floor samples from House 1 were generally from the northwest half of the shelter which Brauner (1983:34) suggests was the "primary task area" based on distribution of fire-cracked rock, bone fragments, pestles, and grinding stones.

In addition, although relative seed density was lowest on House 2 floor, the number of plant processing tools was greatest (see Figures 9, 11). If reduced seed density was the result of periodic housecleaning, why was this practice not also reflected in reduced numbers of tools?

Degree of Disturbance

The trend seen in increased relative manzanita seed density from House 3 floor samples does not appear in hearth samples. Factors influencing disparities in seed densities across floors, suggested here as catastrophic fire or refuse disposal practices, do not appear to apply as distinctly to hearths. Variations in seed densities seem to be primarily correlated with post-depositional disturbance.

Table 10. Data from Hearths, 35JA42

	Hearth 1	Hearth 2	Hearth 3
Relative Densities Arctostaphylos	23.8	51.1	5.3
Hearth Description	Pit, confined within cobble ring, filled to 15 cm.	Pit, 40 cm in diameter filled to12 cm cobble ring.	No pit, ash on same plane as the floor, tightly contained.
Disturbance	Ash smeared across floor.	No disturbance indicated.	Cobbles absent, assumed scavenging.

Clearly, the greatest relative seed density occurred in Hearth 2 where disturbance was absent or minimal. Hearth 1 material was re-deposited across the floor, probably eliminating some seeds from consideration in the process. House 3 hearth was morphologically different than the other two with the typical ring of cobbles absent altogether. Brauner has suggested that cobbles from this hearth were scavenged by later residents of the site. If this is so, then scavenging activities may have eliminated hearth contents, destroying or redepositing botanical remains, thereby reducing the relative density of manzanita seeds.

The structural difference between Hearths 1 and 2, and Hearth 3 is intriguing. Tolowa and their southwest Oregon relatives typically created "a shallow, clay-lined depression surrounded by stone" (Drucker 1936:236). Takelma hearths are described simply as located in the center of the shelter (Gray 1985:71) with a smoke hole above in the roof. Whether the structure of the hearth in House 3 indicates cultural variation or severe disturbance is not clear, but once again House 3 is an anomaly.

Summary

Relative seed density for manzanita and botanical diversity differ across house floors and hearths. Various depositional, formational, and taphonomic processes which may have contributed to the variation in these factors have been discussed with post-abandonment refuse disposal, catastrophic fire, housekeeping practices, and disturbance as well as sampling methods being forwarded as the most affective. Differences in relative seed density and numbers of taxa represented acorss houses and hearths are not statistically meaningful, although they are valuable in providing insight into events and processes which occurred during the life of the site and in the lab.

CHAPTER V

DISCUSSION

Testing Brauner's Hyphotheses

The main questions to be dealt with in this discussion are relative to earlier stated research objectives:

1.) Are macrobotanical remains from 35JA42 useful in testing Brauner's hypotheses concerning behavior of the aboriginal inhabitants of the site?

2.) What can be said about the ethnobotanical practices of the inhabitants of 35JA42 based on archaeobotanical evidence recovered from the site?

Testing Hypotheses with Macrobotanical Remains

It is a generally adopted procedure of scientific inquiry that evidence can be amassed ad infinitum in support of a hypothesis, but that only a single case is necessary to refute it (Pelto and Pelto 1983). Therefore, although Brauner's hypotheses can be tested with macrobotanical evidence, only if the derived data refutes the hypotheses will the test be successful. Much supportive data has been provided by the archaeobotanical collection from the Applegate site, but in no case were Brauner's propositions refuted. In particular, macrobotanical remains substantially support suppositions of site function, seasonality and adaptive preferences of the occupants. Plant evidence neither supported nor refuted archaeological data relative to chronological placement, social relationships of inhabitants and trade connections and only tentatively supported sequence of occupation. Each supported hypothesis is discussed below.

Site Function

Brauner has hypothesized that 35JA42 was occupied by a single nuclear or small-extended family (1983:86), presumably rather than by a specialized aboriginal sub-group, e.g. hunting or collecting party, etc.. His suggestion rests on structure size and type, lithic assemblage, ethnographic documentation, etc.. Botanical investigations in southwest Oregon have been few, therefore, in the absence of comparative data, it is not known whether site function can be distinguished from the botanical assemblage alone. It may have been productive to analyze soil samples from House 6, apparently a menstrual hut, on the assumption that the seed assemblage would reflect the specialized use and population of that feature.

The presence of acorn and manzanita seeds, which were known ethnographically to have been collected and processed by women (Sapir 1907:258 - 259) in concert with remains of deer and elk (Schmitt 1986) which were hunted by men (Sapir 1967) suggests this was not a site occupied by a specialized group of people. Brauner's hypothesis of family occupation can be tentatively supported by inferring from the archaeobotanical and faunal evidence that 35JA42 was occupied by a mixed gender group.

Seasonality

The phenology of fruits and seeds represented in the Applegate archaeobotanical assemblage overwhelmingly points to a fall or winter occupation of the site (see Table 6 for seasonal availability). When coupled with faunal data which indicate winter occupation (Schmitt 1986:07), site environment and location, and ethnographic evidence, the seasonality of site utilization is secured.

Sequence of Occupation

The sequential, rather than simultaneous occupation of the pithouses at 35JA42 has been discussed at length in the context of formational processes, with particular reference to: 1) mode of structural degradation, 2) housekeeping and refuse disposal practices, and 3) degree of disturbance. Abandonment and subsequent burning of House 3 and its use as a refuse dump or a possible source of hearthstones and plant processing tools preclude simultaneous occupation of Houses 1 and 2. Other factors, as noted by Brauner (1983), such as sterile soil from construction of House 1 overlying cultural soil in House 2, point to sequential occupation of Houses 1 and 2. Essentially, macrobotanical evidence alone cannot support or refute Brauner's hypothesis of sequential occupation. There have been too many variables at work on the macrobotanical assemblage; more reliable support for this hypothesis comes from other factors.

Cultural Affiliation

Brauner has supposed that site occupants were the Applegate Athapascans or *Dakubetede* apparently ethnographically indistinguishable from the Takelma and neighboring Shasta (Brauner 1983, Kroeber 1920). Macrobotanical evidence can indicate adaptive similarities between ethnographically known peoples and the occupants of 35JA42, but cannot verify cultural affiliation. A comparison between the archaeobotanical assemblage from the Applegate site and ethnobotanical accounts may support the premise of Athapascan occupation assuming that archeobotanical remains reflect cultural preference for certain plant resources. Discussion of ethnobotanical practices of site occupants is expanded here to meet one of the goals of this research.

Sapir, Drucker, Harrington, and Card are the primary sources of ethnographic data which provide accounts of Takelma and southwest Oregon ethnobotanical practices. It is assumed that these documented plant preferences are relatively congruous with those of the Applegate Athapascans. The staple plant food in southwest Oregon was apparently acorns, followed in importance by camas and manzanita berries. Other important foods were sugar pine nuts, madrona, fern roots, skunk cabbage roots, tarweed and grass seeds, various berries, and green shoots.

Similarity between the botanical preferences of the ethnographic southwest Oregon Indians and the inhabitants of 35JA42 can be seen in the table below, with a major exception; manzanita berries dominate the archaeobotanic assemblage where acorns and camas were ethnographically recorded as staple foods.

Table 11. Comparison between Ethnobotanical Resources of SW Oregon and Archaeobotanical Evidence from 35JA42

Plants Foods Listed in Ethnographic Accounts (Listed in order of dominance in the diet)	Taxa Recovered from 35JA42 (% of units in which taxon occurred excluding hand-collected material)
Acorns	Manzanita 100%
Camas	Acorns 28%
Manzanita berries	Compositae 17%
Sugar pine nuts	Pinus. 17%
Madrona	Chenopdiaceae 6%
Fern roots	Vitis 6%
Skunk cabbage roots	Abies 6%
Tarweed, grass seeds	
Berries, green shoots	

Acorns

I believe the apparent disparity between the recorded ethnographic importance of acorns and the actual on-site occurence can be partly explained by the 1) mode of location of acorn preparation and, 2) non-random sampling methods, among other factors already discussed above. In order to obtain "nut meats", acorns were shelled; the shells were either burned or thrown away as waste. The meat was pulverized and processed further. Sapir (1907:258) says that, "A hole about an inch in depth was cut into the ground so as to hold the . . . flat rock on which acorns were pounded", possibly suggesting a processing location outside the house structure.

Due to the fact that acorn shells were removed from the meat and then burned or disposed of in a location outside the house, the probability of recovering acorn remains from house floor and hearth samples is considerably reduced. In addition it is assumed that because of the high starch and fat content of acorn nut meats (Baumhoff 1963: 162-163), nothing would remain over time in an archaeological setting, unless preservation were mitigated by unusual circumstances.

In addition, field sampling methods may have influenced the frequency and distribution of Quercus in the archaeobotanical assemblage. As stated above, acorn shells were collected during field operations in 1982 by hand from the living floor surfaces when sufficiently large to be detectable; soil samples were obtained when sufficient concentrations of botanical material appeared in the 1/16" screen. In my opinion, it may have been difficult for field school students to detect large acorn shell fragments or concentrations of small shell debris. Therefore, the archaeobotanical assemblage available for sampling may have been biased against Quercus remains. However, Brauner (1990) has stated that field crew members were intensively trained to spot large macrobotanical remains. On the other hand, at Elk Creek, Pettigrew (1988) has found a less than expected occurence of acorn remains at four pit-house sites: JA100, JA59, JA27A-B. He has suggested that the reduced frequency of Quercus is due to difficulty in distinguishing small shell debris and fragments from the cultural soil matrix and other organic material.

Camas

It is assumed that seasonality of occupation, based on the archaeobotanical evidence, was fall/winter. According to ethnographic accounts and phenology, camas would have been available for collection in the spring. The bulbs were baked in earthen ovens, mashed into a dough and, "made into the form of a big pan, kept for winter use" (Sapir 1907:258).

Presumably, then, the Applegate Athapascans could have had a supply of processed camas for use at 35JA42. However, several factors have eliminated the possibility of camas occurring in the archaeobotanical assemblage: 1) plant resources with high starch content such as camas (27.1 gms carbohydrates/100 gms edible portion. Hilty et al. 1980) degrade rapidly and presumably would have disappeared from cultural deposits, and 2) most importantly, only carbonized whole or nearly whole <u>seeds</u> were considered in this research. However, no whole charred bulbs or bulb fragments were detected by either Smith or myself in spite of the composition of the sampling universe.

Manzanita nutlets, on the other hand, are very "seed-like" in appearance and easily detected in the screen; they are relatively hard and resistant to decay and attrition. Manzanita berries may have been processed within the living structure, in contrast to acorns and camas, and therefore, available for sampling in increased numbers.

In summary, although at first glance it seems that comparative absence of acorn and/or camas remains, and the correlative abundance of manzanita nutlets may indicate an adaptive preference different from the ethnographic Takelma/Athapascans, dominance by manzanita may be explained by mode and location of plant food processing, seasonality of occupation, and sampling procedures. Based on the presence and frequency of manzanita, acorns, Compositae, and <u>Pinus</u> evidence, and assuming that the apparent absence of camas and the less than expected frequency of acorns is due to the factors discussed above, then adaptive preferences of the inhabitants of 35JA42 appear relatively similar to those of the ethnographic Takelma.

On the other hand, rather than attempting to define the relative importance of each taxa in the aboriginal diet, it may be wiser to take a more conservative view. Begler and Keatinge (1979) have stated that in many cases, the relative importance of dietary items may not be identified due to inherent limitations in quantification of remains and that, at best, a mere presence/absence comparison across houses can lead to a "shopping list" of those botanical resources assumed to have been exploited by aboriginal inhabitants. In addition, conclusions about the relative importance of taxa are less secure at 35JA42 in part due to lack of soil samples outside houses and across non-site locations as well as lack of corroborative evidence such as copralite or pollen analyses. Therefore, the target population -- the full range of botanical resources represented in proportion to their economic importance as utilized by proto-historic humans at 35JA42 -- may not be fully disclosed in the archaeological context. As Begler and Keatinge (1979), and Dennell (1972, 1974, 1976:230) have emphasized, carbonized plant remains are not random in composition and may not directly represent the prevailing economy.

The same theme is stressed by Gasser and Adams (1981), who found that less than 1% of the plant remains at Walpi were carbonized and those constituents did not accurately represent the entire assemblage. However, they have concluded that unfortunately, carbonized elements (and pollen) are generally the only botanical evidence available from open sites. Absolute seed numbers may not reflect a primary reliance upon or exploitation of manzanita seeds above other resources. Arctostaphylos fruits generally contain 58,000 nutlets per pound (see Table 6, USDA Handbook 1974). Dennell (1976) has commented that some fruits may contain numerous seeds and are, thus, represented in the archeobotanical assemblage by large numbers of seeds. Therefore, estimating the economic importance of a plant by its numerical frequency alone may be misleading. Grayson (1984) has pointed out many of the problems related to analyses of taxonomic frequencies based on specimen counts. If, instead, Renfrew's (1974) method of inferring economic status by estimating the percent of samples in which the taxon is the dominant plant is applied here, then manzanita may be seen to have been of primary dietary importance.

Regional Ethnobotany

Valid behavioral inferences concerning extractive, energy-producing activities of the Applegate Athapascans, specifically those involving botanical resources, are dependent on representativeness of the archaeobotanical assemblage or upon recognition of processes that may have biased the assemblage. Research strategy pertaining to analysis of macrobotanical remains from 35JA42 called for examination of carbonized seeds, a scheme which guarantees inherent biases not only because carbonization is not a random event, but other plant components such as leaves, roots or tubers are excluded. Additionally, Dennell (1972, 1974, 1976) and others (Shackley 1981, Ford 1978) have repeatedly emphasized that samples of carbonized remains are not random in composition and cannot be considered as indicative of the full range of botanical resources exploited by an aboriginal people.

However, through this research, we have gained a better understanding of the botanical subsistence resources utilized by protohistoric southwest Oregon native peoples. Apparently manzanita, acorns, pine nuts, and possibly members of the Compositae and Chenopodiaceae families, and grapes were used as food resources while Abies seeds may have co-occured as a result of using fir branches or foliage in some capacity other than food. It has been confirmed that early people were living in pithouses in the uplands on a stream-side bench during the fall/winter, gathering available indigenous plant foods, processing them and probably storing them through the winter. Schmitt (1986) has outlined the concomitant exploitation of faunal resources such as deer and elk. However, beyond this, ethnobotanical practices of early native people in the Applegate drainage remain relatively obscure. Much more investigation must take place before the entire range of subsistence strategies is illuminated. Ethnobotanical research in southwest Oregon is in its infancy; the database is just beginning to be constructed.

When this work is combined with Prouty's at the Saltsgaver site and Pettigrew's at Elk Creek, a sketchy picture of southwestern Oregon adaptive strategies through time can be drawn. At the Saltsgaver site, situated on a broad flat alluvial flood plain near the confluence of Bear Creek and the Rogue River, Prouty (1988) investigated 108 camas baking ovens which he suggests were used from 5310BP to historic times. Other botanical resources utilized at this same low elevation location were probably acorns, other nuts, seeds, and tubers.

Along Elk Creek at approximately 1400' elevation, Pettigrew (1988) excavated a number of pithouses dating approximately over the last 1000 years. Seed assemblages (absolute counts) from four sites were composed of:

1) 35JA100 -- most abundant resource was manzanita, followed by huckleberry, rye grass, borage and lamb's quarters. Whole acorn made up only 0.4% of the total.

2) 35JA59 -- Most abundant resource was lamb's quarters, followed by madrone, manzanita, and rye grass.

3) 35JA27A -- Most abundant was lupine, followed by lamb's quarters and borage.

4) 35JA27B -- Only bluegrass and lamb's quarters were represented.

The Applegate site, 35JA42, at an elevation of 1750' sheds further light on the economic pursuits of southwestern Oregon early peoples, particularly between 1750 - 1830AD.

Information from the three sites described above provide a sketchy foundation for a regional ethnobotanical data base.

CHAPTER VI

CONCLUSION

During the summer of 1982, a protohistoric archaelogical site located on a streamside terrace above the Applegate River in southwest Oregon was excavated by David R. Brauner and his field crew from Oregon State University. Three house pits and a possible menstrual hut were uncovered with lithic, faunal, and archaeobotanical components recovered from house floors and hearths. Following excavation and lithic analysis, Brauner had postulated that the site:

1) dated to protohistoric/early contact periods, ca. 1750-1830 AD.

2) was occupied by a single nuclear family or a small extended family.

3) was occupied over several successive winter seasons rather than all three houses being occupied simultaneously.

4) was occupied by native peoples who maintained trading relationships either within an aboriginal trading system or directly with Euro-Americans or both.

5) was occupied by the same family or families.

6) was occupied by Applegate Athapascans who were culturally similiar to neighboring Takelma people.

My research has dealt with the processing, analysis, and interpretation of the macrobotanical remains recovered from soil samples from the Applegate site, 35JA42. The main goals of this research were:

1) To determine whether the macrobotanical remains from the three house structures could be useful in testing Brauner's hypotheses as listed above.

2) To expand the picture we have through ethnographies of the ethnobotanical practices of the aboriginal occupants of southwest Oregon, and to interpret the ethnobotanical practices of the inhabitants of 35JA42 based on the macrobotanical remains. It was assumed that these relics did not represent the full range of plant resources exploited by the aboriginal people.

A literature search indicated that the diversity, complexity, and age of geologic features in southwest Oregon were critical factors in influencing the botanical resources available to protohistoric native Americans. Geologically, southwest Oregon is one of the oldest areas in western North America. Parent material, substrate, topography, climatic regimes, and a long history of fire disturbance have also influenced the plant communities of the Applegate Valley. Today, as was most likely during occupation of the site, climate is typically mild, damp winters and hot, dry summers. Floristically, southwest Oregon is very complex, presenting a vast array of resources for aboriginal people within a fairly small geographic area.

Early people were central-based wandering families who extracted faunal and floral raw materials from diverse habitats throughout a seasonal round. The Applegate site is located within oak woodlands heavily co-populated by sclerophyllous shrubs such as manzanita and ceanothus. Exploitation of these resources is inferred from the archaeobotanical remains recovered from soil samples. It has been assumed that early native people would have utilized botanical resources from neighboring plant communities whenever culturally-preferred plant products were available. Southwest Oregon plant communities overlap and merge with similar plant communities in northern California inland valleys, and frequently along the N. California/S. Oregon coast.

Because of the commonalities in topography, climate, floral compostition and faunal resources, ethnographers and other researchers have classified southwest Oregon aborigines as adaptationally similar to natives of northern California and the coast with resultant similarities in archaeological assemblages.

Early ethnographers were primarily linquists who collected plant-related data secondarily and who documented that the Applegate and Rogue River Valleys were inhabited by Takelma and Athapascan speaking peoples. A great deal more investigative energy was spent on the Takelman speakers although the majority of ethnographers agreed that Takelma and Athapascan adaptational behaviors were extremely congruous. This study relies primarily on data collected on the Takelma and assumes that this data can be utilized for drawing inferences about Athapascans who lived along the Applegate River.

Applegate Athapascan people depended on local plant resources for food products, structural elements in habitations, basketry, clothing, domestic implements, and weapons, etc. Ethnographies state that acorns, camas, and manzanita were the primary food resources; semi-subterranean habitations were constructed from split pine boards layered with bark as exterior protection. Evidence of both plant foods and structural elements was recovered from 35JA42 coinciding with ethnographic data.

This research was based on data derived from carbonized seeds recovered from hearth and house pit floor samples during the 1982 field season. Soil samples consisted of 100% of the hearth material and comparative samples obtained from house floors. Analysis included macrobotanical material which had been hand-collected as it became visible during the excavation process.

My initial work consisted of processing soil samples through handsorting and flotation in order to recover the carbonized whole or nearly whole seeds. A nested sampling strategy was employed to reduce processing time. Seeds were then tentatively identified with collaborative identification by Ruth Post of the Oregon State University Seed Laboratory.

Analysis of botanical diversity, relative seed density, and seed distribution across the site was based on 20% of the hearth contents and samples taken from subjectively chosed locations across house floors. Inferences derived from the data were influenced by:

1) sampling strategies and methods during field work.

2) sampling strategies during the laboratory phase

3) original depositional processes

4) taphonomic processes

Briefly, analysis of the archaeobotanical material tentatively identified the presence of seven taxa: Quercus, Arctostaphylos, Pinus, Compositae, Chenopodiaceae, Vitis, and Abies. Distribution of taxa varied across the site along with relative seed density (absolute numbers of seeds divided by matrix weight). Essentially, House 1 had the greatest botanical diversity with six taxa present; House 2 had the least with only two. Greatest relative seed density occured in House 3 with Arctostaphylos although this genus had the greatest relative density by far in all three houses. Botanical taxa in hearths were represented by acorn shell fragments, Arctostaphylos seeds, and Compositae. All taxa were present on house floors.

It had been presumed based on ethnographic documentation, that Quercus would occur in the greatest relative density in the greatest number of samples. Rather, Arctostaphylos occurred ubiquitously across the site with the greatest relative density. Hypotheses for this apparent disparity have been discussed; variables that may have influenced the archaeobotanical assemblage include:

1) composition of the autochthonous seed population previous to aboriginal occupation.

2) varying length of house occupation

3) seasonality

4) function of structures

5) differential preservation of plant material

6) varying plant food preparation methods and location

7) faunal-and floralturbation

8) historic events

9) techniques and locations of excavation, processing, and sampling

Three primary affective events are believed to have influenced distribution of botanical material across the site:

1) mode of structural degradation—catastrophic fire vs. natural degradation

2) refuse disposal practices/housekeeping practices

3) degree of disturbance

After weighing and discussing these variables, it was determined that a simple "shopping list" of botanical resources utilized by protohistoric inhabitants of the site was the most reliable conclusion of this research. Many variables simply could not be controlled for, especially biases introduced through subjective sampling procedures and locations.

In addition, I concluded that none of Brauner's hypotheses concerning the site could be refuted by the archaeobotanical assemblage. Several, however, were corroborated:

1) seasonality - early fall/winter

2) site function - mixed gender occupation

3) adaptational similarities - inhabitants of 35JA42 were adaptionally similar to ethnographically documented Takelma and Athapascan speakers.

Therefore, it can be seen from this research that macrobotanical remains can provide valuable, supportive data.

Macrobotanical remains from the Applegate site have added to the expanding store of information on aboriginal ethnobotanical practices in southwest Oregon. When coupled with other research such as Prouty's camas oven site (the Saltsgaver site) and Pettigrew's work on Elk Creek, a picture of Native American plant use is drawn that does not differ substantially from ethnographic sources. Acorns, camas, and manzanita were the primary plant foods with native peoples extracting plant products as they became seasonally available: fall/winter in the foothills and on streamside terraces relying on oak woodlands or sclerophyllous shrubs such as manzanita; spring/summer along water courses in the valleys gathering and processing camas, sunflowers, or grass seeds.

Ethnobotanical studies in southwest Oregon have been relatively infrequent; a great deal more research must be accomplished before we can begin to look at adaptational change through time or explanations for behavior.

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