Integrating Historical Environmental Data with the Cultural Record: Laying the Foundations for Interpretation of the Archaeological Record

Paper Presented to:
The Society for California Archaeology

April 9, 1993
Monterey, California

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Authors Note:

Portions of this paper were incorporated into a book published by the Forest Service in 1995: *The Environmental and Cultural Ecology of the North Fork Eel River basin, California*.

I am including this paper on my web site for researchers and the general public since the book is out of print. Also on my web site see Keter and Busam 1997: *Growing the Forest Backwards: Virtual Prehistory on the North Fork of the Eel River*.

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I have tried to refrain from making changes to the original text except for minor editing. I have, however, in a few places included comments within text boxes or brackets due subsequent research that in some way (for better or worse) has led me to change or modify my data or conclusions.

TK
November, 2015
Three Rivers, Ca.

Introduction

This paper is one in a series (Keter 1986, 1987, 1988, 1989, 1990, 1992) which documents the environmental and cultural history of the North Fork of the Eel River basin located in southwestern Trinity County (see Map 1). The purpose of this portion of the study is to synthesize data related to the historic environment of the North Fork basin with the area's ethnographic record. This synthesis is produced in order to provide insights into the procurement and utilization of natural resources by the aboriginal peoples of this region. Ultimately, this information can be useful in interpreting and providing a context for the region's archaeological record.

A catchment analysis is presented which integrates regional pollen analysis data and paleoclimatic data with the basin's historic environmental record in order to formulate a dynamic (diachronic) model of the environment for the prehistoric era in the North Fork region. In effect, this catchment analysis delineates the potential resource base and procurement opportunities available to the aboriginal population through time and in a changing environment. The purpose of the catchment model is to permit us, as Richard Gould (1975:153) writes, to "examine the universe of edible resources in this region from the point of view of how human beings must organize their movements, technology, and social groups in order to collect them effectively."

An overview of the ethnographic data for the region related to the kinds of natural resources utilized by the inland southern Athabascans follows the catchment analysis. Given the resource base outlined for the North Fork catchment and the region's ethnographic record, the final part of this paper presents some suggestions on potential site settlement patterning and the kinds of sites likely to be found in the North Fork region.

A Diachronic Catchment Model for the North Fork Basin

A Catchment Analysis Model is a useful method of organizing the environmental data needed to analyze prehistoric settlement patterns and subsistence activities. Kent Flannery (1976:19) defined a catchment as "the zone of resources, both wild and domestic, that occur within a reasonable walking distance of a given village." More generally, it can be defined as "a method of regional [environmental] analysis designed to examine prehistoric site locations and land-use patterns" (Francis and Clark 1980:97).

To date, much of the work applying Catchment Analysis Models to the archaeological record has consisted of examining the environmental context of a single site or group of related sites (Vita-Finzi and Higgs 1970, Rossman in Flannery 1976:95-103). Within the North Coast Ranges, Dwight Simons (1983) conducted this type of catchment analysis for a series of sites located on Pilot Ridge and for a site located to the east of Round Valley on the Black Butte River (Eidsness 1986). Simons (1983:3.35) has summarized the major criticisms of the catchment theory as it has been applied to human populations and to the interpretation of the archaeological record. Criticisms relevant to this portion of the current study include:

1. The use of present day environmental conditions and use patterns as a key to the past.

2. Seasonal variation in resource availability and productivity not being adequately considered.

3. Failure to consider that catchment models often represent static, synchronic views of subsistence behavior [and the ecosystem].

In response to the criticisms cited above, the catchment model for the North Fork basin takes into account environmental change resulting from land-use practices during the historic period which (as documented earlier in this study, see Keter 1986, 1987, 1988, 1989, 1992) have had profound effects on the North Fork ecosystem. Seasonal variability of the resource base is also integrated into the model. Moreover, the model also accounts for the temporal dimension during the prehistoric era by using pollen analysis data and paleoclimatic data to formulate a time-sensitive or diachronic environmental model. The temporal dimension is important since the availability of specific plant and animal species as potential procurement resources has varied significantly, given the changes in climate and vegetation communities over time, since the beginning of the Holocene. This variability has implications for human populations since the availability of subsistence resources and their distribution across the landscape should be reflected in the archaeological record both temporally and spatially.

In formulating this catchment analysis, an effort was made to consider cultural variables which might also have influenced the evolution of the region's ecosystem. There is an intrinsic relationship between the environment and the land-use activities and subsistence strategies of prehistoric populations. While the environment has influenced human land-use activities, cultural variables including anthropogenic fire and intensity of resource procurement activities have, in turn, affected the region's ecosystem. Hunter-gathers were far more than passive observers of the ecosystem within which they lived. A dynamic existed between the potentialities of a particular environment and the effects to that environment by the land-use activities of its human inhabitants.

In utilizing the Catchment Analysis Model, a theory developed for the biological sciences, and applying it to hunter and gatherer societies, it should be remembered that resource procurement strategies and site settlement patterns are not entirely determined environmentally (by what might be classified as a form of the paradigm of environmental determinism). Technological, social, and other cultural factors play a role in formulation of settlement and subsistence strategies (see Keter and Heffner-McClellen 1991).

The catchment area for this study is defined by the North Fork Eel River watershed and utilizes the 1865 baseline environmental data presented earlier on vegetation, wildlife, and anadromous fish. The baseline environmental data is then placed within the parameters set by the North Coast Ranges paleoclimatic and pollen data (see Keter 1988) to create a diachronic model of the North Fork basin. There are a number of factors which must be considered when applying paleoclimatic and pollen data to the North Fork basin from the various locations sampled by James West in the North Coast Ranges. These factors include differences between the North Fork region and the pollen sample locations in altitude, latitude, distance inland from the Pacific, and local conditions such as soils, exposure, and micro climate all of which can affect the distribution of vegetation associations.

Shifting regional climate patterns were subtle and probably occurred over a long period of time. Significant changes in vegetation distributions in response to the changing climate took place even more slowly. Graph I presents a hypothetical model of the long-term trajectories of the plant communities found within the North Fork basin based on vegetation survey data, historic environmental studies, and paleoclimatic data. Development of a prehistoric catchment analysis model is necessarily generalized and the time-frames presented below are approximate. The purpose of this portion of the study is to begin organizing environmental variables into a coherent model which then can be used for the interpretation of artifact assemblages recovered in the North Fork of the Eel River region.

<u>Xerothermic Period</u> (8,500-3,000 B.P.)

[This section is based on Keter 1988 and relies on pollen data from sites in the North Coast Ranges and paleoclimatic data. See West 1983a, 1983b, 1988, 1990, 1991, and Davis and West 1983]

During this period, plant communities in the basin moved up slope about 300 meters in altitude and the temperatures were about 1.3 to 2.1 degrees centigrade warmer than today resulting in somewhat warmer, drier summers with a longer dry season. With longer drier summers, it is likely that the oak species currently found in Round Valley (15 air miles to the south) and to the east in the Sacramento valley (at the same latitude) would have extended their range northward and westward. The vegetation associations during this era would have been similar to the more open Blue Oak/[Gray] Pine Vegetation Type (Kuckler 1977: Map) found today in the Coast Range foothills along the western edge of the Sacramento Valley and to the south in portions of Mendocino, Napa, and Sonoma Counties. [gray] pine were more abundant than today, and the oak savanna and savanna vegetation associations were major components of the environment (see Graph I). Natural fire, and possibly towards the end of the Xerothermic Period anthropogenic fire, would have occurred periodically helping to maintain or encourage these vegetation associations.

It is probable that during the Xerothermic Period a migration of plant species northward of only about 50-70 miles would have produced a species mix very different from that which exists today. A useful analogy, in attempting to model the past environment of the basin, is to compare it to an area existing today which has climatic conditions similar to those which might have been found in the basin during the Xerothermic Period.

A movement up slope or down slope of 300 meters by vegetation communities in response to climatic change is, relatively speaking, equal to a distance north to south of about 140 miles. Therefore, by examining vegetation associations present today about 140 miles to the south (with some attention given to soil types and historic land-use factors), and at the same altitude and inland location, one can gain some insight into the kinds of vegetation associations which were likely to have existed at lower elevations within the North Fork basin during the Xerothermic Period.

The San Francisco Bay area is located about 140 air miles south of the basin. Here, the vegetation associations are influenced by their close proximity to the Pacific Ocean and San Francisco Bay. For comparison purposes, therefore, a slightly more northerly location was selected for study; the northern portion of Napa County southwest of Lake Berryessa. This area is approximately 110 air miles to the south of the North Fork basin. Here, vegetation communities which are located at 1,500' to 3,000' above sea level are quite different than those growing at the same altitude within the North Fork basin. Both locations, at the beginning of the Contact Period (the mid-19th century), had extensive areas of savanna, oak savanna, and oak woodlands. In the Lake Berryessa area, however, the oak species were different. There is also a significant decrease in the distribution of Douglas-fir which are limited to the highest elevations and to areas with topographical shading (usually north facing slopes).

In northern Napa County, white oaks are uncommon and are found only in disjunct populations at a few locations and at relatively higher altitudes than within the North Fork basin. The most common oaks in the Napa region are California live oak (*Quercus agrifolia*), valley oak (*Quercus lobata*), blue oak (*Quercus douglasii*), and black oak (*Quercus kelloggii*). Today, live oaks are found as far north as southern Mendocino County (Griffin and Critchfield 1972: 34). The northerly limit of valley oaks in the Coast Range is near the Trinity County line (Griffin and Critchfield 1972: Map 74). Valley oaks are not restricted to alluvial soils and can be found on open savanna and broader ridgetops directly to the east of the North Fork basin in Tehama and Shasta Counties (Griffin and Critchfield 1972:36). Blue Oaks are found only a few miles to the south of the basin in the hills directly to the north of Round Valley. One isolated remnant blue oak stand is located in Trinity County east of Redding in the Browns Creek/Reading Creek area (Griffin and Critchfield 1972:35).

The main characteristic of these oaks and their associated vegetation species, when compared to the white oak woodlands found today in the North Fork region, is that they are better adapted to a slightly drier and warmer climatic regime with a longer dry season. In addition, the number of trees per acre for these more xeric oak species is, generally, not as great as that of the white oak vegetation association type (Baumhoff 1963:165).

Given the vegetation associations described above, it is likely that during the Xerothermic Period the North Fork basin at lower altitudes would have been composed of extensive oak woodlands (Primarily black oak, blue oak, valley oak, and [gray]pine), some scattered ponderosa pine, significant areas of oak savanna (grasslands with only a few oaks per acre), and savanna grasslands. On areas with poor soils, especially with southern exposure, [gray] pine, manzanita, and other brush species predominated (see Graph I). It is likely that Douglas-fir and the other species of the Mixed Evergreen Forest vegetation type were only a minor component within the basin, limited at lower elevations to some north slopes and other locations which provided topographical shading and conservation of soil moisture. Most Douglas-fir were found above 3,500'-4,000'. White oaks were not common within the basin, especially at lower elevations. The range of the white oak is limited by rainfall, needing four to ten inches during its growing season from April to September (West 1988:8). Today white oak distribution in the Coast Range extends south to about central Sonoma County, with disjunct populations extending somewhat further south. For example, there are two small populations of white oaks in the Santa Cruz Mountains (Griffin and Critchfield 1972: 100). Most of these oaks are found in the cooler more mesic micro-environments of that region.

At higher elevations, in the Yolla Bolly region, more arid winters favored the growth of western juniper, fox-tail pine, and aspen these tree species would have had a wider distribution than today extending north to Scotts Valley along the interior of the Coast Ranges and Klamath Mountains.

It is not clear how the Xerothermic Period would have affected the grasses and forbs (see Appendix II Table 1) growing in the savanna and oak woodlands. A slightly warmer and longer dry season may have affected the species mix (as is evident for the species growing to the east and south today, see Beetle 1947 for distributions of grass species). It is likely, however, that some species of perennial bunchgrasses (such as *Stipa spp.*) would have predominated in the region. Clovers and other "greens" (see Appendix II Table 3), and bulbous plants (see Appendix II Table 4) may also have been affected to some degree by the longer drier summers. Oak acorns, also an important food resource for both human and some animals, would have been less abundant than today with the decrease in extent of the oak woodland vegetation communities and an increase in the areal extent of savanna grassland communities (see Graph 1).

Although a change in oak species and a decrease in the size of the fall acorn crop may have been significant, it is not clear if this reduction in acorn availability influenced or was a significant limiting factor to human occupation. Both the valley oak and blue oak acorns produce relatively abundant acorn crops and are highly ranked as preferred species for native use (Baumhoff 1963:163). Blue oaks, however, frequently fail to produce an acorn crop. An abundant acorn crop is produced no more than one year in three (Baumhoff

1963:165). Moreover, regional models and artifact assemblages suggest that acorns were not a major food resource during the Early Period (prior to about 2,500 B.P.).

The climatic conditions and vegetation associations present within the North Fork basin during this period would have affected the habitats of both terrestrial and aquatic fauna. For this study, the most important species of animals to discuss related to aboriginal subsistence activities are deer and anadromous fish (see Appendixes III and IV).

Today, most deer leave the North Fork drainage during the long hot summers. They tend to travel up slope to summer range (Burton n.d.: 30) in the Yolla Bolly Mountains, the Round Mountain/Lassics region, South Fork Mountain, and other locations above 4,000' (approximately 1300 meters). Given the fact that during the Xerothermic Period vegetation moved up slope approximately 300 meters in response to warmer temperatures, it is likely that the summer deer range was also correspondingly somewhat higher than today. This rise in altitude would have reduced significantly the amount of habitat in this region available for summer range (many of the peaks and ridge lines in the basin including Jones Ridge, Mad River Ridge, and Haman Ridge are between 3,500' and 4,000'). The reduction in summer habitat and concentration of deer at higher altitudes (probably to areas above about 4,500') may help to explain the presence of so many Early Period sites at higher altitudes in this region (for example, Government Flat, Estle Ridge, Soldier Ridge, South Fork Mountain).

It is not known at this time if the reduction in summer habitat would have been major factor in limiting the size of the deer population. However, given both the reduction in adequate summer habitat and the reduction in the size of the fall acorn crop, it is likely that the deer population although more concentrated during the summer was somewhat smaller during the Xerothermic Period than during the ethnographic era.

As noted elsewhere in this study, elk were not present within the North Fork basin during the historic era. Given the even warmer temperatures of the Xerothermic Period, it is unlikely that a significant elk population inhabited the North Fork basin. The possibility of elk summering at higher altitudes in the region must (along with deer) be considered, however, as a reason for the high density of early period sites for some of the higher elevation ridges and mountains of the North Coast Ranges.

Given the climatic patterns outlined earlier for the Xerothermic Period including warmer, longer, and drier summers (and most likely less yearly rainfall and reduced snowpack), stream flows would have been reduced within the basin. It is likely that the density and distribution of the riparian vegetation would have also been reduced. Given the critical need for cold water temperatures and adequate water flows to maintain critical summer habitat, it is likely that there was a significant reduction in the number of anadromous fish found within the North Fork basin. For this reason, it is hypothesized that the availability of fish as a procurement resource would have been very limited. It is also likely, that the number of perennial springs in the region would have been reduced influencing both the distribution of deer and other species of wildlife and the selection of locations for temporary seasonal camps and villages.

<u>Post Xerothermic Period</u> (3,000-2,500 B.P.to 1865 the Beginning of the Historic Period)

By about 2,500 to 3,000 years ago, the distribution of plant species and vegetation associations began responding to the changes in climatic conditions as a more maritime weather pattern began to dominate the northwestern California region. White oak and Douglas-fir began to move down slope and spread across the lower elevations of the basin as the more xeric species of oaks retreated to the south and the distribution of the savanna and blue oak/[gray] pine woodland vegetation types began to decline (see Graph I). It is likely that an extended time period (measured in centuries) was needed for vegetation associations to respond to the changing climatic conditions.

Several research papers (for example Lewin 1985:165-166, Ritchie 1986: 65-74, Cole 1985: 289-303) have discussed the response of vegetation to changes in climate. It appears that once established vegetation associations tend to maintain themselves long after suitable initial conditions for their establishment have disappeared. Therefore, the vegetation distributions within the North Fork basin did not simply change over-night in response to changes in the climate. Rather, an extended period of time was needed for the white oak woodlands to become established and before conditions were right for any major succession of the area to Douglas-fir (as noted earlier in this study, the white oak vegetation association in this region is the seral [intermediate] stage for climax growth Douglas-fir forests).

Natural fire also played a role in slowing the rate of change within plant communities taking place in response to the moderating climate. It is also likely that sometime during this era, aboriginal land-use activities (including anthropogenic fire and resource procurement activities) became a major factor influencing the environmental dynamics of the region.

During this period, the change in climate would have resulted in more summer habitat for deer. Fall acorn corps may also have been more productive due to the change in oak species to the more dense stands of white and black oaks and their increased distribution within the basin (see Graph 1). These improved conditions may have contributed to an increased deer population. It is also likely that grasses, forbs, bulbous plants, and other plant species were responding to changes in both climate and distribution of oak species.

With a more maritime climatic pattern influencing the region, stream flows during the dry season would have increased. Moderating climatic conditions (shorter dry season, reduced evapotranspiration, and possibly increased precipitation) also provided for increased ground water flows and the number of live springs in the basin. At lower altitudes, along the stream courses of the region, habitat would have improved for anadromous fish species and the availability of this resource is likely to have increased over time. These changes in the environment and the resulting increase in the availability of subsistence resources would have made this area more attractive for permanent habitation by humans.

The Cultural Record: Resource Procurement and Utilization for the Ethnographic Period

During the ethnographic period, the North Fork of the Eel River basin was inhabited by the Athabascan speaking Wailaki. Linguistic data (Whistler 1979) suggests that they may have inhabited this region for nearly a thousand years (this study considers the "late period" after approximately 1100 a.d. to be culturally contiguous with the ethnographic era). The Pitch Wailaki occupied the southern portion of the basin. That part of the basin to the north of about Rock Creek was home to people traditionally classified by ethnographers as the Lassik. Culturally, there were few differences between these two groups. A review of the ethnographic literature and the original field notes of the ethnographers who worked in the region indicate that the Lassik were in essence the northern communities of the Wailaki (Keter and Heffner-McClellan 1991). They were related through both cultural and social ties (including marriage and kinship) as well as through the need to cooperate in formulating and coordinating resource procurement strategies within the North Fork region.

Each community had its own chief and families had specific claims to hunting, fishing, acorn, and seed gathering locations. During times of need, families would share resource gathering locations with extended family members; even those living in distant villages. Visitors from other communities provided the opportunity to share information about the location and availability of resources. Lucy Young (one of the primary informants on Wailaki culture) indicated that this was an important topic whenever people got together to visit. The following paragraph is quoted from notes taken by her husband, Sam Young (of Wintu descent), and is unedited (from Essene's field notes).

> if a visiter comes to the camp the old folks make the children get back out of Sight of the visiters....someone of the old folks will spread a deerskin or something for the visiter to sit down....after Setting a while they give them something to eat then they will begin telling the news...the greater part of their talk will be about hunting and fishing and gathering seed of different kind, and of acorns of different kinds, and the most and best kind and the best Places to get some nice fat deer and the best places to catch a lot of fish to dry.... [Form the original.]

Very little ethnographic data exists concerning the subsistence activities of the inland southern Athabascans (see Keter and Heffner-McClellan 1991 for an overview of past ethnographic research in the region). It is clear from the available information that they were experts at exploiting an astounding variety of plants and animals for food and other subsistence needs. In the late Nineteenth Century, V. K. Chestnut (1974) recorded the use of plants for medicine and food by the Indians living at the Round Valley Indian Reservation (including the Wailaki and Yuki). Nearly every plant in the region had a specific use as a food or medicine (or both). Chestnut (1974:289) chronicled the use of hundreds of plants and was so inspired by their botanical knowledge that he wrote, "the inventive genius developed by these Indians, as a result of untold years of experience, is truly remarkable." Chestnut (1974:298) was particularly impressed with their use of plants for medicine and wrote "medicine has much to learn from the Indians." He also noted that one plant (*Rhamunus purshiana*) which was used by the Indians as a medicine was at that time in general use by the medical community and was prescribed as a cathartic (Chestnut 1974: 298).

The extensive and profound knowledge that hunting and gathering peoples have concerning their environment can best be illustrated using ethnographic analogy. During the 1980s Jared Diamond studied the *Fore*, a hunting and gathering people living on the island of New Guinea. During his field studies, Diamond was astounded by the taxonomic abilities of the *Fore*. In their small forested territory they could name sixteen frogs, 110 birds, fifteen small flightless mammals, twenty large mammals, two bats, and seventeen lizards and snakes. They could describe each species, what they sounded like, their habits, and if they were good to eat. Diamond (1989:16-23) writes of an experience where his hosts collected mushrooms for dinner. He warned that many kinds of mushrooms were poisonous and extremely difficult to distinguish from the edible species. His hosts asked indignantly why after they had identified so many plants and animals that he thought they would be so stupid as to confuse safe and poisonous mushrooms. They then went on to name twenty-nine kinds of edible mushrooms and where they could be found. Diamond writes that "even after years with the *Fore*, I didn't come close to exhausting their taxonomic knowledge."

An Overview of Seasonal Subsistence Activities

The following section presents a generalized overview of the subsistence activities of the groups in this region based on the limited ethnographic data (primarily Essene, Goddard, Merriam, and Foster both published and unpublished data). Refer to Appendixes II, III, and IV for a complete overview of the natural resources available within the North Fork basin.

In the North Coast Ranges during the ethnographic period, subsistence resources were so abundant that usually it was not necessary to travel long distances to collect them (Chestnut 1974:296). Although hunting and fishing provided a major part of the subsistence base, plants, especially acorns (and in the North Fork basin gray pine nuts), were the most important food resources utilized by inhabitants of the region (Essene 1942:55).

The inland southern Athabascans practiced a form of what has been termed the seasonal round. This subsistence strategy involves movement through the environment across ones territory in order to procure resources as they become seasonally available. The seasonal round is also referred to as transhumance. Year to year strategies might need to be modified because of drought, crop failure, or other events which might have caused the lack in availability of a particular resource. For example deer populations can fluctuate greatly and sometimes runs of anadromous fish are limited by unfavorable conditions. The scarcity of an important food resource most likely resulted in an attempt to harvest lower level resources. Significant loss of a primary subsistence resource might possibly result in hunger or even starvation (see Appendix I for an explanation of the rational used in ranking the subsistence resources of the basin).

Spring

After a long winter spent consuming primarily stored food resources, spring was welcomed for it provided the opportunity to secure fresh plant resources. Plants collected this time of year included clovers (see Appendix II Table 3), the young leaves and stems of the sunflower, and other plants which were consumed as "greens" (clover was actually a generic term used by Indians during the historic period to refer to a number of herbaceous plants which were consumed this time of year [Chestnut 1974:359]). Essene (1942:84) wrote, "the earliest clover is eagerly gathered as greens [and] have been a conspicuously absent dietary item during the past season." Chestnut (1974:359) noted that clover was an essential element of the Indian diet and that in the Round Valley region; it was "not uncommon to see Indians wallowing in the clover eating it by the handfuls." According to Chestnut (1974:360), chemical analysis indicates that clover contains some essential food elements.

Although not documented in the literature, it is clear from an analysis of anadromous fish runs (Keter 1992) that during March and early April steelhead and salmon were available for procurement (this conflicts with Goddard's [1924:217] statement that salmon did not migrate up the North Fork). By the end of April, anadromous fish runs were declining and eels were becoming available for procurement. Eel runs could last into mid or late May in some years. It is not clear just how important a resource eels were in this region. They have been ranked in this study as a secondary resource (see Appendix I) due to the fact that the small size and quantities of this resource were limited and because eels degenerate physically quite rapidly as they approach their spawning grounds.

It was sometime in the spring that the local communities began to leave their river villages to begin their seasonal migration through their territory. The travel to exploit seasonally available food resources in this region was not over great distances-- rather it was a gain in altitude. The usual pattern was for each extended family to travel alone, although several families might be together for weeks at a time. At certain times of the year many families would gather when a particular resource was abundant, not only for the purposes of collection but for an opportunity to socialize. It also appears that villages were not entirely abandoned during the summer and that occasionally families would return to villages for some period of time. In the North Fork area most upland locations in the Lassics/Round Mountain region and Middle Fork of the Eel River drainage are within a day's travel of the river villages. Cultural factors including socialization and the need to share environmental information on availability and location of particular resources were also factors considered in selecting the location of seasonal camps and may have been part of the impetus to leave winter villages for seasonal migration (see Keter and Heffner-McClellan 1991).

By late March or early April bulbous plants were maturing at lower altitudes and becoming available for consumption. Botanist V. K. Chestnut (1974:322) noted that: "nowhere in the world is there more characteristic abundance and variety of bulbous rooted liliaceous plants than in California." There were a number of species of the lily family and the camas family in this region (see Appendix II Table 3). The bulbs of these plants are highly nutritious with a nut-like flavor and were collected in large quantities for roasting (or sometimes they were boiled). They were collectively referred to by residents of the Round Valley Indian Reservation as "Indian Potatoes" and were dug up by women with a "potato stick" usually made of mountain mahogany. It is for this reason that many of the white settlers moving into California referred to the Indians of the state by the disparaging term of "Digger Indians" (Chestnut 1974:322).

[The common name "digger pine" for *Pinus sabiniana* is no longer used. The Jepson Manual recommends avoiding the use of this name as it is considered a pejorative term. I have edited this paper to reflect that change.]

The availability of bulbous plants in large quantities may have been the impetus for extended families from the smaller winter villages to gather this time of year at the relatively higher altitude valleys of the region for extended periods of time (Hettenshaw, Kettenpom, and Hoaglin Valleys) for both the bounty of the food resources and the opportunity for socialization (Goddard 1923:95). It was during this time (probably June) that the four day "camas" ceremony took place in Kettenpom Valley. A dance took place in a circular enclosure made of brush during each day and late into the night. This was considered by some informants the most important ceremony for the peoples inhabiting this region. One important characteristic of bulbs is that they remain edible long after they first mature. It appears that some bulbs were processed and stored for winter consumption (see Appendix II Table 4 comments section).

In the North Fork basin and adjoining areas of southern Athabascan territory deer travel in herds during the winter and spring making communal hunting practical (local residents during the early 1900s could count over 1,000 deer in one day, see also Foster 1944: 161). In the North Fork region, small herds of deer (15-25) can still be seen in April and May especially in the grasslands on the southern facing slopes (personal observation). Deer were taken in several ways including with a bow and arrows. Rope snares were also used. With this method, the snares were placed across well-worn deer trails and the deer were communally driven up the hillsides. As the game trails came together and passed over a narrow gap in the ridgeline a hunter would be located near the snares and would shoot any deer avoiding the snares or when they were snared the men would dispatch them using stones and clubs (Foster 1944:161). During certain times of the year (including spring) a deer drive would be organized every two or three days and there was no need to preserve meat because of the abundance of deer. Women and children helped in the butchering and carrying the meat back to the camp or village (Curtis 1924:23-24).

Summer

As warm weather arrived and the hillsides began to dry out, the availability of plant resources at lower elevations began to decline. It was during this period that families began to migrate to their summer camps located in the mountains. Interviews with local residents and Forest Service employees who work in the North Fork region also indicate that most deer leave the lower elevations in the summer when the heat is oppressive and many of the springs began to dry up. In addition, plants mature later at the higher elevations thus prolonging the availability of greens, bulbous plants, and other plant resources.

It is not entirely clear from the ethnographic literature exactly where summer camps were located in this region. It appears that some of these locations included South Fork Mountain, the head of the Mad River drainage, and the Lassics area. Other higher altitude locations where large numbers of prehistoric sites (as well as abundant resources) suggest longer term summer occupation include Hettenshaw Valley, Kettenpom Valley, Hoaglin Valley, and the Red Mountain Meadows area (although these locations are less than 4,000' in elevation they have abundant water and bulbous plants).

It is also quite possible that early twentieth century ethnographers may have overemphasized the seasonal round as practiced by the southern Athabascan in contrasting their subsistence practices with the more riverine oriented groups to the north. Some resources were available along the North Fork during the summer months. This included summer salmon and steelhead and resident trout and suckers (Keter 1992). Soap root was used to stun fish at this time of year when the flows were substantially decreased.

Fish (especially steelhead) were also caught bare handed by diving into large pools and catching them under the rock ledges (Interview 448). Also, the perennial bunchgrasses began to mature by early-to-mid July providing an important seed source. By August the grasses were mature and along with various other mature seed sources (see Appendix II Table 1) were used to make *pinole* a major storable resource. Therefore, it is possible that a number of individuals may have spent the entire summer in the river villages (for example the elderly), while occasionally entire families may have returned for some period of time. The concept of hunters and gatherers traveling throughout their territory motivated primarily by the pursuit of seasonally available resources independent of cultural and social factors is an overly simplistic model for the inhabitants of this region.

During the summer when the people camped in the hills they usually built brush shelters, or conical bark houses, or simply slept in the open (Essene 1942:12, 57). At the higher elevations, deer and plant resources including greens and bulbous plants were collected. Another food resource maturing during the late summer was the fruit of the buckeye (*Aesculus californica*). This tree, however, does not grow throughout much of the drainage. Buckeye are only found on the western side of the basin extending over the ridge into the Zenia area. Grasshoppers were considered a delicacy (and are high in nutritive value) and prairies were sometimes burned to kill and roast these insects which were immediately consumed.

Lucy Young indicated that summer was a "good time" because of the abundance of food resources available (Edith Murphy Notebooks). It appears that one of the most notable things about summer in this region was the wide variety of plant resources collected and the distance families sometimes traveled to both pursue resources and to socialize. This may indicate that summer was a time when no single food resource was available in large quantities at one location for an extended period of time. Instead, a wide range of secondary food resources occurring in limited amounts in any one area, but relatively easy to secure, were exploited across a wide area of their territory.

<u>Fall</u>

By late summer and early fall local villages and extended families began to collect, prepare, and store food for the coming winter. It is likely that at this time, the people returned to their winter villages so that transportation of food resources for winter storage could be accomplished efficiently.

The most important food resource for the inhabitants of the North Fork region was acorns (Chestnut 1974:333). Lucy Young told Essene (1942:55), "If Indians ain't got acorns, it seem like he ain't got nothing." Tanoak (*Lithocarpus densiflorus),* available in only limited areas in the North Fork watershed, white oak, and black oak acorns were the preferred species, with each being selected for a particular use (see Appendix II Table 5). Oak acorns ripen in early September and into October (personal observations indicate that in this region tanoak mature first, as early as late August, followed by white oak and then black oak). Foster (1944:165) noted that for the Yuki, oak acorns (*Quercus* spp.) were gathered for about two weeks after the first frost of the season which generally occurred in late September. Acorns which fell to the ground were collected as they were considered ripe. In addition, men would climb the trees and beat the nuts off the trees with long poles. The women then collected the nuts in large conical shaped burden baskets carried on their backs and supported by a wide band across their forehead so that both hands were free to collect acorns. A year's supply, about 400-500 pounds was collected by each family. Each species of acorns was processed in a particular way to render them useful.

Essene (1940:9, 56) indicated that for the inland southern Athabascans white oak acorns and some black oak acorns were stored outside in granaries which were bark covered and elevated off the ground. Tanoak acorns (when available) and some black oak acorns were stored inside reflecting the value placed on these particular species.

Acorns are very nutritious and their caloric power exceeds that of chestnuts, Brazil nuts, and almonds (Chestnut 1974:335). Lucy Young indicated that among the *Sittenbiden* (the name of her community at Alderpoint) tanoak acorns were considered best for acorn soup and white and black acorns were best for bread (Murphey 1941:359). Use of various species of acorns for bread and soup may have varied from tribe to tribe since Curtis (1924:23) indicates that for some of the Wailaki (on the main Eel River) tanoak acorns were also used to make bread.

Hazelnuts common to the canyons and hillsides of the region were also collected by the sacksful. Hazel branches and shoots were also used for basket materials. Another food resource available in the fall was gray pine nuts. Gray pines are found within the basin but not to the west. Lucy Young (Murphy notebooks) indicated that the "Pitch Indians" (*Che-teg-ge-kah*) were so named because they ate gray pine nuts [they are full of pine sap]. Sugar pine nuts were also a desirable product but were not as common in the North Fork region. They were more common in the Yolla Bolly region to the east.

Grasses which began to mature in the summer (first on the south facing slopes and at lower elevations) were collected and used along with other seed resources, such as sunflower seeds and tarweed to make *pinole*. Next to acorns, *pinole* was the most important winter staple. During the late summer and fall the seeds of many species (see Appendix II Table 1) were parched by live embers, shaken (winnowed) in a shallow basket and reduced to a meal-like consistency to make *pinole* (Curtis 1924:23).

In the North Fork basin, the catchment analysis clearly indicates that grass seeds, and black oak and Oregon oak acorns would have been available adjacent to the riverine villages. Tanoak acorns were not readily available for the villages south of Rock Creek on the North

Fork [I have since noted that there are substantial groves of tanoaks on the north facing slope dropping down to the confluence of Hulls Creek and the North Fork visible form the country road.] There were no groves of tanoak located to the east of the river north of where Hulls Creek meets the North Fork.

Winter

By mid to late November, winter usually arrives in the North Fork country. This was a critical time of year for the peoples inhabiting the region. Dependent on stored food resources there was always the danger of famine. Essene (1940:84) recorded one instance of a winter famine. It may have taken place, however, during the Conflict and Settlement Period.

Merriam (field notes on the Wailaki) noted that in the winter families of each community (band) were scattered along the river in small rancherias consisting of four to seven families living in two or three houses. Each house was inhabited by about seven to eight people. Winter houses were excavated to about two feet and were made of split pine (probably ponderosa with cedar used when available as it splits easily, Douglas-fir is a much stronger wood and probably was not preferred) slabs standing upright or sloping in at the top to form a conical house (some ethnographers recorded bark covered houses, see also Curtis 1924, Baumhoff 1958:176). Trees were felled by means of elk horn chisels and stone mauls--a very tedious and laborious task. They were then cut into useable lengths by the same method and then split into slabs using elk horn wedges.

In preparing for the long winter, families would pile firewood in a dry place and fill their storage bins made of hazel and willow branches with acorns. Lucy Young (Essene field notes) indicated that in addition to acorns, the main winter staples were grass seeds (for *pinole*), buckeye (uncommon in the North Fork basin but not at Young's home village at Alderpoint), dried meat, and dried fish (also available from the main Eel River). She said that this would provide enough food to last them until the "small potatoes" (bulbs) that grew in the early spring could be harvested.

As noted earlier in this study, inhabitants of the village located in Soldier Basin hunted hibernating black bears during the winter. The bear meat was smoked and used as a winter staple. It is likely that other groups in the North Fork basin may also have utilized this resource although given the relative population density of black bears this would not have been a primary food resource.

The catchment analysis also indicates that significant numbers of deer wintered in the lower altitudes of the North Fork basin. In addition, by mid-to-late January both steelhead trout and Chinook salmon began their yearly migrations up the North Fork of the Eel River. For these reasons, it appears that there were some important food resources available during at least a part of the winter. The danger of famine during the winter, given the availability of significant quantities of deer and fish, supports the hypothesis that famine was an exceedingly rare event in the North Fork region.

A Diachronic Model of Resource Utilization and Settlement Patterning

Given the historical environmental data, the catchment analysis, and the review of ethnographic data related to the procurement of subsistence resources presented thus far, a model of resource utilization and settlement patterning for both the Xerothermic Period and the Post Xerothermic Period is now presented. The purpose of this portion of the study is to synthesize the data presented earlier into a model which can provide some context for interpretation of the archaeological record. In addition, some suggestions related to settlement patterns and site locations are also discussed. It is hoped that by presenting some hypothetical scenarios on settlement of the region, the types of sites which might be found, and the intensity of prehistoric settlement, in the future archaeological researchers can confirm or refute their validity.

<u>Xerothermic Period</u> (8,500 B.P. to Approximately 3,000-2,500 B.P.)

Based on the catchment analysis presented earlier, it is hypothesized that the potential resource base available for human exploitation during the Xerothermic Period was much less than that of the ethnographic period. Some plant resources, especially acorns, were somewhat reduced in abundance (see Graph 1). Moreover, the animal species (deer and especially anadromous fish) which provided an important part of the food supply during the ethnographic era were not as plentiful. It is likely the reduction in the subsistence resource base combined with a more xeric environment, including a reduction in the number of springs, live creeks, and quite possibly a dry North Fork of the Eel River bed for much of the summer, reduced the overall desirability of permanent settlement.

During this era (as early as 5,000 to 7,000 B.P.), it is likely that small mobile groups practicing a forager subsistence strategy relying for the most part on big game (primarily deer and possibly elk in some parts of the region including South Fork Mountain) would have visited the North Fork area occasionally perhaps on a seasonal basis. The collecting of plant resources during this era has generally been considered of secondary importance when compared to the ethnographic era. It has been hypothesized (Keter 1988: 12) that because of the reduced resource base during the Xerothermic Period there were few permanent residents within the North Fork basin. Additional research and input to the environmental model since this hypothesis was first formulated continues to support this view.

Post Xerothermic Era (3,000 B.P./2,500 B.P. to Approximately 1,100 ad.)

It was only after the change to more maritime climatic conditions sometime after 3,000 B.P. that the North Fork region was able to provide an adequate resource base and the environmental conditions suitable for permanent occupation of a relatively large human population. Because of the length of time needed for significant changes in the environment to take place, it is likely that conditions favorable to permanent human occupation in significant numbers did not occur until well into the Post Xerothermic Period (see Graph 1).

As the potential amounts of harvestable subsistence resources (primarily deer and anadromous fish) increased, human occupation of the area is likely to have slowly intensified. In addition, with more maritime conditions the number of perennial springs within the basin also increased. Initially, permanent residence within the basin and utilization of basin resources may have remained at a low level. Towards the end of this era it is likely that a collector strategy focused on the most abundant natural resource crops including acorns, grass seeds, deer, and anadromous fish began to evolve.

This evolution to a more sedentary riverine based population, focused primarily on resources located within or directly adjacent to the North Fork region, resulted in the need to intensify exploitation of plant resources (see also Hildebrandt and Hayes 1984:120) both for their nutritive value as well as for their ability to be stored for winter consumption. It is quite possible that this intensification and diversification in the use of plant resources coupled with a reduction in a forager oriented subsistence strategy, would have led to an increase in population. Over time, this dynamic between a more intensive use of the natural resource base and an ever increasing human population could have been a significant factor influencing the evolution of the region's ecosystem.

One possible hypothesis for the evolution from a forager to a collector based economy within the North Fork basin is that prior to about 1,100 ad. the region was inhabited by the Yuki (or proto Yuki). This suggestion is based on the proximity of the Yukian peoples located directly to the south and linguistic evidence which suggests that they predate Athabascan movement into the region. It is also possible Penutian speakers (Wintu or proto-Wintu) from the east may have also utilized portions of the basin during this era (see Keter and Heffner-McClellan 1991 for an overview on Wintu influence on Wailaki culture). It is suggested that arrival of Athabascan speakers is roughly contemporaneous with or took place sometime after the environment of the region became more productive as the result of the changing in climate. The more intensified and diversified utilization of the natural resource base led to an increase in population and further specialization in the procurement of localized resources.

Post Xerothermic Period (After 1,100 ad.)

Given the catchment analysis and the ethnographic data presented earlier, some suggestions are now presented concerning site settlement patterning and resource utilization. Unlike the riverine oriented cultures found further to the north in Hupa, Karuk, and Yurok territory, it appears the location of village sites along the North Fork of the Eel River was not based primarily on the abundance of anadromous fish resources. Although a primary resource (see Appendix I for a discussion of primary, secondary, and tertiary resources), anadromous fish, were limited to runs during only a few months of the year and there was no run in the fall. In the North Fork basin village sites were clustered along the river for cultural and social reasons as well as environmental reasons.

Due to the lack of water at higher elevations, especially during the acorn harvesting season in the fall, the clustering of villages along the North Fork (for example the villages listed by Goddard [1924] from the confluence of Hull's Creek north for about 2 miles) or a very large village (for example the one at Soldier Basin) permitted a much larger social grouping (community) than would have been possible even at only slightly higher elevations.

Another reason village sites were located along the river was that it was below the snowline. The major valley locations (areas with relatively flat land) Hettenshaw, Kettenpom, Hoaglin, and Hull's Valleys and Mina while below the permanent winter snowline (about 3,500') often do go for significant periods with heavy snows. In addition, another barrier to year around settlement in these areas is that lack of significant amounts of water (excepting Hull's Valley which probably contained winter villages) may have limited their use to some degree during the late summer and fall.

During the spring, there was a great deal of social interaction between communities in Hettenshaw, Kettenpom, and Hoaglin Valleys. These valleys were important gathering locations for bulbs, a primary subsistence resource, as well as secondary and tertiary subsistence resources including clovers and berries. Deer were also plentiful in these areas in the spring. Given their relatively higher altitudes (2500'-3,000') and easy access to nearby regions above 4,000' (as noted earlier most deer summer above 4,000' in this region and plant resources mature somewhat later in the year) it is possible that these locations were inhabited by a significant number of families and for extended periods of time during the spring and summer.

High altitude sites utilized during the summer were focused on the hunting of deer and the procurement of a wide range of secondary and tertiary resources. Single component sites of flaked lithic material (primarily chert flakes) are common within the basin and are most likely resource processing locations or at the most temporary encampments. It is unlikely that extended families inhabited these sites. Further complicating the formulation of a site settlement model for the region is the fact that some subsistence activities and resource procurement locations may not be evident in the material record. For example, the use of digging sticks to harvest bulbous plants which grow in great quantities was a major subsistence activity yet evidence of this activity will be lacking in the archaeological record.

It appears that during the summer people sometimes returned to their river villages. Some secondary subsistence resources including summer steelhead and salmon as well as plant resources (including grass seeds and bulbs) would have been available at this time. It is possible that some communities or extended families summered in the mid-altitude valleys previously mentioned as well as at Red Mountain Fields (near Red Mountain). The Round Mountain/Grizzly Mountain region (above 4,500") may also have been the location of some major summer encampments. High altitude sites east of the North Fork basin in the Middle Fork of the Eel/South Fork of the Trinity River region may also have been the location of extended summer settlements (see for example sites located along the North Fork of the Middle Fork of the Eel River).

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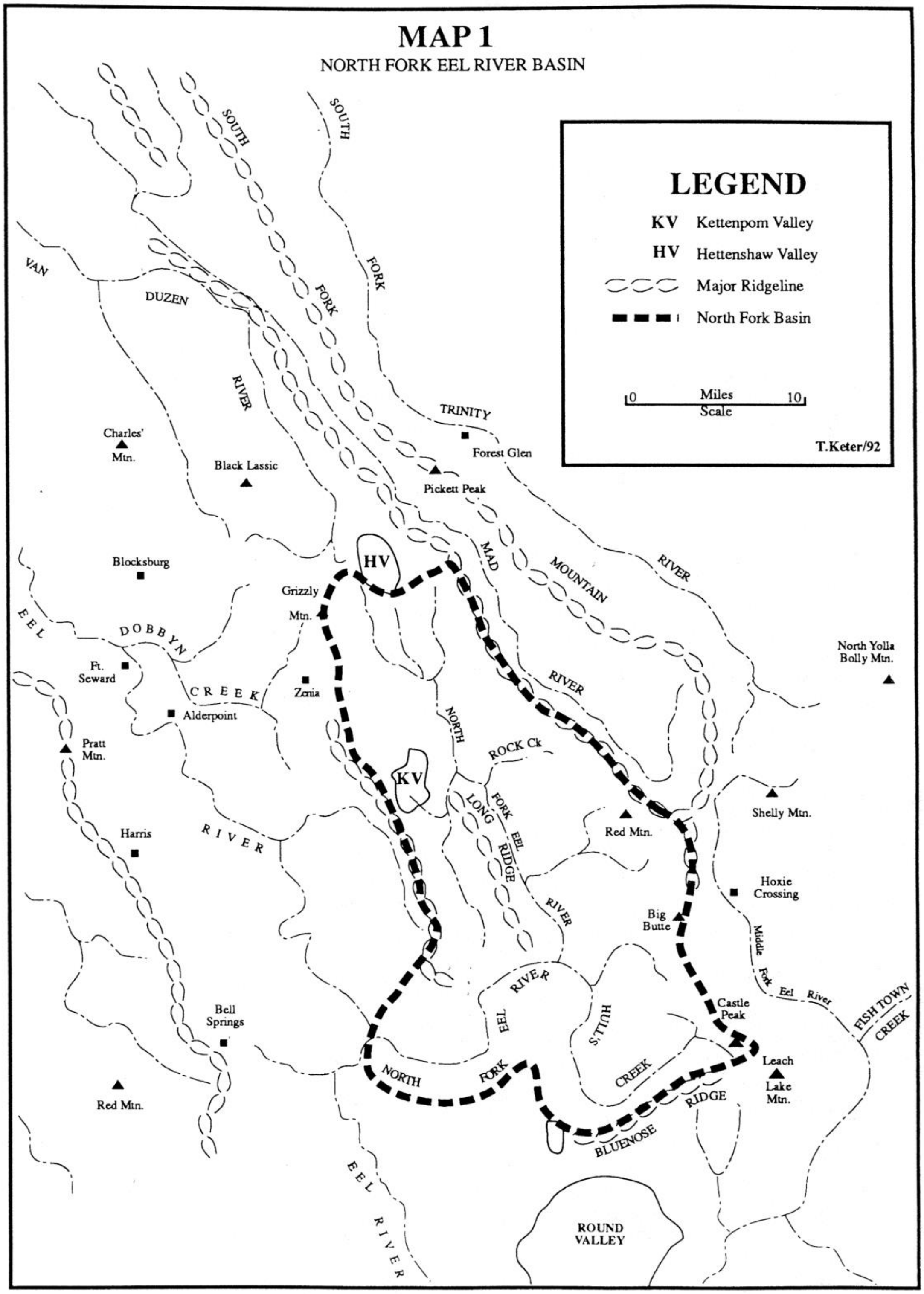
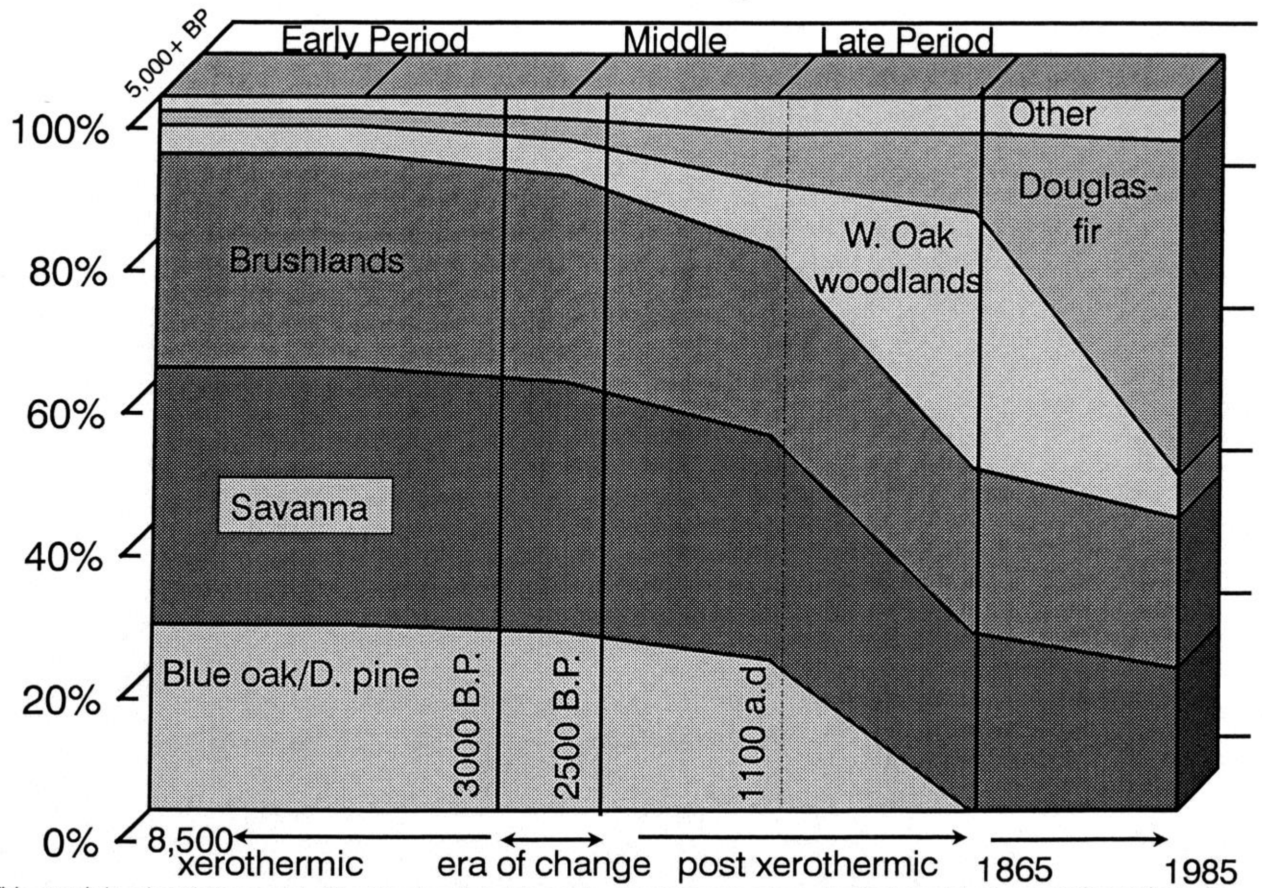


Graph 1

Diachronic Model of Vegetation Associations



This graph is a heuristic model. The timeline is not to scale. It represents a hypothetical model of vegetation trajectories for the Xerothermic and Post Xerothermic Periods. Data for 1865 and 1985 are based on North Fork vegetation studies

Appendix I

Ranking of Procurement Resources

Potential food resources have been classified according to their importance in the subsistence procurement activities of the local aboriginal populations based on the available ethnographic data. A second consideration is the seasonal availability and potential abundance of the various resources as presented in the enviromental and catchment analysis sections of the North Fork study. The classification system is presented below, along with the assumptions and criteria used in evaluating each resource. See Appendixes II, III and IV for a complete overview of these resources. It should also be remembered that water, even with the end of the Xerothermic Period, was still a scarce resource within the North Fork basin for a significant part of the year. For this reason access to water was critical factor. This access is especially important for the processing of acorns (and buckeyes) when significant amounts were needed for the leaching process.

Primary Food Resources: Resources which provided a significant portion of the diet for at least some part of the year. Failure of any of these resources to be available due to disease or some other form of crop failure could lead to a serious food shortage situation. Primary subsistence resources were of the magnitude of importance that permanent or seasonal habitation sites were often located in areas where the resources occurred. These resources were available in great quantities and either provided a high return on the energy expanded for their collection or provided other advantages such as storability.

The seasonal occurrence of many these resources were in quantities large enough to support the coming together of the smaller communities for social and cultural activities. Examples of primary resources include anadromous fish, acorns, bulbs, grass seeds, and deer.

Secondary Food Resources: Resources which provided an important dietary supplement, especially when availability of primary food resources was limited due to scarcity or seasonality. These resources were also desired to provide variety to the diet and some may have provided important nutritional needs not available in other resources. Secondary resources were sometimes available in great quantities (for example hazelnuts on South Fork Mountain), but for the most part took greater capture or processing time to

secure, provided a smaller return on energies expanded for their procurement, were not as abundant as primary resources, or were spread across the environment in a pattern which made their use as a primary resource difficult to attain. It is possible some temporary camps were established adjacent to areas when secondary resources occurred or that resource processing sites used only on a daily basis were situated near some secondary resources.

It should also be noted that based on seasonality of primary resources for portions of the year a primary resource might become a secondary resource for some portions of the year. For example, in the summer while fish were not caught in great numbers they were available for procurement with the potential to contribute to the food supply.

Tertiary Food Resources: These resources provided only a minimal contribution to the dietary needs of the local populations. They may have required longer foraging or capture time, were less palatable and were therefore less desirable, were not abundant in the region, or were simply difficult to obtain. Many of these resources were secured opportunistically when encountered in daily life. Some of these resources may have been desired based simply on the fact that they tasted good (for example, the sweet tasting gum of the digger pine cones or were like grasshoppers quite nutritious). Activities to secure these resources are unlikely to have led to establishment of activity centers such as temporary or permanent encampments. The most important thing to note concerning these resources is that they played only a minor role in procurement activities and site settlement locations.

* Resources not consumed: Although sometimes ethnographic data conflicts on whether local groups consumed a particular resource, it is clear that many of these resources are so rare (otter) or difficult to secure (grizzly bears) that they would have contributed little to the diet.

* Special Use Procurement Items: These resources would include materials gathered for religious purposes, to construct baskets, nets, and other cultural or technological products. Although the majority of these sites were visited for specific purposes most were not associated with extended occupation although in some instances individuals may have spent some time in the vicinity for purposes of collecting or the practice of religious activities.

Appendix II

Plant Resources Available Within the North Fork Region

Notes on the use of Seed Resources (Tables 1, 1A, 2, 2B)

The grasses of the North Fork basin would have been a rich source for edible seeds. It is likely that several perennial bunch grasses were abundant within the basin including California oat grass, some species of *Poas* (possibly including *P. scarbel*), *Stipas*, *Melicas*, and *Festucas*. A large number of other plant species would also have provided a rich source of seeds (see Table 1B). For example, sunflower seeds were collected (Curtin 1957:11, Chestnut 1974:397) in the fall and were dried, pounded and winnowed in a flat basket. Often, they were parched and blended with other grass seeds for pinole (Curtin 1957:11) It was noted by one native informant that the harvest of seeds was extremely important to insure an adequate winter reserve of storable food supplies (Hamman n.d.:16). For the reasons outlined above, storable seeds are ranked as a primary subsistence resource.

Tables 2A and 2B present those species of grasses and other plants utilized for seed procurement during the historic era. They are presented in order to show both the adaptive responses made by the Indian people to the changing envriorment as well as to document for the record those resources not available during the prehistoric period.

The perennial grasses which predominated the savannas and oak woodlands in the region matured (at the lower elevations) in July and August, but were most likely available for procurement as late as September and possibly into October for some species. With significant areas of savanna and oak woodlands vegetation communities adjacent to village sites, fall collection of seed resources could be accomplished without traveling long distances.

Appendix II

Table IA
Native Grasses

Many of these species provided seed resources. Maturation of the majority of these grasses was in mid-July to August.

Species	Common Name	P/A	Comments
Bromus marginatus@		P	@ notes native
*Danthonia californica@**	California oat grass	P	common precontact bunchgrass
Deschampsia elongata *	slender hair grass	P	
Elymus glaucus *	blue wild rye	P	
E. triticoides +@	beardless wild rye	P	squaw grass-locally
Festuca californica *	Ca. fescue	P	
F. Idahoensis	Idaho fescue	P	
F. occidentalis	western fescue	P	
F. microstachys		A	rare
F. octoflora	six weeks fescue	A	
Melica californica *	California melic	P	
Poa scabrella *	pine bluegrass	P	
Sitanion hystrix @	bottlebrush sqrltail	P	@ as *S. elymoides*
S. jubatum *	big squirreltail	P	
Stipa lemmoni *	lemmon's bunchgrass	P	also L. needlegrass
S. pluchra	purple needlegrass	P	

P/A P=Perrenial A=Annual

* Identified in the North Fork basin by the author or Leitner (1988)
\+ Identified on Mad River Ranger District Six Rivers National Forest adjacent to basin
@ Chestnut (1974) identified as used in or adjacent to basin by Wailaki

Appendix II

Table 1B

Native Plant Seed Resources Other than Grasses

These plants were collected primarily for seeds for pinole and were storable for winter use.

Species	Common Name	Comments
Achyrachaena mollis @	blow wives	
Boisduvalia densiflora@	dense flowered B.	
Ceanothus spp. @+	deer brush	brushland species
Godetia purpurea @	purple Godetia	dry slopes rare today
*Hemizonia luzuloefolia**@	hayfield tarweed	
Madia anomala @	plump seed madia	annual grassy slopes
M. sativa @	coal tarweed	annual
Nymphaea polysepala @	Indian pond lily	aquatic numerous seeds
Perideridia kelloggi @	Kellogg's yampah	
Plagiobothrys campestris@	popcorn flower	young leaves eaten as greens
Pogagyne douglasii @	Douglas' pogagyne	(var. *parviflora*)
Saliva columbariae @		annual
Thysanocarpus curvipes @	(var. *elegans*)	mustard family grassy slopes
Verena hastata +@	blue vervain	
Wyethia angustifolia *	sunflower	
W. longicaulis +	sunflower	used in region

* Identified in The North Fork basin by author or Leitner (1988)
\+ Identified on Mad River Ranger District Six Rivers National Forest adjacent to basin
@ Chestnut (1974) identified as used in or adjacent to basin by Wailaki

Appendix II

Table 2

Introduced Species of Grasses

Some of these grasses were exploited as food resources during the historic period. Seeds are oten larger but less nutritious than native grasses.

Species	Common Name	P/A	Comments
Aira caryophyllea	silver hair grass	A	established 1870s
Avena fatua *@	wild oats	A	est. by 1850s
A. barbata *@	slender oat	A	
Briza minor *	little quaking grass	A	
Bromus commutatus	hairy chess	A	
B. mollis *	soft chess	A	weed
B. molloformis *		A	
B. racemosus		A	weed
B. rigidus +	ripgut grass	A	in Davy *B. maximus*
B. rubens	fox-tail chess	A	est. 1870s
B. tectorum *	downy chess	A	
Cynosurus echinatus *	dogtail grass	A	
Elymus caput-medusa *	medusahead	A	weed-common locally
Festuca myuros	rat tail fescue	A	locally squirreltail
F. reflexa *		A	
*Gastridium ventricosum**	nite grass	A	est. 1870s weed
Hordeum leporimun		A	est. 1870s
H. hystix +	mediterranean barley	A	Est. 1880's
H. leporinum		A	Chestnut mistook as *H. murinum*
H. marinum +	barely grass	A	est. after 1860s
H. vulgare	barely	A	used @ Round Valley
Lolium multiforum	Italian ryegrass	P	weed
L. temulentum	poison rye grass	A	
Madia sativa		A	Est. 1880s
Phalaris tuberosa +	(var. *stenoptera*)	P	Est. late
Poa annua	annual bluegrass	A	weed
P. trivialis +	rough bluegrass	P	

P/A P=perrenial A=Annual

* Identified in The North Fork basin by author or Leitner (1988)
\+ Identified on Mad River Ranger District Six Rivers National Forest adjacent to basin
@ Chestnut (1974) identified as used in or adjacent to basin by Wailaki

Appendix II

Table 2A

Other Introduced Species

These plants were exploited as food resources during the historic period.

Species	Common Name	P/A	Comments
Erodium cictarium *	red stemmed filaree		used as a green
E. moschatum	white filaree		after 1890 as green
Heracleum lantrim	cow parsnip		*H. sphondylium* only is native
Medicago denticulata	bur clover		used as a green
Rumex crispis @	curly dock	P	est. very early seeds used

P/A P=Perrenial A=Annual

* Identified in The North Fork basin by author or Leitner (1988)
\+ Identified on Mad River Ranger District Six Rivers National Forest adjacent to basin
@ Chestnut (1974) identified as used in or adjacent to basin by Wailaki

Appendix II

Notes on the use of Clovers and "Greens" (Table 3)

The ethnographic literature (Chestnut 1974:322, Parker 3:1988) notes that the gathering of clover in the early spring was one of the most notable times of the year for resource collection. Clover actually was a general term used by the Indians in this region to refer to a number of herbaceous plants (Chestnut 1974:359).

The emergence of clover (and other leafy green plants) after the long winter was a much anticipated event. Most clovers (which contain high amounts of vitamin C lacking in the winter diet) were eaten raw as a green, some were steamed (Curtin 1957:14). Stephen Powers (1976:235) noted that; "Clover is eaten in great quantities in the season of blossoms. You will sometimes see whole villages squatted in a lush clover-meadow snipping it off by hooking the forefinger around it and making it into little balls."

The Wailaki held a Clover Dance each year. It was performed during the early spring (Powers 1976:118, Chestnut 1974:360). When V.K. Chestnut (1974:300) visited the Round Valley Indian Reservation in the 1890s to record plant use among the local Indian population, clover was still an important food resource. Frank Essene (1942:84) noted that during his research in Round Valley he was told that "the earliest clover is eagerly gathered as greens have been a conspicuously absent dietary item during the past season."

Clovers would have been available at lower altitudes as early as mid-March and at higher elevations well into the late spring and early summer; possibly later at more mesic site locations. Clovers have been ranked as a primary resource due to their importance in the aboriginal diet, their relative abundance, and their availability in the late winter and early spring when few other plant resources were yet available for use.

Clovers are often found in the savanna and oak woodlands vegetation associations and are especailly common in more mesic locations.

Table 3

Seasonal Greens

Species likely to be found in the North Fork basin. This resource is referred to collectively in the literature as "greens".

Genus and Species	Common Name	Comments
Various plants used as greens		
Lupinus spp.	lupine	
Montia perfolia *	miner's lettuce	
Traxicum vulgare	dandelion	
Vicia americana *@	peavine	
Clovers		
*Trifolium bifidium decipiens**@		seeds make good pinole
T. cyathiferum *@		
T. dichotomum		
T. fucatum virescense *		
T. microcephalum		
T. tridentatum		uncommon (Davy 1902)
T.variegatum @		

(all clovers are annuals)

* Identified in North Fork basin by author or Leitner (1988)
@ Chestnut (1974) noted as utilized in or adjacent to basin

Notes on the Use of Bulbs (Table 4)

In the North Fork region bulbous species of plants (*Camas*, *Lilliaceai*) appear to have provided a major portion of the food resources of the local Indian populations during part of the year. Chestnut (1974:322) notes that "no where else in the world is there a more characteristic abundance and variety of bulbous-rooted liliaceious plants than in California". These plants were a very important resource to the aboriginal inhabitants of the North Fork basin. The bulbs were referred to (after the Contact Period) as Indian Potatoes (Chestnut 1974:327) and most were cooked before consumption.

One species of bulb was especially important in the North Fork basin. This bulb (*Cammassia leichtinii*) was referred to by its Wintun name *Ket' en-chow*. This name also referred to Kettenchow (now Kettenpom) Valley and Hettenshaw Valley.. This plant was found in great abundance in these valleys (Powers 1976:117). It was dug up in June and early July using a digging stick. The bulbs were usually roasted although sometimes they were boiled (Chestnut 1974:327).

In the early 1900s when V. K. Chestnut made his botanical survey, Kettenpom Valley was recognized as fine hog country due to the abundance of these bulbs. It was found that pigs fattened better on the bulbs than on corn. Hoaglin Valley is an extension south of Kettenpom Valley and it is likely that it provided the same types of resources (Hettenshaw Valley, Summit Valley, the Lake Mountain area, and the Mina area also contain significant colluvial flats within or adjacent to the North Fork basin). These locations, taken as a whole, total well over 2000 acres and would have provided significant seasonal resource locations for procurement of bulbous plants, clovers, seeds, and other subsistence resources. Numerous prehistoric sites have been located at these locations and it is likely they were inhabited for a significant portion of each year especially in the spring and early summer. For example, the abundance of these resources permitted a number of extended families to assemble during the late spring and early summer in Kettenpom Valley and focus on intensive collection of subsistence resources and the possibility for extensive socialization. During this time of year, bulbs of the various species were gathered in great quantities and a large feast was held (Essene 1942:84).

Some species of bulbous plants grew on the mountainsides and at higher elevations (for example *Triteleia laxa*). The significance of this is that bulbs could be collected at a number of locations not just in the more obvious flat colluvial valleys. Some species of bulbous plants were available for procurement as early as April (*Brodiaea laxa*). In addition, bulbs were still edible after remaining in the ground for long periods of time (through the summer and into the fall although they would be harder to dig and collect at this time). Some bulbs were processed for winter storage this was accomplished by reducing them to a pulpy mass and letting them dry.

The bulbous portion of the soap root (*Chlorogalum premeridianum*) in addition to being used as a poison to stun fish in slow moving water, was also eaten. It is a large tuber with a fibrous outer covering and the poison apparently was removed during cooking. This plant occurs above 2,000 feet and is common in the basin.

Due to their importance to the native diet bulbs are ranked as a primary resource. In addition, bulbs were an imnportant resource because they permitted the gathering of a large number of families and communities in one location for soical interaction and cultural activities.

Appendix II

Table 4

Bulbs

All the plants listed below are native to the region.

Genus and Species	Remarks
Allium unifoloium@^	Indian onion
Brodiaea pluchella^	very sweet bulbs
B. laxa^@	abundant on hillsides desired resource
B. hyacinthina@	Chestnut's *Hespercordum capitalatum*--wild hycinith
B. coronaria@	Chestnuts *Hookera c.*
B. laxa@	Chestnust's *Triteleia l.* available as early as April, common
Calochortus tolmiei@#	Chestnut's *C. maweanus* excellent food resource
C. amabilis#	Chestnut identified as *C. pulchellus*
Camassia leichtlini@+	Ketten bulb found in great quantities in high valleys
C. qumash@^	blue camus also called common camus
*Chlorogalum premeridianum**@	soap root
Fritillaria lanceolata@	Chestnut's *F. mutica* not used for food
F. recurva#	This may have been misidentified by Chestnut as *Allium bolanderi* which is very similar-abundant in region
Lillum spp.*	not confirmed as food resource

@ Chestnut (1974)--utilized in or adjacent to basin
^ Curtin 1957
* Identified in North Fork basin by author or Leitner (1988)
# Identified personal communication Orvel Ballantyne, botantist

Notes on Acorn and Nut Bearing Trees (Table 5)

Oak acorns and nuts were the most important subsistence resources utilized by the Indians of this region (Chestnut 1974:333).

Oaks (*Quercus*)

Within the North Fork basin, the most common oak was the Oregon white oak followed by the black oak. Oak acorns matured in September and early October and were also a major food resource for deer which consumed large quantities of acorns to put on fat to last them through the lean winter months. One of the most important reasons acorns were utilized to such a great extent was storability. Along with grass seeds acorns provided the bulk of food stored for use during the winter season.

Both white oak and black oak acorns are ranked as primary food resources. Significant areas of the oak wodland vegetation communitites are found at lower elevations in the North Fork region. For this reason, it is likely that most collecting could be accomplished within a reasonable distance of winter villages.

Tan oak (*Lithocarpus densiflora*)

Tan oak were a preferred species of acorn for many of the Indian groups in northwest California. In the North Fork region tan oak are limited to a few locations on the north facing slopes in the northwest portion of the basin (Sub-area 3 on Map 2). In addition, some tan oak stands were identified at relatively higher elevations (above 2,500') adjacent to the county road leading to the Hull's Creek site. Ranking of this resource is problematic. As it is much desired in those areas where it is found it is a primary resource. Due to its limited distribution in the North Fork basin, especially to the south of about Rock and Salt Creeks, it might more accurately be ranked as a secondary resource.

Digger Pine (*Pinus sabiniana*)

The pine cones of the digger pine provided a very nutritious seed. The process of collecting these seeds was labor intensive (Chestnut 1974:308) but the seeds were valued as was the gum which accompanies the pitch which covers the seed cones. This pitch called *ju* by the Wailaki was highly prized. Children chewed it much like gum.

Lucy Young (Murphey Collection) noted that the name "Pitch Wailaki" was the name given to the Indians of the North Fork region because of the pitch they got on themselves when they harvested the digger pine nuts. They are ranked as a secondary resource, but might well have been a primary resource for some areas of the region especailly in the southern part of the drainage.

Hazelnut (*Corylus cornuta* var. *californica*)

Hazelnuts were available in relatively large quantities at higher elevations. Lucy Young (Murphey Papers n.d.) noted that in the fall her people would meet on South Fork Mountain with the Wintu for a celebration timed to the maturing of hazelnuts. Hazelnuts were considered a desirable product although they are not classified as a primary resource due to their relative abundance when compared to oak acorns. For this study, they have been ranked as a secondary resource.

Appendix II

Table 5

Tree Species

Acorns and Nuts

Genus and Species	Common Name	Comments
Corylus californica @*	hazel	
*Lithocarpus densiflorus**	tanoak	mostly limited to NW part of the N.F. basin
Pinus lambertiana *	sugar pine	rare in basin more located to just to the east and south of the basin
P. sabiniana *	digger pine	fairly common in the basin
Quercus chrysolepis *	canyon live oak	common along the steeper rockier canyons
Q. garryana *	Oregon oak white oak	most common oak in the basin
*Q. kelloggii**	black oak	found in association with Oregon oak
Umbellularia californica @	buckeye	fruit is poisonous until processed

Other related use of tree resources

Pinus ponderosa *	ponderosa pine yellow pine	pitch was chewed also used for medicinal purposes
Taxus brevifolia *	Pacific yew	used for making bows berries eaten-seed poisonous

* Identified in North Fork Basin
@ Identified by Chestnut (1974) as utilized in or adjacent to basin

Appendix II

Notes on other plant species (Table 6)

Numerous other species of plants were utilized to provide variety to the aboriginal diet. Although most of these plants likely provided only a minor component to the diet they may have been important from a nutritional standpoint in providing a balanced diet. Some of the more important species include wild strawberry, Choke cherry, Manzanita berry, wild black raspberry, thimble berry, elderberry and wild plum. Various species of these plants were available for procurement throughout the late spring and summer months and, depending on species, were probably ranked as secondary and tertiary resources.

Table 6

Other Plant species

Berries

Genus and Species	Common Name	Comments
Fragaria california @	wild strawberry	
Grossularia californicum@	thorny gooseberry	
G. divaricata @	straggly gooseberry	
Prunus demissa @	choke (bitter) cherry	
Rubus leucodermis @	wild black (white stemmed) raspberry	special trip to mts. for berries in July also dried for winter use (Chestnut 1974:355)
R. parviflorus @	thimble berry	
R. vitifolius *	common blackberry	
Vaccinum ovatum *	evergreen huckleberry	mesic areas nw part of basin

Misc.

Arctostaphylos Manzanita@*	Manzanita	July-Aug. berries used for cider also ground for pinole-highly nutritious
Prunus subcordata @	wild (sierra) plum	

* Identified in North Fork basin by author
@ Identified by Chestnut (1974) as utilized in or adjacent to basin

Appendix III

Terrestrial Fauna of the North Fork Basin
Resource Procurement and Utilization

Table 1

Mammals

Common Name	Scientific Name	Habitat*	Rank+
Deer	*Odocoileus hemionus*	W/S	1
Elk	*Cervus cannadensis*	-	6
Wolf	*Canis lupus*	-	6
Red fox	*Vulpes fulva*	-	6
Gray fox	*Urocyon cinereoargenteus*	-	4
Coyote	*Canis latrans*	-	4
Grizzly bear	*Ursus americanus*	W/S	4
Black Bear	*Ursus arctos*	F	3
Mountain Lion	*Felis concolor*	-	4
Bobcat	*Lynx rufus*	-	4
Beaver	*Castor canadensis*	-	6
Mink	*Mustela vison*	-	6
Fisher	*Martes pennanti*	-	6
Weasel	*Mustela* spp.	-	4
Wolverine	*Gulo gulo*	-	6
Otter	*Lutra canadensis*	-	4
Stripped skunk	*Mephitis mephitis*	-	4
Wood rat	*Neotoma* spp.	F	3
Other rodents:voles, chipmunk, mice,etc.	*Rodentia* family	ALL	3
Cottontail rabbit	*Sylvilagus* spp.	B/W	3
White-tail jackrabbitt	*Lepus townsendii*	B/W	3
Black-eared jackrabbit	*Lepus californicus*	B/W	3
Squirrels	*Citellus beecheyi*	ALL	3
Porcupine	*Erethizon dorsatum*	-	6
Badger	*Taxidea taxus*	-	6
Racoon	*Procyon lotor*	R/F	3
Ringtail cat	*Bassariscus astutus*	-	6
Pine Martin	*Martes americana*	-	6
Oppossum	*Didelphis marsupialis*	-	6

(Essene 1942, Foster 1944, Marcot 1979 Maser et al 1981)
* Habitat Type (for higher ranking species only): B-brushlands and shrubs, W-oak woodland, S-grasslands, F-forest, R-rapairian
+ Rank: 1 Primary resource
2 Secondary resource
3 Tertiary resource
4 Not eaten or probably not eaten
5 Used other than as food resource
6 Rare or may have entered the area only occasionally

Appendix III

Table 2

Reptiles
(Species Cited in Local Ethnographies Only)

According to Essene (1942:54) few reptiles were eaten. Some were used by shamans for ritual purposes and rattlesnake doctors may have consumed some species of snakes. No species is considered a significant food resource.

Order	Family	Common name
Anura		frogs
Urodela		salamanders
Sqamta	*Anguidae*	alligator lizard
	Colubridae	garter, gopher, kingsnake, etc
	Viperidae	western rattlesnake
	Testudinata	turtle

Table 3

(General Overview)
Birds

Order	Family	Common name
Gaviiformes	*Ciconiforms#+*	heron, egret
	*Anseriformes**	mallard, wood duck, etc
Falconiformes	*Cathartidae #+*	turkey vulture
		condor (prehistoric period)
	Acciptridae#+	hawks, eagles
	Pandionidae#+	osprey
	Falconidae#+	peregrine falcon
Galliformes	*Tetraonidae**	grouse
	*Phasianidae**	quail
Columbiformes	*Columbidae+*	pigeons, doves
Strigiformes	*Strigidae#*	owls
Apodiformes	*Trochilodae**	hummingbirds
Piciformes	*Picidae#+*	woodpeckers
Passeriformes	*Hirundinidae#*	swallow, martin
	Corvidae#	jays, raven, crow
	*Trudidae**	robin, thrush
	Parulidae#	warblers
	Icterdiae#	meadowlark, blackbird
	Fringlillade#	finchs, sparrows

* Essene reports use considered rank 3
+ Possible use for cultural purposes
# Use unknown

Appendix III

Table 4

Insects

(Only those mentioned in ethnographic data as possible foods sources in the region*)

Order	Family	Common Name
		catapillars*
		grasshoppers *
		Yellow-jacket larve * (and other species)

Insects are ranked as tertiary resources
* Essene 1942

Appendix IV

Aquatic Resources of the North Fork Basin

Notes on the use of Aquatic Resources

It should also be noted that evidence exists that the inhabitants of the North Fork basin utilized portions of the southern part of the Mad River drainage and the northern part of the Middle Fork of the Eel River drainage for subsistence activities including procurement of aquatic resources (Keter and McClellen 1991:15). For example, Lucy Young mentions gathering during the summer along the Mad River during which salmon (quite possibly summer steelhead) were consumed. The Wailaki were said to have a camp near the confluence of the Middle Fork and Fishtown Creek and the Lassik visited Hoxie Crossing along the Middle Fork (Keter and McClellen 1991:15-17). Because of this historic use of the Middle Fork drainage for both terrestrial and aquatic resources, this region must at least be considered when formulating the potential availability of fish resources for the inhabitants of the North Fork basin. The Middle Fork of the Eel still has a good summer steelhead population (CDF&G pamphlet).

Table 1

Scientific Name	Common Name	R/A*	Rank
Catostomus humoldtianus	sucker	R	tertiary
Oncorhynchus kisutch	coho salmon	A	main Eel River
O. tshawytscha	chinook salmon	A	primary
O. mykiss (anadromous gene)	steelhead trout	A	primary
O. mykiss	rainbow trout	R	tertiary
Entosphenus tridentatus	Pacific lamprey	A	tertiary

*R/A R=Resident A=Anadromous

Appendix IV

TABLE 2

Potential Fish Habitat
North Fork of the Eel River System

(Six Rivers National Forest Stream Inventory Files)

Major Course	Tributary	Length	Fish Habitat Resident	Anad.
North Fork		35.8	35.8	35.8
	East Fork	3.5	2.2	.7
	West Fork	4.2	2.5*	1.0*
	Bar	2.5	.8	.2*
	Bluff	4.5	4.3	.2
	Bradburn	3.4	2.4	.2
	Cottonwood	1.5	1.5	0
	Dutchman	3.0	0	0
	Gypsy	1.1	.3	0
	Hoaglin	1.5	0	0
	Kettenpom	4.3	1.7	.2
	Lightfoot	4.4	3.7	.2
	Little Red Mt.	2.6	2.4	0
	Panther	2.2	1.0	0
	Raglan Gulch	2.2	0	0
	Red Mountain	4.3	3.9	1.5
	Rock	4.1	1.2	.2*
	Salt (North)	2.9	0	0
	Salt (South)	10.0	8.0	.8
	Soldier	3.8	.9	.2*
	Tub	4.1	0	0
	Willow	3.4	1.8	.5
	Yellowjacket	2.0	0	0
Hull's Creek+ (1)		17.7	16.0	4.0
	Casoose	4.5	3.0	.2
	Hull's Valley	2.0	0	0
	Horse/Brin	7.5	4.0	0
	Pepperwood	2.0	1.0	0
Below Hull's Creek+				
	Asbill W. Fork	2.5	1.0	.2
	E. Fork	1.8	.5	.0
	Lousy	1.5	.0	.0
	Wilson	4.3	2.0	.5
	Bear	2.5	.0	.0
	Totals	159.0	101.9	46.2

* Estimate: no fish survey estimates for streams in these drainages available (these are conservative estimates).

(1) Interview data note the presence of steelhead above the falls on Hull's Creek. Conservative estimate of habitat above the falls includes Hull's and Casoose Creeks is 8 miles.

\+ Estimate no actual mileage available