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The Granite Mountains Archaeological Survey

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The Granite Mountains Archaeological Survey: Prehistoric Land Use in the East Mojave Desert, California

Don D. Christensen, Jerry Dickey, and David Lee

Abstract

Archaeological survey of approximately 9,600 acres in the Granite Mountains and adjacent areas yielded data from 170 prehistoric sites. Based on the presence of diagnostic artifacts, human occupation of the Granite Mountains covers the span from at least 4,000 BP until the historic era. The Late Prehistoric represents the most extensive period of habitation and procurement activities. Cultural affiliation is extremely difficult to determine but it appears that the Pre-Numic, Desert Mohave, and the Chemehuevi made use of the area. The settlement pattern is hypothesized to be centered around a winter base camp associated with a number of temporary seasonal foraging camps in, or near, a full range of environmental zones. The presence of seashell ornaments and nonindigenous flakeable stone for tools denotes an exchange of commodities with outside groups. Currently the Granite Mountains have more recorded pictographs than the rest of the East Mojave Desert combined, and the variety of rock art styles indicates the importance of the Granite Mountains as a center of ritual activity over a long temporal span. It is hoped that this study will serve to encourage intensive archaeological surveys in other areas of the East Mojave in order to delineate regional differences and similarities.

Introduction

The Granite Mountains sit like a detached sentinel at the end of a chain of connected uplands composed of the McCullough Range, New York Mountains, Mid Hills, and the Providence Mountains that stretch approximately 135 km from southern Nevada, south into San Bernardino County, California, through the center of the East Mojave Desert. The Granite Mountains were known as *Toyongkariri*, "boulder sitting," to the Chemehuevi (Laird 1976:121), and the rugged granite outcrops and peaks give the range a distinctive appearance (Fig. 1). Driven by multiple research designs, we conducted archaeological investigations intermittently in the Granite Mountains and environs from 1994 to 1999. We focused initially on areas with the potential for containing rock art sites, and later on areas of concern for resource management. Our records search and the field survey of 9,600 acres (3,886 hectares) resulted in the compilation of data on 170 prehistoric sites and one historic site. Of the prehistoric sites, 23 had historic components. This baseline information will assist in the construction of a resource management plan for the University of California's Sweeney Granite Mountain Desert Research Center (GMDRC) and adjacent holdings jointly managed with the Mojave National Preserve. The sheer number of sites alone seems to indicate the importance of the Granite Mountains.

Background

Physical Environmental

The Granite Mountains are a rugged isolated range in the eastern Mojave Desert of San Bernardino County, California (Fig. 2). They are separated from the

Fig. 1. Photograph of the Granite Mountains from the mouth of Granite Cove.

Bristol Mountains to the west by the lower Budweiser Wash, and from the Providence Mountains to the east by the broad pediment of Granite Pass. To the north, a massive alluvial fan descends to the Kelso Dunes which represent an eolian residue of Pleistocene Lake Mojave. The south slope of the range is a bajada that runs to Bristol Dry Lake. The Granite Mountains cover approximately 220 square kilometers (85 square miles) and range from an elevation of 670 meters (2,198 feet), along their western base, to the summit of Granite Peak at 2,061 meters (6,760 feet). The range is divided by an east-west ridge that forms the summit of the mountains and a delineation between two different geologic foundations. From the summit ridge and to the south, plutonic rock composed of monzonite predominate. To the north granodiorite and metamorphic amphibolite and augen gneiss are more common. Throughout the range are east-west dikes of quartz and felsite as well as a few isolated occurrences of rhyolitic breccia which serve as the only significant indigenous sources for flaked lithic tools. The granite and metamorphic formations decompose into gravels and sand; therefore, soils are quite limited. Water percolates more quickly in the granitic substrata, whereas, the more extensive metamorphic bedrock exposures allow for surface flow and pools of water to exist for limited durations of time. The hydrology of the Granite Mountains is defined by eleven major drainage basins. Nine of these eventually flow off to the north in the direction of the Mojave River Sink and the other two meander southeast towards Bristol Dry Lake. The height of the range is also sufficient to garner enough precipitation to sustain at least fifty intermittent and permanent springs. These springs, which are predominately between 1,220 and 1,828 meters in elevation (4,000 to 6,000 feet), proved essential to prehistoric and historic peoples as a

Fig. 2. Map of the East Mojave Desert showing the location of the Granite Mountains.

resource for a variety of foods as well as potable water (Cahn and Gibbons 1979:15-58).

Human activity is directly affected by climate. In a xeric landscape, water means life. The climate of the Granites is typical of the Mojave Desert which is dominated by an orographic rain shadow caused by the high western ranges such as the Tehachapi Mountains and the Sierra Nevada. This gives rise to minimal precipitation, low humidity, strong seasonal winds, and a wide diurnal temperature range. The annual rainfall pattern is bimodal with both winter and summer precipitation peaks. Cyclonic winter storms spawned in the northern Pacific frequently result in snow, sleet, and hail. Moist, unstable tropical air from the Sonoran Desert produces a summer “monsoon” condition that results in short, torrential downpours and thunderstorms. Weather records have been compiled at the GMDRC (elevation 1,300 meters [4,264 feet]) for the period of 1986 to 1995 (Table 1) and clearly illustrate this bimodal annual precipitation pattern. The average annual rainfall for 1986-95 was 23.6 cm (9.3 inches). Recordings show the average daily high for December as 48.9 F and an average low of 33.1 F. Corresponding July temperatures range from an average high of 90.4 F to an average low of 67.4 F. The highest recorded temperature in recent years was 106 F and the lowest recorded temperature

Table 1. Average Monthly Temperature and Precipitation in the Granite Mountains from 1986-1995. Temperatures are shown in Fahrenheit, precipitation in inches. (Compiled by Philip Cohen and Jim Andre)

Month	Average High	Average Low	Precipitation
January	49.7	33.3	1.83
February	53.4	36.2	1.30
March	58.6	38.3	1.72
April	66.9	46.5	.43
May	74.2	53.2	.28
June	84.0	62.7	.22
July	90.4	67.4	.30
August	89.1	66.5	.90
September	83.2	60.7	.58
October	72.8	52.4	.55
November	57.6	39.8	.52
December	48.9	33.1	.68
Yearly average	69.1	49.2	9.30

was 5 F. Lower elevations, particularly on the northern periphery of the mountains would, of course, show higher averages.

The Granite Mountains host a number of biotic communities due to their regional location and topographical variation. The range is situated at the interface between the Sonoran Desert to the south and the Great Basin to the north; as a result, species from both are present as well as those endemic to the Mojave. Macro fossil evidence seems to indicate that the Mojave and the Sonoran Deserts were a single floristic unit as recently as the Pliocene (Lawlor 1995:53-54). The Sonoran vegetation still exhibits a dominate influence due, in part, to the Granite Mountains position at the southern terminus of the New York-Providence ranges, the highest mountain chain in the eastern Mojave (Hart *et al.* 1979:81-88). The various zones by elevation of the Granite Mountains support a diversity of plant species. The slope aspect also influences vegetative cover with a greater density found on the north and east facing slopes and in the interior canyons due to more favorable mesic conditions.

Hart *et al*. (1979:68-80) have proposed four major plant communities in the Granite Mountain range with eight subdivisions. For the sake of simplicity in dealing with the description of site types and related artifacts, the authors have synthesized this into five general environmental zones which are as follows:

1. Uplands – This area encompasses the mountain tops and upper slopes of the range and is extremely rocky with small basins of developed soil. The plant community includes pinon pine (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), waxy bitter-brush (*Purshia glandulosa*), buckwheat (*Erigonum wrightii*), Mojave sage (*Salvia mohavensis*), banana yucca (*Yucca baccata*), Great Basin sagebrush (*Artemisia tridentata*), golden bush (*Ericameria cuneata* var. *spathulata*), and agave (*Agave desertii*). This zone starts at approximately 1,300 meters elevation, although it can be slightly lower with the

shade aspect of a northern exposure, and goes to the summit of the range. No cultural site exceeds 1,810 meters (5,937 feet) in elevation, however.

2. Bajada – This area is around the rocky outcrops on the mountain base and the immediately adjacent lower slopes. This periphery varies from 700 meters (2,296 feet) on the western side to 1,240 meters (4,067 feet) on the east. The principal vegetation here is creosote bush (*Larrea tridentata*), black bush (*Coleogyne ramosissima*), Mohave yucca (*Yucca schidigera*), turpentine broom (*Thamnosma montana*), buckwheat (*Eriogonum fasciculatum*), buckhorn cholla (*Opuntia acanthocarpa*), pencil cholla (*Opuntia ramosissima*), silver cholla (*Opuntia echinocarpa*), Indian tea (*Ephedra viridis*), Cooper golden bush (*Ericameria cooperi* var. *cooperi*), desert sage (*Salvia dorii*), desert almond (*Prunus fasciculata*), and Cooper desert thorn (*Lycium cooperi*).

3. Wash – This zone encompasses the drainages and adjacent flatlands below the bajada where there is a pronounced decline in the steepness of stream gradients and slope. Soils are very thin and sandy and plant density markedly declines. The vegetation here includes creosote bush (*Larrea tridentata*), Indian tea (*Ephedra viridis*), white bursage (*Ambrosia dumosa*), catclaw acacia (*Acacia gregii*), mistletoe (*Phoradendron californicum*) in some of the acacia, desert willow (*Chilopsis linearis* ssp. *arcuata*), squaw bush (*Rhus trilobata*), desert almond (*Prunus fasciculata*), milkweed (*Asclepias erosa*), and bladderpod (*Isomeris arborea*).

4. Riparian – This is a very compact area centered around springs and seeps. The characteristic plants are narrow-leaf willow (*Salix exigua*), arroyo willow (*Salix lasiolepies*), Fremont cottonwood (*Populus fremontii*), juncus (*Juncus xiphioides*), deergrass (*Muhlenbergia rigens*), waterweed (*Baccharis sergiloides*), study sedge (*Carex alma*), canyon live oak (*Quercus chrysolepsis*), cattail (*Typha domingensis*), and honey mesquite (*Prosopis glandulosa*). Only four archaeological sites are directly located at springs.

5. Dunes – The Kelso Dunes is an area of approximately 155 square kilometers (60 square miles) of shifting sand dunes that reach a height of 140 meters (460 feet) above the surrounding desert floor. Vegetation is minimal but consists of creosote bush (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), ricegrass (Achnatherum hymenoides), and needlegrass (*Achnatherum speciosum*). Ricegrass made this a zone of major importance to aboriginal subsistence.

Current research has identified 67 floral families, 238 genera, and 428 species. Perennial plants comprise 58% of the specimens, and the other 42% are annuals. Sunflowers (*Asteraceae*) are the largest family, making up 20% of all the specimens, and buckwheat (*Eriogonum*) is the largest genus, represented by 4% of all species (Jim Andre, personal communication 1999). The economically significant flora to prehistoric human populations are discussed below under subsistence strategies (Table 2).

The diversity in the floral component often influences the variety of faunal inhabitants of an environment and that is certainly the case in the Granite Mountains. Identified so far are two amphibians, 33 reptiles, 115 birds, and 42 mammal species (Claudia Luke, personal communication 1998). The animals significant as food resources to humans are listed in Table 3 and are discussed below.

The physical landscape has undergone significant changes during the prehistoric past that had a bearing upon human utilization. Lakes have existed intermittently in most of the adjacent basins since the Late Pleistocene. For example, Lake Mojave was inundated intermittently between 12,000 and 8,700 BP for extensive periods of time and for lesser durations since (Grayson 1993:195; Pippin 1998:25-26). In the

Table 2. Economic Plants of the Granite Mountains and immediate environs. (* denotes items identified in the ethnography by Pahrump or Chemehevi informants [Lawlor 1995])

Common Name	Species	Parts Used	Availability
buckwheat	*Eriogonum* spp. (17 species)	stems, seeds	February - September
miner's lettuce*	*Claytonia perfoliata*	greens	March - April
wild rhubarb	*Rumex hymenosepalus*	stems, leaves	March - April
cattail*	*Typha domingensis*	flower, roots	March - May
fiddleneck	*Amsinckia tessellate*	stems, greens	March - May
bladderpod	*Isomeris arborea*	seeds	March - May
scale bud	*Anisocoma acaulis*	stems, greens	March - May
filaree	*Erodium cicutarium*	greens	March - May
wild onion*	*Allium nevadense*	leaves, bulb	March - May
phacelia	*Phacelia* ssp (12 species)	greens	March - June
wild cabbage	*Guillenia lasiophylla*	greens	March - June
tansy mustard*	*Descurainta pinnata*	seeds	March - June
beaver tail cactus*	*Opuntia basilaris*	stems, fruit	March - June
Indian tea*	*Ephedra* spp. (4 species)	seeds	April - May
barrel cactus*	*Ferocactus cylindracens*	buds	April - May
reed*	*Phragmites Australia*	aphis residue	April - May
locoweed	*Astragalus* spp. (8 species)	roots	April - May
princes plume*	*Stanley pinnata*	stems, greens	April - June
desert alyssum	*Lepidium fremontii*	seeds	April - June
seep willow*	*Baccharis glutinosa*	seeds	April - June
blazing star*	*Mentzelia albicaulis*	seeds	April - July
desert mallow	*Sphaeralcea ambigua*	seeds	April - July
Anderson's desert thorn*	*Lycium andersonii*	berries	April - July
Cooper desert thorn*	*Lycium cooperi*	berries	April - July
agave*	*Agave desertii*	buds, meristem	April - August
Mohave yucca*	*Yucca schidigera*	fruit, pods	April - September
Banana yucca*	*Yucca baccata*	flowers, fruit	April - September
broom rape*	*Orobanche parishii*	stems, leaves	April - October
fishook cactus	*Mammillaria tectracistra*	stems, fruit	April - October
coyote gourds*	*Curcurbita palmate*	seeds	May - June
live forever	*Dudley saxosa and arizonica*	leaves	May - June
ricegrass*	*Oryzopsis hymenoides*	seeds	May - June
cottontop cactus*	*Echinocactus polycephalus*	buds, seeds	May - June
Mojave mound cactus*	*Echinocereus triglochidatus*	buds, seeds	May - June

Table 2 (con't). Economic plants of the Granite Mountains and immediate environs. (* denotes items identified in the ethnography by Pahrump or Chemehevi informants [Lawlor 1995])

Common Name	Species	Parts Used	Availability
needlegrass	*Stipa speciosa*	seeds	May - July
galleta grass*	*Hilaria rigida*	seeds	May - July
chia*	*Salvia columbariae*	seeds	May - July
Mohave sage*	*Salvia mohavensis*	seeds	May - July
purple sage*	*Salvia dorrii*	seeds	May - July
rose sage*	*Salvia pachyphylla*	seeds	May - July
sumac*	*Rhus trilobata*	berries	May - July
catclaw acacia	*Acacia gregii*	pods	May - August
desert willow	*Chilopsis linearis*	pods	May - August
blue dicks	*Dichelostemma pulchella*	bulb	May - November
serviceberry*	*Amelanchier utahensis*	berries	June - July
juniper	*Juniperus osteosperma, californica*	fruit	June - August
gilia	*Gilia* spp. (8 species)	seeds	June - August
pencil cholla*	*Opuntia ramosissima*	fruit	June - September
buckhorn cholla*	*Opuntia acanthocarpa*	fruit	June - September
silver cholla*	*Opuntia echinocarpa*	fruit	June - September
old man cactus*	*Opuntia erinacea*	fruit	June - September
pancake pear*	*Opuntia chlorotica*	fruit	June - September
hedgehog cactus*	*Echinocactus engelmanni*	fruit	June - September
Mojave prickle pear*	*Opuntia phaeacantha*	fruit	June - September
dropseed*	*Sporobolus cryptandrus*	seeds	June - October
lamb's quarters*	*Chenopodium fremontii*	seeds	June - October
love grass	*Eragrostis cilianensis*	seeds	June - November
saltbush	*Atriplex polycarpa*	seeds	July - September
desert sage	*Salvia dorrii*	seeds	July - September
wild rye	*Elymus elymoides, multisetus*	seeds	July - September
evening primrose	*Oenothera* spp (4 species)	seeds	July - October
deergrass	*Muhlenbergis rigens*	seeds	July - October
desert milkweed*	*Asclepias erosa*	seeds	July - October
honey mesquite*	*Prosopis glandulosa*	pods	August - September
desert almond	*Prunus fasciculate*	seeds	August - September
pigweed	*Amaranthus fimbriatus*	seeds	August - October
New Mexico thistle	*Cirisium neomexicanum*	roots	August - December

Table 2 (con't). Economic plants of the Granite Mountains and immediate environs. (* denotes items identified in the ethnography by Pahrump or Chemehevi informants [Lawlor 1995])

Common Name	Species	Parts Used	Availability
goldeneye	*Viguiera deltoidea*	seeds	September - October
plateau gooseberry	*Ribes velutinum*	berries	September - October
pinon pine*	*Pinus monophylla*	nuts	Sept. - November
Great Basin sagebrush	*Artemisia tridentate*	seeds	Sept. - November
canyon live oak*	*Quercus chrysolepsis*	nuts	Sept. - November
desert mistletoe	*Phoradendron californicum*	berries	November - April
wire lettuce	*Stephanomeria exigua*	gum	unknown
Introduced Cultigens			
beans	*Phaseolus* spp.		
Corn	*Zea mays*		
squash and pumpkins	*Cucurbita* spp.		
Watermelons	*Citrullus vulgaris*		
cantelope	*Cucumis melo*		
wheat	*Triticum* spp.		

Table 3. Potential Game Animals of the Granite Mountains and Immediate Environs. (Also lizards, squirrels, mice, grasshoppers, cicadas, worms, grubs, and fly larvae.)

Common Name	Species	Availability
Gambel Quail	*Lophortys gambelii*	year-round
Mourning dove	*Zenaidura macroura*	spring, summer
Chuckwalla	*Souromalus obesus*	year-round
Desert tortoise	*Gopherus agassizii*	spring, fall
Black-tailed jackrabbit	*Lepus californicus*	year-round
Audubon cottontail	*Sylvilagus audubonii*	year-round
Desert wood rat	*Neotoma lepida*	year-round
Desert bighorn sheep	*Ovis canadensis nelsonii*	year-round
Roadrunner	*Geococcyx californicus*	year-round

20th century alone it has held water nine times for short-term events. A similar pattern has occurred with Danby, Cadiz and Bristol Lakes to the south. Springs have changed location and the quantity of their discharge due to seismic activity. The Kelso Dunes have shifted considerably, especially around 7,000 years ago. The Amboy Crater erupted at approximately 6,000 years ago (Lawlor 1995:53-58). Regional volcanic episodes had the potential to affect prehistoric land use in the Granite Mountains; however, the actual impact of such natural phenomenon are beyond the scope of the present study.

The contemporary biotic environment also reflects major climatic shifts. During the Early Holocene (11,500 – 8,000 BP) a post glacial warming trend resulted in an increase in annual temperatures, a slight decrease in winter precipitation, and an increase in summer rainfall. Juniper and Joshua tree woodlands moved upslope (Pippin 1998:21-26) and the makeup of valley vegetation underwent change with the arrival of creosote bush (Grayson 1993:200). In the Middle Holocene (8,000 – 4,500 BP) there were two pronounced dry periods that occurred from approximately 7,200 to 6,680 and from 6,350 to 5,130 years ago (Altschul *et al.* 1998:131). As a consequence, there were many more xerophytic plants than there are currently (Lawlor 1995:53-57). At the same time pinon pine became much more common in upland zones (Grayson 1993:216-219). During the Late Holocene (4,500 BP to the present) more optimal climatic conditions for humans and for some types of vegetation existed (York and Spaulding 1995). There was, however, a great variability in climatic conditions with four distinct episodes: a Neo Pluvial (3,800 – 2,300 BP), a major drought (900 – 500 BP), the Little Ice Age (400 – 300 BP), and in the Great Basin a historic expansion of woodlands in the last 150 years (Pippin 1998:32-34).

Contemporary human activities, particularly cattle grazing, have resulted in a decline in needlegrass (*Achnatherum speciosum*), ricegrass (*Achnatherum hymenoides*), and galleta grass (*Pleuraphis rigida*) and an increase in foxtails (*Bromus madritensis* spp. *rubens*), filaree (*Erodium cicutarium*), and cholla (*Opuntia* spp.) (Jim Andre, personal communication 1999). These biotic changes have to be considered in reaching conclusions regarding prehistoric food resources.

Archaeology

Despite the pronounced aridity of the East Mojave Desert, a long cultural history exists for the region. Beginning with the Campbell's (1937) and Rogers' (1939) initial attempts at developing a cultural chronology, numerous additional efforts have created a confusing nomenclature of descriptive terms and conflicting dates. Since Warren's (1984) synthesis of California desert archaeology however, agreement upon period labels has reached a degree of concordance. Sutton (1996), as well as a number of more recent cultural resource management reports (e.g. Basgall and Hall 1994a; Schaefer and Schultze 1996; Byrd 1998), offer a more recent update. With limited formal excavation for the East Mojave, there remains a lack of consensus concerning the temporal guidelines for the cultural sequences. Because Warren (1984), Warren and Crabtree (1986) and Sutton (1996) go into extensive detail, only a brief overview, derived from them and summarized in Table 4, will be offered here.

A pre-Clovis presence has been proposed for the Mojave by Simpson (1958, 1960) which she labeled the Manix Lake Lithic Complex and attributed to the Late Pleistocene. The subsequent Calico Hills excavation, which was undertaken to prove the validity of Late Pleistocene human use, has been clouded by controversy and by the lack of a systematic and final report of the project. At this time the veracity of the Lake Manix Complex seems unsupportable (Moratto 1984:40-48; Grayson 1993:57-59)

Table 4. Cultural Chronology of the East Mojave Desert.

Age (BP)	Period	Diagnostic Points	Other Attributes
12,000 - 10,000	Paleoindian	Fluted Point (Clovis Type)	Rancholabrean megafauna
10,000 - 7,000	Lake Mojave	Lake Mojave Silver Lake	Crescents, leaf-shaped bifaces, lanceolate bifaces, gravers, ovate-dome scrapers, elongated keel scrapers, choppers
7,000 - 4,000	Pinto	Lake Mojave Silver Lake (occasionally) Pinto	leaf-shaped bifaces, lanceolate bifaces, choppers, leaf-shaped points, unshaped flake knives, drills, gravers, scraper planes, flake scrapers, some milling/handstones
4,000 - 1,500	Gypsum	Gypsum Cave Elko Eared Elko Corner Notched Humboldt Concave Base	milling/handstones common, split twig figurines, mortar/pestle, rectangular based bifaces, flake scrapers, incised slate, shaft smoother, tortoise shell bowls, Haliotis and Olivella beads, bone awls, S-twist cordage
1,500 - 1,000	Saratoga Springs	Rose Springs Corner Notched, Eastgate	various shell beads, Anasazi Gray Ware ceramics, Tizon (Patayan) Brown Ware, Pyramid (Patayan) Gray Ware
1,000 - contact (AD 1776)	Late Prehistoric	Cottonwood Triangular Desert Side Notched	Tizon Brown Ware ceramics, Lower Colorado Buff Ware, Southern Paiute Brown Ware, steatite beads, various shell beads, large triangular bifaces
Post-contact	Historic	Cottonwood Triangular Desert Side Notched	Tizon Brown Ware ceramics, Lower Colorado Buff Ware, Southern Paiute Brown Ware, glass trade beads, metal tools, can, and buckets

and it will not be further considered in regards to this study.

The elusive Paleoindian Period (ca. 12,000 to 10,000 BP) is represented in the desert by “Clovis style” fluted projectile points which exist as isolated artifacts in several areas of the Mojave Desert and usually in association with pluvial lakes. Examples have been found at China Lake (Davis 1978), Fort Irwin (Basgall and Hall 1994b), at Lake Mojave (Moratto 1984) and at a more recent find in the East Mojave with a lakeshore association (Thomas Holcomb, personal communication 1994). Although direct radiocarbon dating is lacking, it is widely believed that fluted points date to the end of the Pleistocene. Warren’s (1997) stratigraphic studies at Lake Mojave assign a Clovis presence to a drought period around 11,500 BP with the occupation level being below the current playa floor. No other associated artifacts have been identified for this period in the Mojave.

Located above the Clovis layer at Lake Mojave are stemmed projectile points such as the Lake Mojave and Silver Lake points (Warren 1997) which are the principal diagnostics of the Lake Mojave Period (ca. 10,000 to 7,000 years ago). At the onset, this period is associated with a lacustrine adaptation that emphasized the hunting of big and small game, but even before the end of the period the desiccation of the pluvial lakes was occurring. This resulted in an opportunistic and more nomadic pattern utilizing wider based subsistence resources with a high degree of residential mobility of family-sized units (Altschul *et al.* 1998:126-131). This marked the beginning of the transition to the Archaic period. While the milling of seed resources did occur, it seemed to have been of minor importance. So far, no evidence of these first two periods has been discovered in the Granite Mountains or its contiguous ranges. This may be a reflection of the lack of effort to investigate in detail those paleoenvironments that would be most likely to possess such evidence, as well as the poor preservation of such sites.

The onset of the Pinto Period (ca. 7,000 to 4,000 BP) corresponds to the increased aridity of the Middle Holocene resulting in a focus on springs and seeps as residences. The population in the greater Mojave Desert may have been in decline as attested to by a minimal archaeological record (Warren 1984:411-414). Due to a primary environmental shift, family-sized organizations persisted as mobility was necessary in an expanding foraging strategy and resource base. The major subsistence change was a hypothesized increase in the utilization of hard seeds, as reflected in the presence of milling stones, although a variety of food sources can be ground. Three Pinto style projectile points have been found in the Granite Mountains.

The Gypsum Period (ca. 4,000 to 1,500 BP) seems to indicate an increase in population, probably due to the onset of a more mesic period. Mobility was still the most effective strategy as reflected in numerous small, short-term occupation sites that were coupled with wide-range foraging of high-yield food sources. The increased use of seeds is apparent; the processing of mesquite had begun, and faunal resources include lagomorphs, tortoises, and artiodactyls. The diagnostic points of the period are the Gypsum, Elko series, and Humboldt Concave which reflect pressure flaking and a preference for microcrystalline materials as opposed to the percussion flaked, fine-grained igneous tools of the earlier periods (Hall and Basgall 1994b:85). This is the first period for which an extensive prehistoric occupation in the Granite Mountains becomes apparent. Only two Gypsum points have been seen on surveys but fourteen Elko Eared, Corner-Notched and Humboldt Concave projectile points have been recorded.

The Saratoga Springs Period (ca. 1,500 to 1,000 BP) continues basically the same subsistence strategy with the addition of increased utilization of the upland areas for pine nuts and the introduction of the bow and arrow, as indicated by the Rose Spring and Eastgate projectile points. Cultural traits from the east make an appearance during this period. The presence of the pre-ceramic Patayan from the Lower Colorado River and Western Arizona is probable, as is the presence of the ceramic producing Virgin and Prescott Anasazi from Southern Nevada, the Arizona Strip and Central Arizona (Warren 1984:421-423). In the Granite Mountains this period is sparsely represented and relegated to four Rose Spring Corner-Notched points and a few black/gray and corrugated ceramic sherds.

In the Late Prehistoric/Protohistoric Period (ca. 1,000 BP to historic contact) the subsistence strategy continued to be based on small mobile family groups but they now appeared to be using a number of short-term residential base camps to monitor a wider range of lower ranked resources. These camps were used on a regular basis as the size of the foraging area decreased. In the Granite Mountains this may be indicated by the development of midden and the increased number of milling stones at these sites. This may be a reflection of the hypothesized onset of drought conditions at 900 to 500 BP (Pippin 1998:32). York and Spaulding (1995) note such environmental evidence as diminished spring discharge, the absence of any high stands of desert lakes, and the presence of more xeric plants at higher elevations as the reason for a major decline in site occurrences during this time in the Mojave Desert. Even with the onset of the Little Ice Age (400 to 300 BP) and the increase of biotic productivity, there does not appear to be any appreciable change in the subsistence strategy during this period (Pippin 1998:110). Horticulture utilizing the annual inundation of the river floodplain was practiced along the Colorado River. A variety of indigenous cultigens, as well as introduced European crops, were cultivated in this fashion. Ceramics are widely prevalent and represent one of the major indicators of ethnic groups. Paddle-and-anvil constructed Lower Colorado River Buff ware and Tizon Brown are diagnostic of the Patayan tradition and the historic Mohave. A poorly defined brownware is associated with the Chemehuevi. The Cottonwood Triangular and the Desert Side Notched projectile point are the diagnostic arrow points, with the latter point being more closely identified with the Chemehuevi although not exclusively. Based on surface finds, the most extensive and intensive archaeological inventory present in the Granite Mountains is that of the Late Prehistoric Period.

Ethnography

Attempting to determine ethnolinguistic identities from the archaeological record in the East Mojave is almost impossible. Many supposedly diagnostic artifacts cut across cultural boundaries. Perhaps the first identifiable culture in the region is the ancestral Mohave, a Hokan speaking group. The Mohave are known archaeologically as the Yuman, Hakatayan, or Patayan, with the latter currently being the preferred term (McGuire and Schiffer 1982). King (1981:33) hypothesized that the Mohave, and related groups, moved north up the Colorado River "from the vicinity of the Kiliwa in Baja California," eventually settling in the East Mojave Desert from circa AD 700 to 1500.

An alternative view is that the Mohave were already in the desert and expanded eastward to the Colorado River around AD 1150 (Schroeder 1952:29). The small number of Mohave who lived in the desert adopted a different subsistence/settlement strategy than the river Mohave and are thus known as the Desert Mohave, or the *Tiira?ayatawi* by the Chemehuevi (Laird 1976:140).

The Chemehuevi moved into this region after AD 1500 which led to a struggle for control of the strategic desert water holes. A series of skirmishes between the Desert Mohave and the Chemehuevi eventually culminated in a victory for the Chemehuevi at Mopah Spring in the Turtle Mountains. Several more battles were fought between them as late as AD 1867. Subsequently, the Desert Mohave pulled back to the Colorado River where they resided from Cottonwood Island south to Needles. There, the Mohave (*Ahamakhav*) continued their floodplain farming subsistence pattern (Stewart 1983:56). They would eventually invite the Chemehuevi to also farm a portion of the river floodplain. The Mohaves crossed Chemehuevi territory regularly on trade expeditions and, in general, exercised a great deal of influence on Chemehuevi culture (Kroeber 1925:728).

Another desert people who may have utilized the area were the Vanyume, a Mohave term derived from the word "Beneme," as they were first called by Francisco Garces in AD 1776. The Vanyume may have spoken a dialect of Serrano or perhaps even a separate Takic language. They lived along the Mojave River, probably as far east as the Mojave Sink, and perhaps traveled even further afield. They had amiable relations with the Chemehuevi and the Mohave, something the Serrano did not enjoy. The Vanyume decreased significantly in numbers between 1820 and 1834 and were virtually extinct by 1900 (Bean and Smith 1978:570).

The predominant ethnic group in the East Mojave in historic times was the Chemehuevi. They are part of the larger Numic speaking Southern Paiute who have been classified into 16 groups by Kelly and Fowler (1986:368) and stretch from California into central Utah and north-central Arizona. The Chemehuevi, the southernmost extension of the Southern Paiute, called themselves the Black Bearded Ones (*Tuumontcokowi*), or more simply the People (*Niwiwi*). Within their own tribe they recognized three divisions: the Northerners (*Tantiitsiwi*), Southerners (*Tantivaitsiwi*), and Desert People (*Tiiraniwiwi*) (Laird 1976:138). Within the three groups were numerous "bands" which were actually small numbers of related winter camps that functioned more like economic clusters. The Desert Chemehuevi, therefore, were distinct from the Las Vegas division and the Southerners who farmed along the Colorado River. They were loosely affiliated into seven village groups which included Ash Meadows, Armagosa River, Pahrump Valley, Potosi Mountain, Kingston Mountain, Clark Mountain, and Providence Mountain. Isabel Kelly's (1934) field notes list 85 individuals living in the last three bands. The Providence Mountain group was called *Tim-pa-shau'-wa-got-sits* and were led by *Wa-gu'-up* (Kelly 1934). It can be assumed that Granite Mountain families would be affiliated with them. The Chemehuevi utilized the basic Great Basin foraging strategy that relied heavily upon floral resources such as pine nuts, agave, mesquite beans, hard seeds, cacti fruit, and, to a lesser degree, the hunting of mountain sheep, deer, rabbits, tortoise, rodents, and lizards.

Contact with the River Hokan brought a multitude of new traits. From the Quechan (Yuman) they adopted cane cigarettes, dogs, horses, and Old World cultigens such as wheat. The Mohave provided extensive vocabulary terms, song cycles, an emphasis on dreaming, floodplain farming and its associated crops, squared metates, balsa rafts and ferrying pots to navigate on the river, hair dye, paddle and anvil ceramics, and ceramic forms (Kelly and Fowler 1986:370). In contemporary times the Mohave are split between two reservations that span the Colorado River: Fort Mohave, north of Needles, and the Colorado River Tribes near Poston, Arizona. The Chemehuevi currently have a reservation on the California side of Lake Havasu and other tribal members live at the Colorado River Tribes Reservation as well as the Morongo Reservation near Banning, California (Schaefer and Schultze 1996:10-11).

Previous Research

Archaeological investigations did not officially commence in the Granite Mountains until the post-World War II era. In 1951 Ben McCown reported finding a bow (it was a curved stick with a notch on one end, Robin Laska, personal communication 1998) and an olla with a lid in the Granite Pass area. Michael Kuhn, an avocationalist, began exploring in the Granite Mountains in 1962 and continued for the better part of the decade. His site reports were submitted in 1981 and 1984. He did collect some surface artifacts that were deposited at University of California Los Angeles and the San Bernardino County Museum (SBCM); although recently some items have been returned to the GMDRC. The Archaeological Survey Association of Southern California (ASA) did extensive fieldwork in the Granite Pass and Snake Springs area from 1964-71 which resulted in a few notes and photographs of ASA activities, and some artifacts now curated at SBCM. Some of these sites have been relocated and recorded.

Spurred by a BLM proposal to construct a campground at Snake Springs, the SBCM sent Arda Haenszel, Gerald Smith, and Robert Reynolds to survey sites in the area in 1970. Approximately ten sites were recorded. In 1975 the BLM commenced a program to test 1.5% of the East Mojave to aid resource managers in predicting the location of sites based on a model constructed from random sample surveys of complete sections (640-acre parcels). Two sections were selected in the Granite Mountains. Reports were submitted by Dennis Gallegos, Garth Portillo, Eric Ritter, Louis Payen, and H. E. Hanks. One section was surveyed on the north slope of the Granite Mountains and yielded no sites, although three sites were recorded en route to the sample plot. The other section was completed at the south end of the Granite Mountains in the mouth of Willow Springs Basin and produced 12 sites. In 1976 Gallegos and Carol Rector were afforded limited time in Granite

Cove by the property owners and recorded most of the loci associated with the extensive site there. Gallegos (1976) produced a brief unpublished manuscript on the archaeological context of rock art sites in the Mojave Desert. Later Rector (1981) wrote the first synthesis of rock art in the East Mojave. In 1978 the University of California at Santa Cruz sent a multidisciplinary team that spent ten weeks inventorying natural and cultural resources in the Granite Mountains (Stein and Warrick 1979). Students Ann Harvey and Joanne Kerbavaz (1979:169-190) recorded sites and wrote a chapter in the report which was the only previous archaeological overview to have been written on the range. After their limited investigations, they concluded that their work was neither as systematic nor as thorough as they would have liked (Harvey and Kerbavaz 1979:186). In 1983 Thomas Taylor and David White did survey work along the route of the transmission line that cuts across the north end of the Granite Mountains. They recorded ten prehistoric trails that were within the limits of the present project area.

Single sites were recorded through the years by Henry O'Neil, Emma Lou Davis, Frank Bock, Gene Shepard, Carl Sandhoff, Stan Rolf, Chuck Sabine, Leonard Nelson, Christopher Drover, and Philip Wilke. All of the above site reports are on file at SBCM. Since the mid-1980s little archaeological work has been conducted with the exception of Lawlor's (1995) unpublished doctoral dissertation on the impact on prehistoric plant remains by site formation processes. Her work contains some excellent material on ethnobotany and floral resources in the Granite Mountains.

Research Interests

Our primary focus was to develop baseline archaeological data for the Granite Mountains by locating and describing sites to aid in future planning and monitoring. We did have five research objectives. The first involved the definition of chronology, which, in an area with very little scientific excavation, is always of interest. Diagnostic artifacts, with qualifications, can be temporally significant. Preliminary work in the range and examination of site records indicated an extensive Late Prehistoric presence. Is this the case? What evidence exists for earlier occupation? Chronometric analysis largely depends upon projectile point typology and the identification of ceramic types and other diagnostic materials. Rock art styles also provide some evidence of antiquity.

Cultural affiliation for prehistoric sites was our second objective. Historic records ascribe the use of the Granite Mountains to both the Chemehuevi and the Mohave. What archaeological evidence is there to substantiate these accounts? Who were the Pre-Numic people? Can ethnolinguistic affiliation even be identified at all?

Given the biodiversity of the range, the prehistoric subsistence and settlement pattern of the Granite Mountains was our third research interest. King (1981:10-11) describes a subsistence model for the East Mojave Desert. In general terms it features a large winter encampment living in domed houses, sustained by caches of mesquite beans and pine nuts gathered in the preceding summer and fall respectively. As stored food started to diminish at the end of the winter, cacti in the immediate vicinity was gathered and eaten. In the early spring the winter camp dispersed into smaller, more mobile family groups and sought other sources such as agave in some of the mountain ranges. In early summer these family organizations concentrated on seed-bearing plant resources. Towards the end of summer, attention shifted to collecting serviceberry and juniper berry in the uplands, and mesquite beans in the lower elevations. In the fall, the people moved to the mountains to harvest pine nuts and any mesquite that occurred at that elevation. From there the families re-converged back into the larger winter camps. Does the subsistence pattern defined by King (1983:10-11,14) apply to the Granite Mountain area? Can this settlement pattern be identified? Do site types correspond to vegetation zones and potential food resources? Can winter camps be identified? In our investigation we focused on available food resources, site types, location, frequency, artifact assemblages, and temporal associations when visible. Future inquiries along these lines would benefit from paleoenvironmental analysis of pollen samples, packrat middens, and geomorphology along the lines of the study by Pippin (1998) on a portion of the Nevada Test Site.

A fourth research topic was cultural interaction. During the course of our initial rock art research, we noticed the presence of non-local lithic material in both flaked and ground stone tools. “Exotics” such as black/white ceramic sherds and Pacific Ocean seashells were observed. Were these trade items procured from adjacent areas in the normal course of a seasonal round, or are they indicative of direct contact? What evidence exits for interaction and influence from outside groups and can these groups be identified?

Our final research interest, and our initial focus, was rock art. The Granite Mountains have one of the major rock art concentrations in the East Mojave. The immediate question is why? Is it because there was a greater prehistoric population residing there or is it because of some ritual or mythical importance that we may never be able to reconsider? We have proposed as a hypothesis that regional styles exist in the greater corpus of Great Basin Abstract rock art and, like any style, they reflect geographical, temporal, and cultural reality (Christensen *et al.* 1999a). Does the rock art of the Granite Mountains reflect these proposed regional variations in styles? Realizing that a definitive answer is probably not possible, can any insights be gained into determining what purpose rock art serves within the structure of the society that produced it? Fortunately, ancillary studies being conducted by the authors in the East Mojave have given us additional data to consider in exploring these questions (Dickey 1993, 1994; Christensen and Dickey 1996, 1998, 2001; Christensen *et al.* 1999b).

Field Results

Field Methods

Over a four-year period, this project expanded from an investigation of rock art of the region to an overall study of archaeological phenomena within the Granite Mountains. In 1994, Christensen and Dickey initiated an ambitious research program of trying to define rock art styles and, perhaps, their temporal dimension and ethnolinguistic affiliations in the East Mojave Desert. This included a strategy to document sites in representative geographical regions, and a variety of environmental and archaeological contexts. In consultation with Thomas Holcomb, then Bureau of Land Management (BLM) archaeologist for the Needles Resource area, we mutually agreed to give attention to those sites that were most impacted by natural or cultural forces. Within the year it became apparent that the pictographs we encountered were deteriorating more rapidly than the petroglyphs. We then shifted our emphasis to recording pictograph sites. This resulted in the documentation of almost 1,500 painted elements at 27 sites and produced the first study to deal specifically with the pictographs of the region (Christensen and Dickey 1996).

In the course of researching pictographs we conducted initial investigations within the GMDRC. On the 9,000 plus acres that the Research Center jointly owns and administers with the National Park Service (NPS), we recorded 14 pictograph sites. At the conclusion of the project we became involved in obtaining baseline data for a cultural resource management plan for the center. In conjunction with the GMDRC, and with a cultural resource permit from the NPS, we proceeded to spend an additional two seasons in the Granite

Mountains recording 93 new archaeological sites and rerecording, to more contemporary standards, 25 additional sites in order to create a data base upon which to develop a management guideline. In total, 59 prehistoric rock art sites with 2,363 design elements were fully documented within the Granite Mountains. A separate article dealing just with the rock art component has now been published (Christensen, Dickey, and Lee 1999b). An additional two years were spent focusing on producing this report and doing limited fieldwork to augment those areas which were needed to develop a more inclusive archaeological overview.

The fieldwork consisted of reconnaissance surveys in selected areas with crews ranging usually from one to five individuals. Since our initial intent was rock art recordation, we concentrated on rockshelters and outcrops which are located principally along the bottom edge of the mountains and on the pediment. When we shifted to gathering data to aid in developing a cultural resource management plan, a more comprehensive investigation involving transects was conducted in those parts of the GMDRC which have the highest potential impact from educational and research activities, as well as those areas frequently accessed by the general public. In particular, this involved survey around residences, the research center, educational facilities, campgrounds, field study areas, and roadways. Finally, when we tried to look at the Granite Mountains in total, we did exploratory transects around 32 of the 36-mile perimeter of the range.

Intuitive surveys were done on six of the upland basins and ridges, in the major coves, and in the proximity of the springs on the bajada. In addition, investigations were done in the immediately adjacent regions (all within a 10 km distance) in one area of the Brown Buttes, three areas of the southern Providence Mountains, the southern portion of the Kelso Dunes, the Van Winkle Mountains, and an area on the east side of the Bristol Mountains (Fig. 3). The purpose of these expanded studies was twofold: (1) to see if the same types of sites and artifact assemblages existed in the adjacent regions, and, (2) to see if the sources of lithic material that did not occur in the Granite Mountains, and other potential subsistence items, could be located.

Neither the personnel nor the time was available for an intensive inventory survey and that was, therefore, never considered. Random sampling of selected quadrants was not used due to the size, rugged terrain and remoteness of the range. Locating and reaching random plots would require too much of the limited field time available to the researchers. Instead, reconnaissance surveys were used as a sampling design to yield as much information as possible consistent with our available human resources. An effort was made to include all the identifiable environmental zones.

For purposes of future management of the area, new sites encountered on survey were recorded on the State Office of Historical Preservation (OHP) standard forms. Previously recorded sites were re-recorded if significant new data could be added or site maps were lacking. In most cases, the older sites were updated so the bulk of the site reports are at least standardized. All rock art encountered was fully documented, including scale drawings of all elements. The rock art was not photographed due to fiscal restraints. Very few artifacts were collected, other than an occasional diagnostic item, and these were all within the boundaries of the GMDRC in areas subject to frequent visitor use. Those items are curated at the facility's lab.

Site Types and Classification

Classifying sites into categories based on hypothesized function is a common analytical technique used to help organize and understand field data. Given that one of our research interests is subsistence and

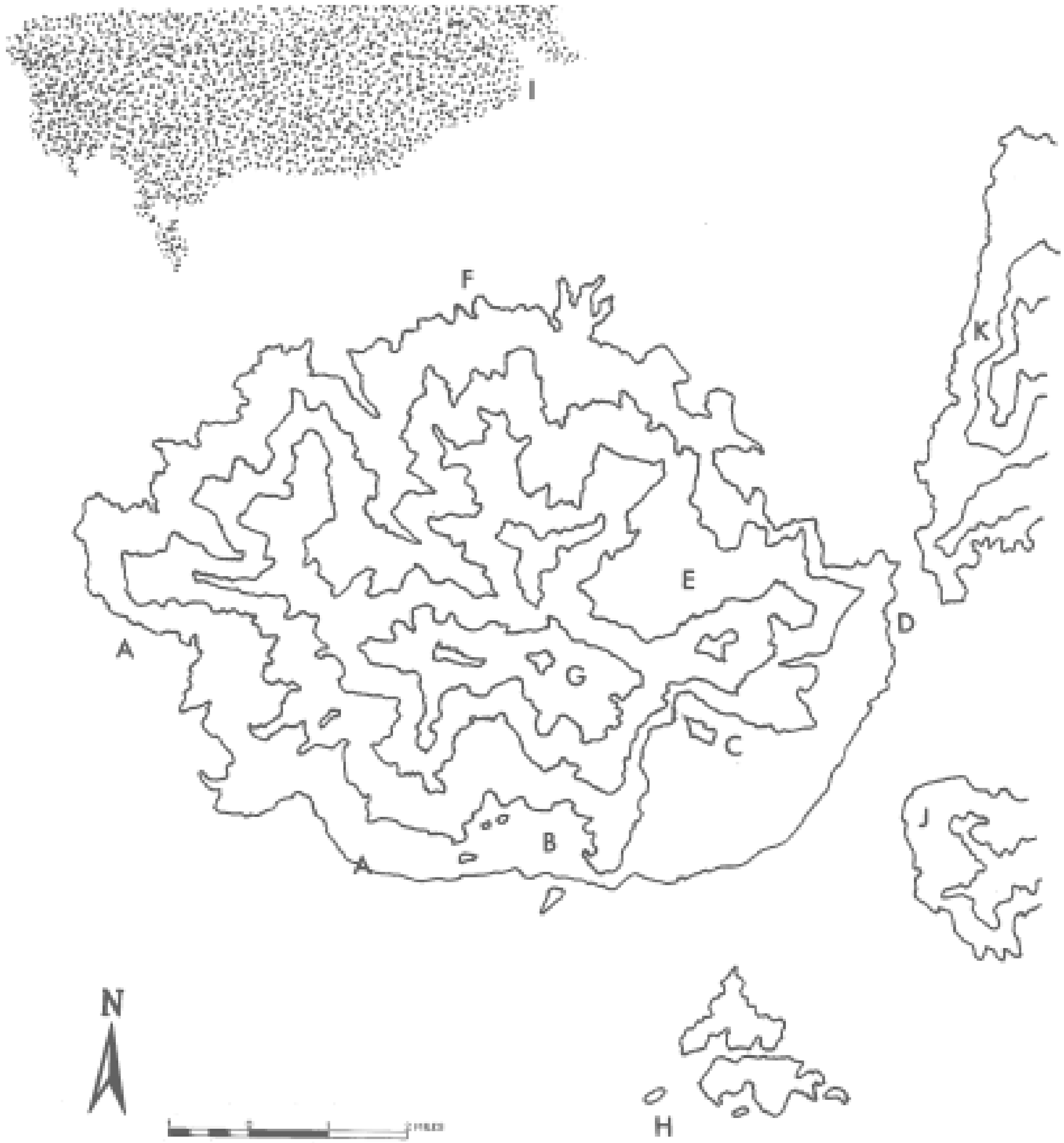

Fig. 3. Map of the Granite Mountains showing general features: A) Western and Southern Bajada, B) Willow Spring Basin, C) Granite Cove, D) Granite Pass, E) Cottonwood Cove, F) North Canyons, G) Uplands, H) Brown Buttes, I) Kelso Dunes, J) Van Winkle Mountains, K) South Providence Mountains.

settlement, such a process is crucial to discerning what patterns, if any, do exist. Our observations are based entirely on surface finds during the course of survey. A variety of natural and cultural post-depositional processes can alter the original context of a site, thereby affecting contemporary conclusions. Sites are therefore classified by their descriptive characteristics to give a picture of what is currently "on the ground" and by their functional attributes, which is obviously more interpretative and open to a degree of subjectivity (cf. McVickar 2001:55-60).

Based on descriptive typology, sites were divided initially into three categories: artifact scatters, sites with a single feature, and sites with multiple features. Sites were further divided between being open sites or those that had one or more rockshelters as a component. This last subdivision was included to assess the significance of rockshelters on site types and functions.

Artifact scatters were spatially distinct surface occurrences of flaked stone tools, debitage scatters, ceramic sherd scatters, and ground stone tools and fragments. They were grouped into seven combinations thereof and Table 5 reflects their frequency and distribution. Artifact scatters are 19% (n=33) of the sites in the study area, although artifact scatters also exist on 83% of the sites with single features and 94%

Table 5. Granite Mountains Artifact Scatters.

Type	Open Site	Rockshelter	Total
Debitage, Sherds, Ground Stone	5	4	9
Debitage, Sherds	3	1	4
Debitage, Ground Stone	4	3	7
Sherds, Ground Stone	2	-	2
Debitage only	3	1	4
Sherds only	-	2	2
Ground Stone only	4	1	5
Total	21	12	33

Table 6. Granite Mountains Sites With Single Features. (BRM - bedrock milling feature. AS - artifact scatter. Thermal - hearth, fire-cracked rock, roasting pit.)

Type	Open Site	Rockshelter	Total
BRM w/AS	6	2	8
Rock art w/AS	3	8	11
Thermal Fea. w/AS	3	1	4
Trail w/AS	10	-	10
Cairn w/AS	3	-	3
Midden w/AS	6	3	9
Wall(s) w/AS	-	2	2
Spirit stick w/AS	-	1	1
BRM only	1	1	2
Rock art only	2	6	8
Total	34	24	58

of the sites with multiple features. In total 91% (n=155) of all the recorded sites in this study had artifact scatters as a part of the site inventory.

Sites that had a single feature comprised 34% (n=58) of the recorded sites. They were subdivided into ten groupings as shown in Table 6. Single features included bedrock milling stations, rock art, trails, midden, cairns, rock walls, “spirit sticks” (see description under perishables), and such thermal features as fire-cracked rock, hearths, and roasting pits. Rock art was the most common individual feature occurring on 33% (n=19) of the sites in this category.

Sites with multiple features were the largest category (46%, n=79) discovered in the investigation and resulted in 31 different configurations (Table 7). The types of features involved include the same listed as single features above plus caches, rock alignments, “drying palettes” (see discussion under rock features), rock rings, and stone-lined pits. Some type of thermal feature was the most frequently present component at multiple feature sites occurring at 59% (n=47) of the sites. Midden was present at 52% of these site types.

The differentiation between sites which incorporate at least one rockshelter and sites that have open exposure proved to be rather expected and not significant. Artifact scatters tended to be predominate in open sites by a 21 to 12 margin over rockshelters. The difference between open and sheltered sites with single features would be negligible except for the ten sites with trails which gave a margin to open sites. Rockshelters comprise 54% (n=43) of multiple featured sites. Shelters would offer more of a degree of protection to pictographs, middens, and hearths than open sites would, thus increasing the opportunity to observe numerous features. This is especially true of pictograph sites.

The distribution of descriptive site types by chronological periods could be postulated for 66% (n=113) of the total sites using ceramic sherds, diagnostic projectile points, and historic glass artifacts as time markers. Late Prehistoric sites comprised 62% (n=49) of sites with multiple features, 55% (n=32) of single feature sites, and 54% (n=18) of the artifact scatters. Multicomponent sites were few; sites with multiple features represent the highest category at only 10% (n=8).

Functional typology for site types requires drawing inferences from the observed artifacts and features. The cultural components employed in ascribing use include site size, feature types and frequency, debitage and sherd density, and the presence or absence of flaked and ground stone tools. Geib and Bremmer (1996:136-141) have outlined the problems with inferring site functions which are not always supported by the descriptive facts. Interpretation can easily be misled by site reuse, curation, and natural processes. We have identified important post-depositional processes in the Granite Mountains, and can account for them in our interpretations.

Obviously the reoccupation of a site over a number of years would increase the density of artifacts, the types of artifacts, and site size. Granite Pass has the highest site density of any area surveyed in this study with 30 sites in approximately two square kilometers (.75 square mile). Due to the scarcity of potable water, a one time utilization of the region seems unlikely and this would be an area more likely to have been seasonally reoccupied.

Prehistoric people did scavenge older artifacts and frequently reused them for a variety of purposes (Schiffer 1987:99-120). The 15 projectile points from earlier chronological periods that were observed on Late Prehistoric sites could represent previous occupation by Gypsum or Saratoga Springs Period populations, or could be examples of prehistoric curation. Without subsurface testing, there is no way to arrive at a definitive conclusion. Contemporary

Table 7. Granite Mountains Sites With Multiple Features. (BRM - bedrock milling feature. AS - artifact scatter. Thermal - hearth, fire-cracked rock, roasting pit)

Type	Open Site	Rockshelter	Total
BRM, rock art	1	1	2
BRM, rock art, cache	-	1	1
Thermal, cache	-	1	1
Rock alignment, cairns	1	-	1
BRM, rock art w/AS	4	4	8
BRM, midden w/AS	1	1	2
BRM, drying palettes w/AS	1	-	1
BRM, rock rings w/AS	1	-	1
BRM, cache w/AS	-	1	1
BRM, thermal w/AS	1	-	1
BRM, midden, rock art w/AS	2	2	4
BRM, rock art, thermal w/AS	-	2	2
BRM, midden, thermal w/AS	-	2	2
BRM, midden, wall w/AS	-	1	1
BRM, midden, rock art, thermal w/AS	1	5	6
BRM, cache, midden, rock art w/AS	-	1	1
BRM, drying palette, midden, rock art, thermal w/AS	-	1	1
Multiple cache w/AS	1	-	1
Multiple drying palettes w/AS	1	-	1
Midden, thermal w/AS	7	9	16
Midden, rock art w/AS	1	1	2
Midden, Wall(s)/w/AS	-	2	2
Midden, rock art, thermal w/AS	-	3	3
Midden, rock art, wall w/AS	1	-	1
Midden, drying palette, rock art, thermal w/AS	-	1	1
Rock art, thermal w/AS	3	3	6
Rock art, cache w/AS	1	-	1
Spirit stick, cache w/AS	-	1	1
Multiple stone-lined pit w/AS	1	-	1
Multiple thermal w/AS	7	-	7
Thermal, cache w/AS	-	1	1
Total	36	43	79

“pothunting” is an ongoing problem for archaeological research and resource protection. During the course of our project we received numerous anecdotal accounts of people finding and collecting ollas, baskets, sandals, and projectile points in the recent past.

The Granite Mountains, like any region, have been subject to modern-day disturbances that affect the archaeological record. Ranching, mining, spring developments, recreation activities and military incursions have all had a negative impact on site integrity. However, overall degradation from geomorphological forces have been the major form of disturbance. Faunal turbation from surface feeding animals such as rodents, rabbits, badgers, and even ants is a common occurrence although their spoil dirt does reveal the presence of middens on occasion. Nest building rodents relocate artifactual material particularly in rockshelters. The biggest problem, however, is the trampling of sites by cattle and feral burros which are most numerous. Burros, in particular, have the unpleasant habit of wallowing invariably in the middle of middens or artifact scatters such as seen at CA-SBR-1973 and -9526. Regional processes which alter the structure of archaeological sites include eolian and hydrological forces. Wind is a daily factor in deserts and, as a result, desert pavement formation, deflation, and deposition are all ongoing processes. The Kelso Dunes are an active dune formation. Some of the artifacts that Kuhn was able to discover in the 1960s, in blowouts on the dune margin, we could not relocate. We did, however, observe artifacts that Kuhn did not report.

In a region that averages just over nine inches of rainfall one would not expect hydrological erosion and deposition to be much of a factor; however, just the opposite is true. Almost every rockshelter examined has rivulets that have on occasion removed artifacts to other locations as secondary deposits. Given the number of sites along the mountain apron, colluvial deposits are widespread and have compromised numerous sites. BLM archaeologists recorded a huge site (CA-SBR-1874) on the southern bajada in 1979 which they labeled as a “village.” No indications of that site are currently visible owing to sheet wash deposition. Alluvial erosion is not as frequent because most sites are not located in a flood plain; however, torrential rains can – and do – enlarge their channels quickly. A portion of a deep midden at CA-SBR-352 was lost to flooding in the winter of 1997-98. On July 28, 1999, 1.67 inches of rain fell in 40 minutes creating wall-to-wall water up to three feet deep in some arroyos. An examination of CA-SBR-4914 several days later revealed that of the 16 grinding stones that were point provenienced during the recording of the site, six were no longer there; however, 14 new metates had been revealed on the wash floor or in the sidewalls. Site reports are nothing more than photographs capturing a brief moment in time before the record changes due to taphonomic processes.

In consideration of the above qualifications, we created just two functional site types, habitation and limited activity, and then subdivided each of those into more specific categories (see Appendix A for a listing and classification of all sites). All of the habitation sites appear to be of short-term duration where people lived for an abbreviated period of time on one occasion or seasonally over a period of years. These sites show a variety of tool types and activities and, in general, have two features or more with an associated artifact scatter. Sites that had a single feature were considered habitation if that feature was a midden, given that sites with midden are generally infrequent in the East Mojave and take time to develop. There were three exceptions to these parameters in which artifact scatters were inferred to be habitation sites because of their great variety of tool types and heavy to moderate artifact density. For example, CA-SBR-9340 had eight milling stones, a mano, four flaked stone tools, and a medium density of ceramic sherds and debitage on a 1,200 square meter site with no surface indication of a midden.

The 87 identified habitation sites were subdivided into two groups: base camps and temporary camps. Base camps are characterized by a greater variety of features and artifacts and would include extensive artifact scatters and midden deposits, hearths, bedrock and portable milling features, multiple tool types, and rock art. These characteristics would seem to indicate a diversity of subsistence and social activities concomitant with a larger community. Nine base camps were identified based on this criteria. The size of base camps varied from 1,064 square meters to 14,100 square meters with the average being 4,454 square meters. Most of the base camps were within 750 meters of a spring, with four of them having springs on site. Interestingly, an exception was the largest base camp, CA-SBR-418, which is 1.2 km from intermittent water. Site CA-SBR-9549, the smallest base camp, was the farthest from modern sources of water being 2 km distant. All nine of the base camps were found on the bajada zone with eight being on the east side of the Granites where permanent springs are easily accessible (Table 8). Only one (CA-SBR-9326) was located at the mouth of a northern canyon although it has tanks and springs further up the drainage.

Temporary camps, the most frequently encountered site type (n=78), are related to areas of increased biodiversity. They are unknown in the Brown Buttes and are rare on the southern, western, and northern peripheries of the Granite Mountains (4 total). Temporary camps reflect short-term seasonal utilization and function as logistical procurement camps for the acquisition and processing of vegetal and faunal resources. They average 1,410 square meters in size. The sites are on the average 1.25 km from water with two sites having springs on site, while, at the other extreme, two sites are 4.3 km distant from current water sources. Temporary camps may have been occupied briefly or reused intermittently over long periods of time and, therefore, artifact density may vary considerably from sparse to abundant. Hearths

Table 8. Distribution of Functional Site Types By Environmental Zone.

	Zone					
Site Type	Upland	Bajada	Wash	Riparian	Dune	Total
I. Habitation						
Base Camp	1	6		2		9
Temporary Camp	27	36	11	2	2	78
II. Limited Activity						
Transient Camps	1	11	3			15
Trails		10				10
Lithic Manufacturing	1	6	1			8
Food Processing	2	18	5		2	27
Food Storage		5				5
Rock Art	2	10	5			17
Rock Alignment		1				1
Total	34	103	25	4	4	170

and storage features may be present in a few cases, but artifact diversity is limited to certain dominant tool types such as milling implements or projectile points, knives and scrapers, dependent upon the principal resource being exploited in the immediate area. Milling stones, debitage and ceramic sherds are, however, the most frequently encountered artifacts on these sites. Temporary camps are found throughout all the environmental zones of the range although a slight majority (55%, n=43) are found within the bajada areas (Table 8). A significant number of temporary camps were located in the uplands (n=24) and these appear to be related to resource procurement. This may be indicative of the greater East Mojave but to date there has not been enough research undertaken to determine whether this is the case. Research conducted in the Kingston Range (Neraas 1983) led to the location of camps which were correlated with pinyon extraction in the higher elevations. This may also be true in the mountain camps of the Granite Mountains, however, no definitive evidence of that has yet to be established. In Bighorn Basin, a large roasting pit on one site (CA-SBR-9341) seems to indicate the processing of the locally available agave and/or yucca.

Limited activity sites were delineated on the basis of artifact and feature inventories that represent a single, specific purpose. There are 83 sites that met the criteria of this category. They represent a variety of distinct functions, and include transitory camps, trails, flaked lithic manufacture or maintenance, floral or faunal food processing or storage, or a specific ceremonial activity.

Transient camps are located adjacent to natural routes of travel and exhibit minimal artifacts and an occasional hearth. The 15 transient camps have an average size of 307 square meters. All the sites had debitage and 11 sites had ceramic sherds but most of them had less than 10 flakes or sherds respectively. A metate was present at nine of the sites and two had hearths but the combination of attributes seems to indicate a single incident of use or at best irregular utilization. Transient camps are located on the bajada or along washes below the bajada with the exception of one camp located in an upland pass.

Prehistoric trails are rather difficult to determine in the sandy soil which is the residue of decomposed granite. Desert pavement surfaces offer the best chance to trace such features. Undoubtedly, the trail network was much more extensive in prehistoric times, and the fact that the trails are less evident today is because of the impact of erosion, modern roads, revegetation, and their current usage by feral burros. Trails are approximately 30-40 cm in width, although burro traffic can quickly alter that, but are more distinguishable because their course follows the most accessible route between two points and not the shortest distance as is typical of game trails. Trails are primarily located along the washes on the north side of the Granite Mountains. The latter trails connect water sources in the northern canyons with the Kelso Dunes, a primary area for ricegrass collection. The trail coming out of Bull Canyon is a typical example and is discernible intermittently over a 3.2 km distance. Trails also continue along the west side of the range with lateral routes to canyon water sources. The Van Winkle Mountains also have a distinct trail system, one of which runs for over 2 km along its western edge.

Eight sites primarily involved with flaked stone reduction and tool manufacturing were located during the survey. At six other sites it was a secondary activity. Five of these latter sites were found to be in association with temporary camps and one with food processing activity. All six of the sites are located in the uplands. Actual quarrying activities were associated with primary dikes and outcrops of quartz, some of it crystalline. Quarries were characterized by abundant angular shatter, primary decortication flakes, some tested cores, performs, and occasional hammerstones. In several places, mostly on the northern alluvial apron, massive quartz boulders have been partially shattered. It was not always apparent if this resulted from prehistoric or historic action. Lithic sources that have been redeposited in a secondary geological context, particularly rhyolite, also are subject to primary reduction. These locales are similar to quarries in their assemblages yet seem to have more cores and performs. All eight of the sites where flaked lithic manufacturing is the primary focus are located on the flats adjacent to washes. Lithic scatters of secondary reduction seem to be underrepresented in the Granite Mountains in view of the fact that these are the most common site type in the California deserts (Ritter and Coombs 1990:35). This may be reflective of our own methodological bias or possibly these sites are not widespread, but only found in select areas that were under surveyed. A more extensive investigation of the higher elevations and the wash regions might help to answer this question. The scatters that were observed tended to vary in their nature according to the raw material present. Indigenous materials such as rhyolite and felsite appeared to represent later stage reduction of performs while debitage of obsidian and some of the microcrystallines was indicative of tool retouching. This probably reflects the value of the resource and its apparent availability.

Food processing sites exhibit portable and bedrock milling tools, ceramic sherds, bifaces, cores, core tools, and occasionally hearths and roasting pits as their dominant assemblage. There are 27 sites in this category and they occur in representative numbers in all of the ecotone regions except riparian (Table 8). Closely related to processing are sites where food was stored. There are five sites where food or water caching was likely the primary focus although ten of the habitation sites also have caches as one of their features. The characteristics of caches are ceramic sherds or portions of vessels found inside secluded portions of rockshelters, small rock features that supported storage vessels, or rock features that functioned as underground storage units.

There are 17 sites which have rock art as the principal focus of the site. At eight of these there are no other features or artifacts, five of the sites have a few sherds or flakes, and four have a single milling feature. Pictographs occur at eight of these sites, the same number have only petroglyphs and only one site has both painted and pecked elements. The rock art sites are located on the bajada (n=9), washes (n=6), and uplands (n=2). There is only a single rock alignment site which is located on the desert pavement surface between two washes.

Artifacts

Flaked Stone Tools

Seventy-seven sites which contained flaked stone tools were recorded in the Granite Mountains and environs survey (Table 9). Sixty-six percent of these tools (n=167) were found on the eastern bajada of the range and in the pinon-juniper uplands. Bifaces were classified as any thinned, bifacially worked blade that lacked the diagnostic base associated with projectile points. Some of these were probably the broken tips of projectile points and others with straight bases probably represent knives due to their large size. Of the 84 bifaces recorded, 37 of these were of microcrystalline material and 33 were rhyolite (Table 10). Cores and core tools comprised the next largest type with a total of 58. Without edge-wear analysis, specific functional types for these tools could not be assigned, although some are likely choppers and scrapers. Rhyolite (36%), felsite (21%), microcrystallines (19%), and quartz (17%) are the major materials from which cores and core tools were manufactured. Sixteen hammerstones were also located. Twelve were composed of massive quartz. Five drills were documented, however, they were missing portions of their bases and therefore were not diagnostic. One drill was made from rhyolite and the other four were microcrystalline.

Fifty-eight projectile points were recorded during the survey with 62% being arrow points and the remainder being atlatl dart points (Fig. 4). Cottonwood triangular were the most predominant point type (n=19) with 79% (n=15) of these made from a white microcrystalline material. Six Rose Spring and eleven Desert Side Notched points were also found. Elko Eared comprised the second largest projectile point group represented and the most common of the dart points. They were manufactured out of rhyolite (n=4), cryptocrystalline (n=4), and basalt (n=2). Three microcrystalline Gypsum points along with six Humboldt points made from felsite (n=2), microcrystalline (n=2), rhyolite (n=1) and obsidian (n=1) were also found. Three microcrystalline Pintos were observed. Twenty-four percent (n=14) of all the projectile points were found in the upland areas. This may be due to either their remoteness, which reduces their chance for historic curation, or the fact that hunting was of more importance in this region due to the presence of such large game animals as desert bighorn sheep. Granite Cove had the highest density of projectile points (n=17) but it has also been the most intensely surveyed.

Although microcrystalline was present at more sites in the form of debitage than any other material, the greatest amount of flaked lithic waste noted during the survey was of rhyolitic material. On the basis of visual inspection in the field, it appeared to be identical to deposits in the nearby Van Winkle Mountains. Four sites were recorded in the Van Winkle Mountains that possess an excellent grade of rhyolite as float and exhibit the characteristics of primary reduction sites. A wide band of rhyolite exists in Willow Springs Basin but it is of such poor quality because of irregular fracturing. Examination of the deposit indicated no shatter, cores, preforms, or debitage associated with primary reduction. No systematic sourcing of lithic sources has been done in the Granite Mountain area but the authors' fieldwork offers the following observations. Basalt with enough silica to produce a conchoidal fracture exits at the east end of the Van Winkle Mountains but good quality basalt exists in

Table 9. Distribution of flaked stone tools by environmental zone.

	Zone (n/96)					
Tool type	Upland	Bajada	Wash	Riparian	Dune	Total
Core/Core Tool	8	45	2	2	1	58
Preform		29				29
Hammerstone	5	8			3	16
Drill	2	3				5
Biface	24	46	4	8	2	84
Pinto		2		1		3
Gypsum		2			1	3
Elko	3	6	1			10
Humboldt	2	3	1			6
Rose Springs	3	4				7
Desert side-notched	3	6		2		11
Cottonwood	7	9	2	1		19
Total sites with tools	23 (68%)	43 (42%)	6 (24%)	3 (75%)	2 (50%)	

Table 10. Distribution of flaked stone tools by material.

	Point							
Material	Pinto	Gypsum	Elko	Humbldt	Rose Spring	Desert side-notched	Cottonwood	Total
Rhyolite			4	1			1	6
Crypotcrystl.	3	3	4	2	5	10	16	43
Felsite				2				2
Obsidian				1	1	1	1	4
Quartz								0
Basalt			2					2
Brecc. Rhyolite								0
Glass							1	1
Total	3	3	10	6	6	11	19	58
	Tool							
	Biface	Preform	Core/Core Tool	Hammer	Drill	Total		
Rhyolite	33	24	21	2	1	81		
Cryptocrystl.	37	0	11	0	4	54		
Felsite	2	0	12	0	0	14		
Obsidian	3	0	2	0	0	5		
Quartz	3	5	10	12	0	30		
Basalt	2	0	1	0	0	3		
Brecc. Rhyolite	2	0	1	0	0	3		
Granite		0	0	2	0	2		
Total	84	29	58	16	5	192		

several volcanic regions in the East Mojave. Limited nodules of chalcedony and small seams of chert and obsidian occur high on the north rim of the Van Winkles. A poor quality red jasper, which occasionally is found as debitage on Granite Mountain sites, is found scattered in the Brown Buttes area and limited quantities of jasper occur on the eastern alluvial apron of the Bristol Mountains. Felsite, brecciated rhyolite, and crystalline and massive quartz, all occur locally within the Granite Mountains. Felsite occurs as a light secondary deposit in the northern half of the Granite Mountains but concentrated deposits that were being used for tool manufacturing were not located. Brecciated rhyolite occurs at a few isolated outcrops on the range's northern periphery. A local feature known as the "Dike of Jewels" runs from Granite Cove up over the mountain ridges and down the east side to the Cove Springs area. It contains an excellent grade of crystalline quartz. There are several other quartz dikes of similar quality in the range. Quartz also served as a source of ritual importance in addition to a tool producing resource. As Kelly (1939:166) noted in her study of Southern Paiute shamanism "one doctor used crystals for making rain. He lived at *Timpi'sawats* [Providence Mountains]. He could bring rain only in winter."

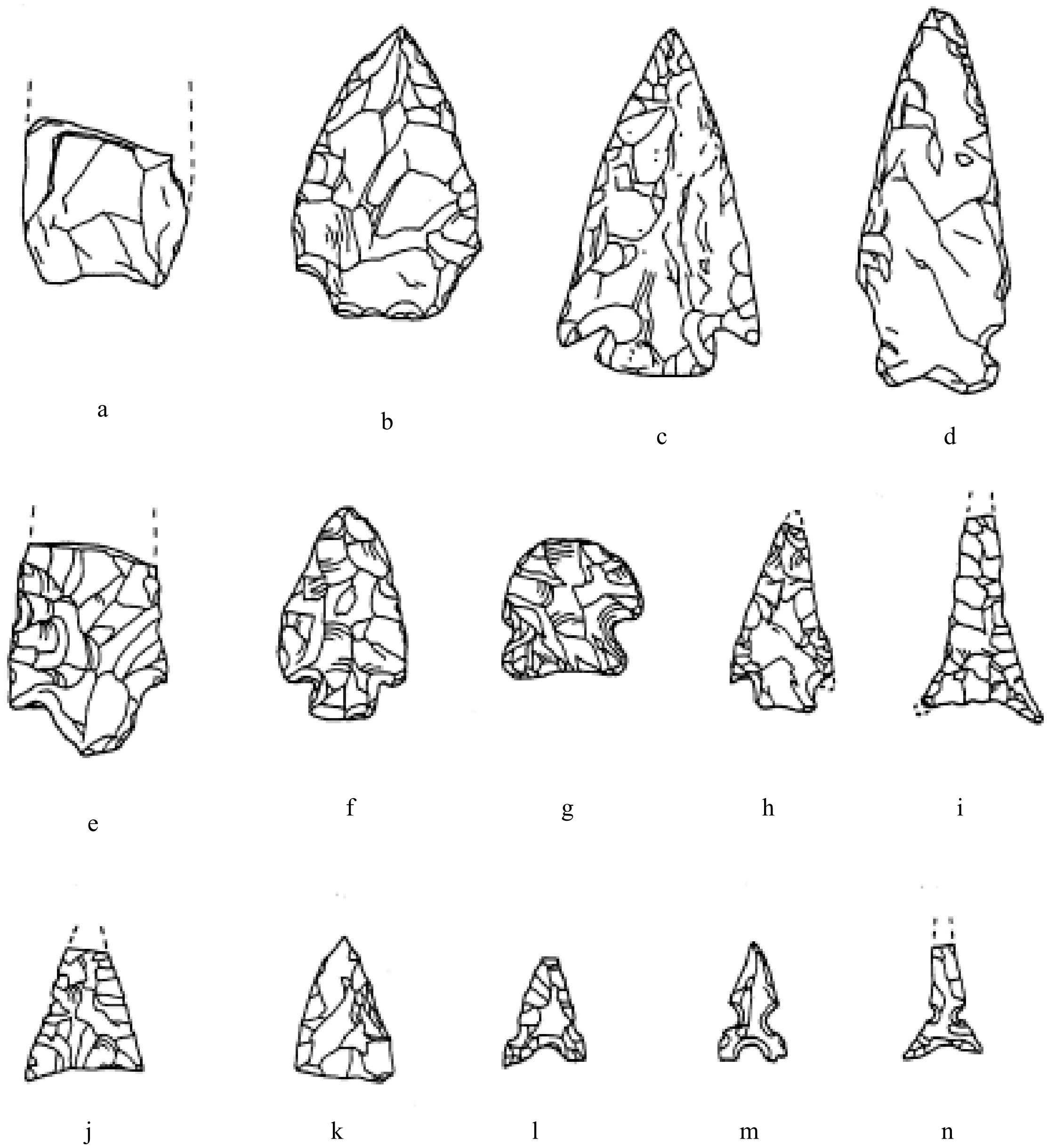

Fig. 4. Representative Projectile Points: a) Humboldt Concave Base, CA-SBR-547; b) Pinto, CA-SBR-544; c) Elko Corner Notched, CA-SBR-1868; d) Elko Eared, CA-SBR-5597; e-f) Gypsum, CA-SBR-547; g) reworked Elko Eared, CA-SBR-547; h) Rose Springs Corner Notched, CA-SBR-9531; i-k) Cottonwood Triangular, i-j - CA-SBR-547, k - CA-SBR-1758; l-n) Desert Side Notched, l - CA-SBR-547, m - CA-SBR-9533, n - CA-SBR-544.

There are two observations not apparent in Table 10 that need explaining. Twelve out of the sixteen hammerstones were made out of quartz which, given its relative hardness, is well suited for that purpose. Recent investigations by Whitley *et al.* (1999:20) have noted the presence of quartz traces embedded in Coso Range petroglyphs. Only three of the petroglyph sites in the Granite Mountains had a quartz hammerstone

Table 11. Distribution of portable and bedrock milling features by environmental zone. (MS - milling stone)

	Zone (n/96)					
Portable MS	Upland	Bajada	Wash	Riparian	Dune	Total
Flat metate	47	63	12	21	7	150
Basin metate	16	38	2	25	1	82
Slab metate	1	2		1	1	5
Mortar	1					1
Pestle		2				2
Unifacial mano	8	18	1	7		34
Bifacial mano	7	4	1	1		13
2 hand mano		2				2
Total sites	27 (79%)	56 (34%)	9 (36%)	4 (100%)	3 (75%)	99
Bedrock MS						
Milling slick	14	86	41	12	1	154
Basin	9	33	9	7		58
Mortar		4	1	1		6
Total sites	4 (12%)	23 (22%)	13 (52%)	2 (50%)	1 (25%)	43

but such an item could easily be transported with the artist or lost to erosional or depositional forces. The other observation is that 16 out of the 19 Cottonwood points are microcrystalline and 87% of those were manufactured out of a white chalcedony. The reason for such a preference is not apparent.

Ground Stone Tools

One of the most common artifactual types encountered during this survey were ground stone artifacts and features in the form of grinding stones (metates), handstones (manos), mortars, pestles, bedrock milling features, and metate and mano fragments. A total of 364 portable milling implements were recorded, including 237 metates, 74 partial metates, 47 manos, one portable mortar, and two pestles (Table 11). Portable milling tools were found at 59% (n=99) of the sites surveyed. A total of 218 bedrock milling features were also recorded and were present at 25% (n=43) of all sites. These included 154 milling slicks, 58 basin metates, and 6 mortar holes. Bedrock basin metates are elliptical, concave-shaped, and range from 1-3 centimeters in depth; whereas, milling slicks are basically flat and more amorphously shaped. Thirty percent (n=13) of all sites exhibiting bedrock milling features were located on the eastern bajada of the Granite Mountains (Table 11). Only 6% (n=2) of the bedrock processing sites were found in the uplands while 20% (n=17) of all sites that were observed with portable milling implements were found in this zone. There were a higher percentage of sites exhibiting bedrock milling features (24%, n=9) on the northern slopes of the range than those with portable grinding tools (6%, n=5). Fifty-one percent (n=50) of all sites containing portable metates were located on the eastern bajada and washes of the Granite Mountains. This seems to correlate with the high number of base camps located in this area. One such base camp (CA-SBR-544) had 68 milling features consisting of bedrock milling surfaces, metates, manos, and ground stone fragments all within an 8,035 square meter area.

Table 12. Distribution of portable milling stone tools by material.

	Lithic						
Tool	Granite	Granidiorite	Vesicular Basalt	Gneiss	Quartz	Rhyolite	Total
Flat Metate	134	9	2	3		2	150
Basin Metate	61	10	8	3			82
Slab Metate	3	6	2				11
Mortar	1						1
Pestle	1		1				2
Unifacial Mano	26	1	4		2	1	34
Bifacial Mano	7	1	5				13
2-Hand Mano	2		1				3
Total	235	27	23	6	2	3	296

Of the 238 portable grinding stones recorded during this survey, 150 (63%) were classified as flat block metates. One hundred and thirty-four were manufactured from granite, twelve from metamorphic material, and four from igneous rock (Table 12). Indeed, the local granite monzonite seems to have been the primary material of choice for portable ground stone due to its availability and inherent abrasive quality. During the course of this survey, we began to notice that some block metates had been worked bifacially. Since we did not discover this, however, until well into the project, we do not have specific data for the frequency of this practice. Of the 82 portable basin metates observed, 61 were granite, 13 were granodiorite or gneiss, and 8 were vesicular basalt. Only slab metates, which were thinned with shaped bottoms, seemed to deviate from the granitic source pattern as 40% of the total number were made from vesicular basalt. Fifty-five percent (n=41) of the metate fragments were granite, 10% (n=7) were granodiorite and rhyolite, and the 35% (n=26) that were basalt were almost, without exception, slab metate fragments. Vesicular basalt occurs in limited quantities along the north face of the Van Winkle Mountains in both black and red hues. No actual quarry source of the material was found, however. Of the 50 handstones documented, 34 were unifacial, 13 were bifacial, and 3 were large, two-handed, loaf-shaped and bifacially worked. Seventy percent (n=35) of all manos were of granitic material, 21% (n=10) were vesicular basalt, and the remainder were manufactured from either granodiorite, quartz, or rhyolite. Two pestles were collected from washes in Granite Cove; one made from granite and the other of vesicular basalt.

The use of grinding tools often tends to be characterized as exclusively associated with the processing of hard seeds by highly mobile hunter-gatherer groups. This is true to a degree but, as Schneider (1993) points out, there are a multitude of variables that should be considered in any evaluation of milling implements. Major considerations are the impact of environmental factors, the function of milling tools, their production, and their role in the social integration of the group.

Milling implements were used to process a wide variance of items for equally varied reasons. Schneider (1993:13) lists “fruits, roots, bulbs, rhizomes, nuts, seeds, beans, tobacco, and sometimes green vegetables” as floral resources processed through grinding. Meat, bone, and insects were sometimes added as sources of protein and other nutrients (Sutton 1988). Non-subsistence items included the pulverizing of pigment, clay, temper, and medicinal herbs, and the sharpening and smoothing of other tools. Schroth (1996:59, Table 1) in a review of the ethnographic literature of southern California found reference to sixteen specific materials that were processed on a metate. She also found specific reference to 45 different plants that were ground for food (1996:67-69, including Table 3). Pritchard-Parker (1996:1-13) confirms the veracity of the ethnographic accounts by an examination, in an archaeological context, of pollen residue on three milling stones from two prehistoric sites in Riverside County. Plants that left pollen remnants in these samples that are also prevalent in the Granite Mountains area would include pine seeds, juniper berries, mesquite beans, seeds from Indian ricegrass, sage, chia, ephedra, and buckwheat. The use of metates for grinding pigment has also been verified archaeologically in the Mojave Desert (Rector 1983:54,56,66; Schneider 1989:136). One portable metate, with what appeared to be red pigment stain, was found at CA-SBR-4914 where pictographs are also present. Considering the large number of pictograph sites recorded during the survey it is surprising that there was not more evidence of pigment processing found on associated features. It should be noted, however, that many of the milling platforms had rock debris in them and they were not swept out and examined for pigment residue.

The morphological variation of processing tools in the East Mojave is typical of southern California and the Great Basin in general (Schroth 1996:55-57). There are more flat grinding stones and bedrock milling slicks than their basin counterparts but tool design is probably more indicative of differences in processing than subsistence strategies (Adams 1999:477). Flat and slab milling stones were more efficient in the processing of oily or pulpy seeds or fruit, such as pine nuts or cactus fruit, that could be easily contained on the working surface. Basin metates were preferable for hard seeds because the confines of the basin would prevent scattering (Adams 1999:492). The indigenous granitic and metamorphic grinding stones, despite being labeled portable, probably were not because of their weight. This reduction in volume also made them less durable and, unlike the local granite metates, they tended to be observed on survey in much smaller fragments. Vesicular basalt was more efficient than granular rock, such as granite, in reducing seeds to flour and was easier to restore to high efficiency. When the vesicles filled with ground food substances, they could be quickly cleaned out with a dried grass brush and did not have to be repecked to re-roughen the milling surface like granular stone.

One-handed handstones are categorized as unshaped or shaped. Unshaped manos lack “comfort features” and have been probably selected for the expedience of the task at hand. Shaped manos, usually bifacially worked, probably fit the hand and reflect a strategy that requires more time in a single grinding session (Adams 1999:492). The three recorded bifacial, two-handed manos, compatible to flat metates, are the only milling implements that seem intrusive. Steward (1933:240) describes the handstones of the Owens Valley Paiute as being bifacial and rectangular in shape. These items also bear a strong resemblance to Southwestern types but lack such amenities as finger grips.

Milling implements connote statements about social organization, relationships, and gender roles. “Women’s milling was fundamental to daily subsistence, for processing winter stores, and for providing lightweight food for traveling. Milling was also central to the maintenance of social arrangements and a distinctive life-style and identity, particularly female identity” (Rucks 1996:19). In her ethnographic examination of Washoe milling traditions, Rucks (1996:19-21) found that each woman owned her own personal grinding slab and possessed a variety of handstones which were either inherited, bought from someone, or had been collected from an older site. In addition, bedrock milling stations were considered personal property as ancestral family domain. The

Table 13. Distribution of ceramic sherds by environmental zone.

	Zone (n/96)					
Ceramic ware	Upland	Bajada	Wash	Riparian	Dune	Total
Brown	17	40	8	1	3	69
Buff	9	37	6	2	1	55
Stucco			1	1		2
Red/Buff	1	11	2			14
Gray		2				2
Corrugated	1	1				2
Black/White	1					1
So. Paiute	1					1
Number of sites	19 (56%)	57 (55%)	12 (48%)	2 (50%)	3 (75%)	93

reutilization of sites or their artifacts required a ritual cleansing or blessing and those areas and artifacts had to be treated with respect. In some case reuse could result in misfortune which could range from hearing mysterious voices to illness and even death. An individual's personal grinding stone was rarely shared. If it was left on an annually visited site, it was either hidden from view for exclusive use or, if intended for use by other family members, it was left more visible. Metates were left in an inverted position as a "matter of hygiene" which was certainly the case with most of the Granite Mountain examples. The function of milling also reinforced existing relationships and established new ones through the activities of food collection, processing, distribution, and trade. Men would also use grinding implements on hunting trips and males did help women on occasion with food processing, particularly if the family unit had few women. "Washoe beliefs and values related to egalitarian relations, sharing identity with and responsibility to the land (a sense of place), and a belief in *wegele'yu* (spirit power) as demonstrated by milling events, have persisted into contemporary times" (Rucks 1996:21).

Ceramics

Fifty-five percent (n=93) of the total sites surveyed were found to contain ceramic sherds (Table 13) with the largest concentration of sites with ceramics (n=45) located on the eastern bajada of the Granite Mountains. The second largest concentration of ceramic sites was found in the highlands and in Willow Springs Basin, with 14 sites found in each of these areas. Seventy-four percent (n=69) of the ceramic bearing sites exhibited brown ware sherds, usually typed as Tizon Brown. Lower Colorado Buff Ware were found at 59% (n=55) of the sites examined.

Ceramic sherds were not freshly broken and rarely collected, so determinations were made in the field based on surface color and treatment, paste, temper, and, in a few cases, decoration. Sherds were classified as Lower Colorado Buff Ware based on their lighter paste and surface color (due to a low iron content) but more importantly on the use of very fine temper, and occasional micaceous materials which is characteristic of alluvial clays. Tizon Brown presented a greater range in surface color varying from buff through a range of browns to gray. The major characteristic is the temper with its larger inclusions, particularly of quartz and feldspar, derived from the detritus of

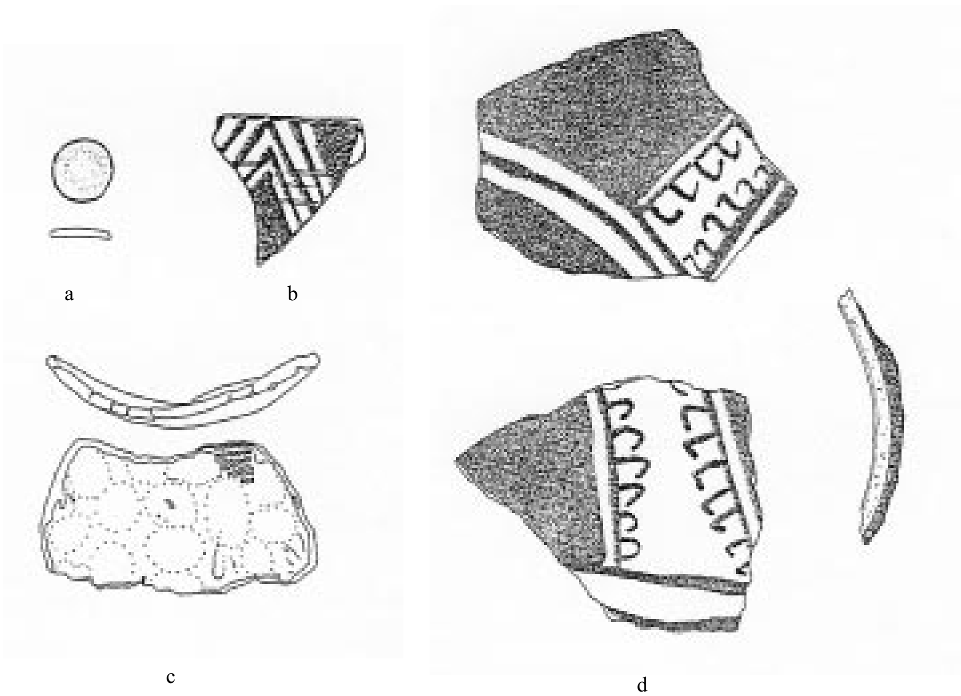

Fig. 5. Specific ceramic sherd examples: a) reworked brownware sherd, CA-SBR-547; b) Lower Colorado Buffware Red/ Buff, CA-SBR-547; c) buffware sherd with coil basket impression, CA-SBR-1758; d) Lower Colorado Buffware Red/Buff, CA-SBR-9531 (b-c are redrawn from Christensen and Dickey 1996).

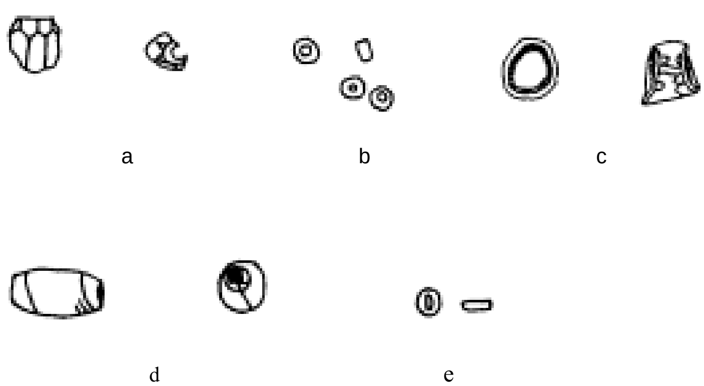

Fig. 6. Ornamental Beads: a) cobalt blue glass bead, CA-SBR-547; b) white glass seed beads, CA-SBR-9339; c) bone bead, CA-SBR-547; d) *Olivella biplicata* spire lopped bead, CA-SBR-9815; e) dark blue “Russian” glass bead, CA-SBR-9339.

granitic or metamorphic lithology. Lyneis (1988:149) has pointed out that although Tizon Brown has little temporal or spatial validity, there does exist a "a buff-brown dichotomy, or a light-dark dichotomy, within the paddle-and-anvil pottery of southern California." Rather than providing us with a reliable indication of age or even a diffusion pattern, the distinction between brown ware and buff ware could be viewed as the brown ware having been made locally in the Mojave Desert and the buff wares having been manufactured from clays in the Lower Colorado River region. Therefore, the differences between the two wares is not so much in technique, since both are thinned by paddle and anvil, as it is in materials. While we are fairly confident in our groupings of the ceramics found in the survey into these classifications, it should be noted that Lyneis (1988:149) has warned that there "probably is more overlap than exclusiveness in the color ranges of the two wares," and that "with careful analysis of materials, we can probably distinguish some, but not all, of the Lower Colorado Buff Ware that crops up in the Mojave Desert assemblages."

Stucco ware, which is not common this far north, was found at two sites. Anasazi corrugated gray ware sherds were also observed at two sites. Unidentified plain gray sherds were discovered at two locations and could be either from an Anasazi origin or Pyramid Gray. Utilized sherds were quite rare with only one example observed (Fig. 5a). Decorated Lower Colorado Buff Ware in the form of red-on-buff sherds were found at 14 sites and made up the third largest ceramic category with the majority recovered on the east side of the Granites. The most probable types are Parker or Topoc Red-on-Buff but specific delineations could not be made in the field (Fig. 5b,d). Painted Puebloan sherds were confined to one site and appeared to be North Creek Black-on-Gray, a Virgin Anasazi type. One buff ware sherd located at CA-SBR-1758 exhibited the impression of a coiled basket on its interior (Fig. 5c).

Ornamentation

Beads were located at three sites during field work. Portions of several dark blue "Russian-style" beveled beads, along with 18 white glass seed beads (Fig. 6a,b) were recorded high on a ridgeline on the north slope of the Granites (CA-SBR-9339). A cobalt blue glass bead (Fig. 6e) was found at one of the loci in Granite Cove (CA-SBR-547) and a tubular bone bead (5 mm long and 5 mm in diameter) of unknown species (Fig. 6c) was found at another. Two *Olivella biplicata* shell beads with the apex spire removed (Fig. 6d) were located at a temporary campsite in the Kelso Dunes (CA-SBR-9815). This is the most common and simplest of the olivella bead types to make (Gibson 1992:25) and has a wide distribution from coastal California throughout the Great Basin and a temporal span of at least 7,000 years (Bennyhoff and Heizer 1958:63). A 1968 site report on file at the San Bernardino County Museum states that an *Olivella* bead and an abalone shell (*Haliotis sp.*) fragment were observed at CA-SBR-543 in the Granite Pass area. During our investigation of the site the items could not be relocated. A portion of abalone shell was collected at CA-SBR-1758 and what appear to be oyster shell (*Ostrea lurida*) fragments were found at CA-SBR-547.

While not used for ornamentation, two interesting glass artifacts were found in the course of the survey. A purple glass fragment (Fig. 7a) was found at CA-SBR-9826/H in the southern Providence Mountains that had incised intersecting diagonal lines and parallel lines on both sides. A Cottonwood Triangular projectile point flaked from green glass (Fig. 7b) was found in an upland basin (CA-SBR-9527). Neither of the artifacts was collected for further evaluation but they, along with the glass beads, indicate a post-contact Native American occupation of the region.

A portion of a larger piece of blue-black slate was collected at CA-SBR-547 that exhibited diagonal

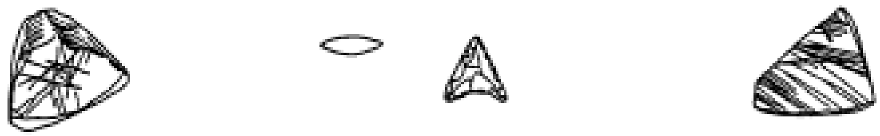

Fig. 7. Miscellaneous items: a) incised purple bottle glass, CA-SBR-9826; b) Cottonwood Triangular projectile point made from green bottle glass, CA-SBR-9527; c) incised dark blue slate, CA-SBR-547.

scratched lines on one surface (Fig. 7c). This is an artifact type that, while not common, does have a wide distribution throughout the Great Basin and into southeastern California (Tuohy 1986:230, 232-233).

Faunal Remains

Twenty-three percent (n=39) of all sites surveyed contained faunal remains with mammal bones present on 77% (n=30) of these sites. Tortoise carapace and plastron was found at 21% (n=8) of sites containing faunal remains. Since this study was conducted as a surface survey, care must be exercised in drawing conclusions as to the significance of some of the faunal evidence. Certain remnants, such as a juvenile bighorn sheep mandible found at CA-SBR-352 (Claudia Luke, personal communication 1996), could easily have been placed on site by historic-period peoples. Natural weathering and scavenging by such animals as coyotes would also tend to remove some faunal remains. Fifty-seven percent (n=17) of the sites, however, did contain burnt bone, which is a more reliable indicator of human usage. One site (CA-SBR-547) revealed a tubular bone fragment which, although not burnt, had been cut and polished. The faunal remains found at four of the 17 locations exhibiting burnt bone may be associated with historic trash deposits found on those sites. Undoubtedly, excavation would prove more conclusive as to the association between recovered faunal materials and prehistoric utilization.

Perishable Items

In the arid Southwestern United States rockshelters and caves usually yield a representative inventory of perishable items. Despite the fact that 74 rockshelters were components of the sites involved in this study, few perishable materials have been observed. The great majority of these rockshelters are not weather-proof and exhibit erosional channels. No remnants of basketry were found during the survey although, as mentioned above, the imprint of a coil basket was impressed in a large buff ware sherd. There is an anecdotal report of a “Paiute basket” and a “fire-starting stick” having been removed from the cave at CA-SBR-8716 in the Van Winkle Mountains by rock climbers in the 1960s. Basketry has been recovered from the East Mojave (Sutton and Yohe II 1988:117-123), the most intact examples coming from Mitchell’s Caverns in the Providence Range (Pinto 1989:68-84).

Site CA-SBR-8716 does appear to have subsurface materials such as grass and shredded juniper bark which are exposed to varying degrees. A 24 cm long *Phragmites* fragment is also visible. More perplexing is a 1.3 meter long wooden limb jammed into a horizontal position like a closet pole in an upper recess of the cave 2.5 meters above the floor level. Another tree limb, 2.75 meters long and forked on one end, occupies a position on the floor at the front of the cave. The wood appears to be cottonwood and cut with a metal axe. The cave is 200 meters above the bajada floor and the nearest source of cottonwood and

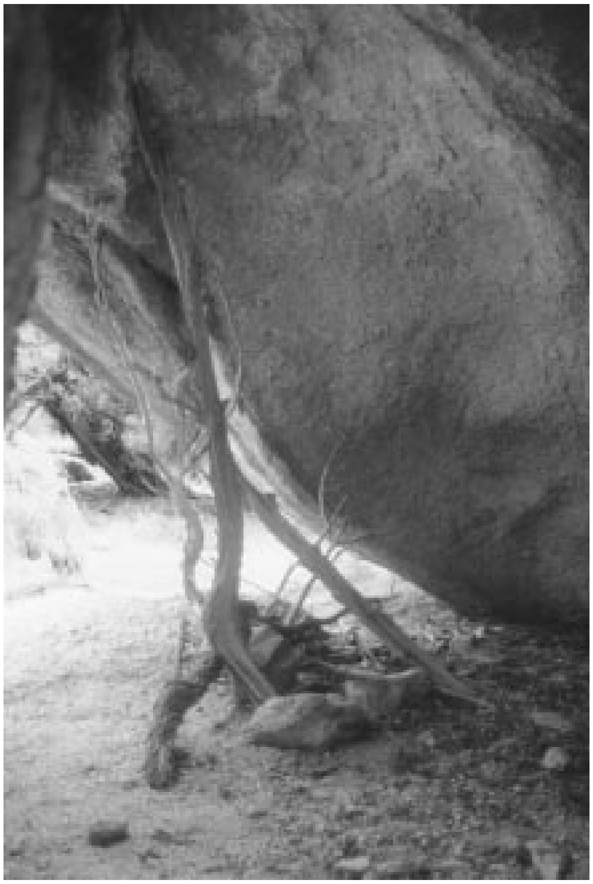

Fig. 8. “Spirit sticks” in mouth of a rockshelter, CA-SBR-5396.

riparian vegetation, or any wood for that matter, is 3.5 km away. Given the presence of glass items and written accounts, the area did have an historic period Native American occupation and this site might be an indication of that. The cave has a definite prehistoric component with a grinding stone and ceramic sherds.

Another wooden item found at CA-SBR-9531 was a 56 cm long sharpened creosote stick that is fire blackened on its pointed end. It was discovered with the remnants of a cached olla tucked away in a narrow rock crevice.

Wooden items were also recorded in two more instances, both on the eastern bajada. In CA-SBR-9553 a two meter high stick was set in a vertical position in the western mouth of a rockshelter jammed against the ceiling and in contact with a raised base of small granite boulders on the floor. It was photographed *in situ* by members of the ASA in 1963. The stick was possibly removed by them, its disposition now unknown, but through the use of their photograph the cave was relocated and the rock foundation was found to be still in place. Another example of this attribute was seen at CA-SBR-5396. In the eastern entrance to this shelter cave are two small tree branches, two meters in length, that run from the roof to the floor where they are supported by a number of rocks (Fig. 8). Tree limbs aligned in a vertical position in the mouths of caves and shelters are thought to have functioned as “spirit sticks.” The distribution of this feature is in the arid interior of California from the

Mexican border to the Owens Valley. “Spirit sticks” have been described in the Table Mountain area of extreme southern San Diego County but, according to May (1987:40-41), there is no known ethnographical information on their actual function. It has been suggested, however, that they were put at the mouth of cache sites to provide ritual protection for the contents therein (King 1975:60) or as supports to protect objects from the intrusion of rodents (Wallace 1961:11). The most extensive discussion of “spirit sticks” has been by Campbell (1931:24-30) who, with her husband, collected a large number of them in the Twenty-Nine Palms region. These are now curated in the collections at Joshua Tree National Park. The Campbells found a definite association between shelters with the sticks in place and caches of ollas and bowls. The branches originated from a variety of wood sources and varied from 20 cm to five meters in length (see Plates 9-12 in Campbell 1931). The Campbells found anywhere from one “spirit stick” to a maximum of six per shelter. They were almost always supported at the base by rocks while the upper end of the stick had a fork in it or was split to produce a quasi-fork. In two cases a small secondary stick had been attached to the upper end by yucca fiber to produce a fork. Only in a few instances was the forked end inverted downward. Since the Campbells excavated, they found in twelve cases water-worn boulders subsurface under the branches. These rocks were not indigenous and had to have been deliberately transported from some distance. In one cave the tree limb was found protruding through a large portion of a coil basket at its base (Plate 15 in Campbell 1931). Flicker bird feathers were another subsurface association in a few cases. Campbell questioned Francisco Patencio, the Cahuilla elder, who was reticent to respond on the subject. He did finally relent that “spirit sticks” were placed only by tribal leaders and that the smoothed stones at their base belonged to shamans (Campbell 1931:28). This would seem to indicate that the label may be somewhat appropriate and that the limbs functioned in some spiritual or ritual capacity.

Fig. 9. Rockshelter with low dry-laid walls, CA-SBR-9544.

Features

Rock Features

Stylistic and deliberate arrangements of rock were classified into nine categories based on their physical characteristics and suggested function. Without excavation, the credibility of such observations remains uncertain. Site context can be very important in proposing tentative observations. The categories include: hearths/roasting pits, rock walls, storage caches, pot or basket rests, rock lined pits, drying palettes, "house rings," cairns, and rock alignments.

The most common rock feature encountered during the survey was hearths. There are 103 hearths defined at 53 sites. Their most common association is with base and temporary camps, especially on the eastern bajada. They are amorphous in shape, vary in size from 50 cm in diameter to 3 by 4 meters in size, and are composed of thermally affected rock. Only within well protected rockshelters were there any indications of ash, charcoal, or burnt bone. Their function varies from fire pit for cooking and warmth, to roasting pit, probably for agave and yucca.

Sites CA-SBR-9544, -9555, -9562, and -9819 all have two walls each at opposite ends of the sides of the rockshelters (Fig. 9). These vary in size from one meter to 4.6 meters in length. Their function is unknown, although protection from the elements would seem possible. However, the wider aperture of all of the shelters is left exposed. At CA-SBR-9338, an open site on a high, windy ridge, a five meters long wall projects out from a large boulder and is associated with midden, an artifact scatter, and numerous grinding implements. This wall, and similar features at other sites, may have served as a wind screen. Most of these walls are no more than one to two courses high and may have served only as a foundation for more pronounced tree limb and brush additions.

The caching of subsistence resources in the course of a seasonal round is a common practice in the Great Basin (Hunt 1960:177; Knack 1980:156). One of the several approaches to the caching of foodstuffs is to cover buried containers, either in baskets or ollas, with rocks to discourage the intrusions of rodents. None of the four subterranean cache pits excavated in Mitchell Caverns were thought to be slab-lined although they were lined with bunchgrass and other plant materials (Pinto 1989:94-95). One of the pits contained 27 pinon pine cones with nuts intact and the other a "large ball of red ochre in a decomposing leather bag" (Wilke and McDonald 1989:64). Neeras (1983:199) cites a local cattleman in the East Mojave who sometime in the 1930s or 1940s dug beneath a mound of rocks and found a small basket full of seeds. Rock mounds and small rock circles represent possible covered or opened cache pits and are found at sites CA-SBR-8719, -8996, and -9342 (Fig. 10). These are characterized by being located on higher ground away from drainage channels, on desert pavement, or rocky soil, to minimize rodents burrowing from below, in regions where vegetal resources are available, and being situated in fairly obvious positions so they can be relocated (see Blair and Fuller-Murillo 1997:33-43 for a more extensive discussion). Most of these mounds are about two meters square in size but the variation ranges from 75 cm in diameter to 2.3 by 2.8 meters. Pine nuts, mesquite beans, and a variety of small seeds were the most likely candidates for storage.

Smaller rock circles which were found on several sites, probably represent support for ceramics or basketry storage containers (Blair and Fuller-Murillo 1997:74). These are less than two meters in diameter and located under low boulder overhangs or on bedrock outcrops. James (1995:241, Fig. 1) illustrates a basketry granary on a bedrock outcrop supported by small boulders in San Diego County. This type of feature exists at Locus A of CA-SBR-9549 and -9827.

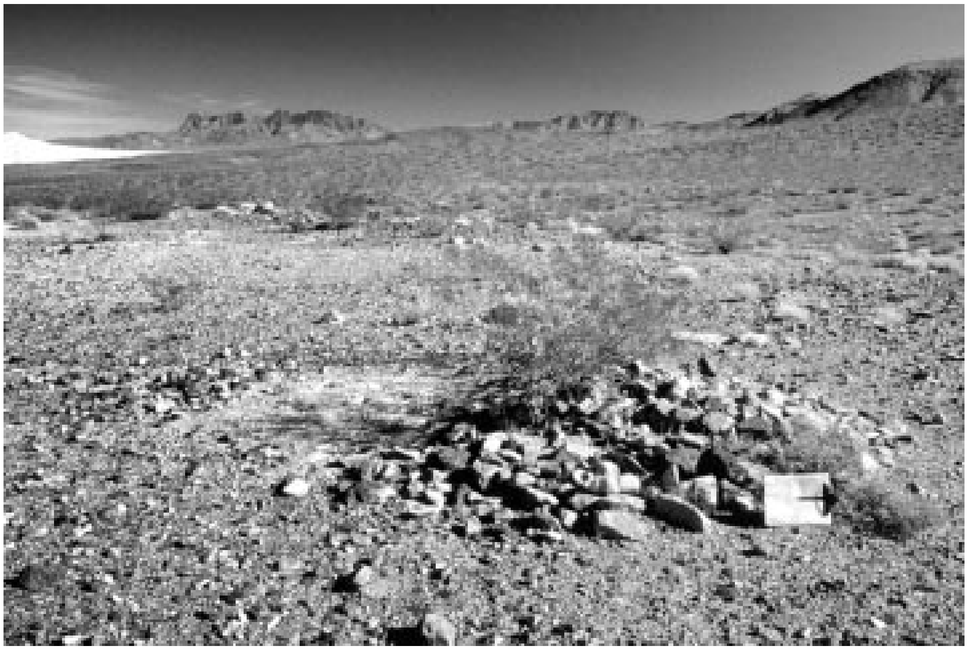

Fig. 10. Storage pit, CA-SBR-9342.

Fig. 11. Rock-lined pit, CA-SBR-8993.

Figure 12. Drying palette, CA-SBR-9941.

Probable pot rests tucked under overhangs were observed at CA-SBR-5396, -9320, -9321, and Locus B of SBR-9827.

Two uncovered boulder-lined pits, 1.25 meters and 1.45 meters in dimension, were found at CA-SBR-8993 with adjacent flat block metates (Fig. 11). These are the only examples of this type of feature located so far and their function is open to investigation. They could represent rock-lined storage pits which have been opened and left uncovered or they could possibly be leaching pits since they are located in a wash. Indian Hill Rockshelter (CA-SDI-2537), in Anza Borrego State Park, contained several rock-lined storage features. They predate the advent of ceramics and it has been hypothesized that buried ceramic ollas may have replaced rock-lined cache pits after ceramic technology was adopted within the region (Wilke and McDonald 1989:56-63).

Drying palettes are used in the processing of some plant products, such as seeds, yucca buds and fruit, cholla buds, and mesquite pods, prior to consumption (see Blair and Fuller-Murillo 1997:43-45 for ethnographic examples). According to their sources the principal physical characteristics of such features are a sunny, open location and a bedrock base to facilitate heating and subsequent dehydration. Site CA-SBR-4915 displays four drying palettes composed of basalt boulders set in a circular fashion on underlying granite bedrock (Fig. 12). They range in size from 1.4 by 2.5 meters to 3.2 by 3.4 meters. These features occur at several of the temporary camps in the study area and have been observed at other sites in the East Mojave, always characterized by their position on bedrock outcrops.

The labeling of rock rings as “house rings” or “sleeping circles” is a common practice although it seems to be difficult to prove both archaeologically and with the ethnographic record (see discussion in Blair and Fuller-Murillo 1997:56-64). Cleared circles, with and without rock enclosures, occur in significant numbers on terraces with desert pavement surfaces in the

Fig. 13. Rock circle, CA-SBR-8999.

Colorado Desert in particular (e.g. Rogers 1966:45,47; Begole 1973:33-48, 1976:3-9). The purpose of these cleared circles is open to interpretation. The author's recent work in the Owens Valley has left no doubt that some rock enclosures are indeed domestic structures. These have associated milling features, habitation debris, and often hearths. Site CA-SBR-8999 has two rock circles (Fig. 13), one 2.4 by 2.9 meters in size and the other 2.15 by 2.0 meters. The two features are located 40 meters apart. The sparseness and dispersion of the associated artifacts as well as the lack of hearths makes their status as a temporary camp questionable, and even their prehistoric origin is provisional due to historic mining activities within 400 meters.

Cairns which do not mark suspected burials and are not associated with prominent artifact scatters, caching, or water collection offer an area of speculation. One hypothesis is that cairns operate as markers between neighboring groups (Ellis 1966). As will be further discussed below, petroglyphs can serve this function but Bean (1972:125) also mentions that the Cahuilla utilized cairns to mark distinctions between sib groups. A more prevalent concept is that cairns served as trail shrines along established trade routes (Heizer 1978). The latter practice was identified as one of the main cultural attributes of the Patayan tradition (Schroeder 1979:100; Euler 1982:53). Often shrines tend to mark the beginning or end of long and "dangerous" sections of important trails (Boma Johnson, personal communication 1999). There also seems to be a tendency to locate cairns at the summits of trails where they pass through the saddles of ridgelines or ranges (e.g. Greenleaf 1975). Two sites in the Granites survey area, CA-SBR-8998 and -9535, fit this latter pattern.

The most impressive examples of rock mounds in this study are the cairn clusters at CA-SBR-5188. The site is a prehistoric trail that features 71 rock cairns along a 1.2 kilometer portion of its still visible 2.8 kilometer course (Fig. 14). The cairns average about two meters in diameter, about 25 centimeters in height, and lay scattered in random fashion form one meter to 14 meters from the trail (the average distance is 4.6 meters). One flat block metate and scattered ceramic sherds were found along the trail but none were associated directly with the cairns. The largest concentration of sherds (n=45) was scattered around a small boulder outcrop four meters off the trail. The

Fig. 14. Rock cairn (behind clipboard) along prehistoric trail, CA-SBR-5188.

sheer number of the cairns at this site is not the norm for trail shrines. Also they lack the artifacts thrown onto the mounds that is occasionally seen in the Sonoran Desert sites (Rogers 1966:76).

Two other sites in the East Mojave offer similar comparisons. Site CA-SBR-221 in the Crucero Hills region has at least 89 cairns arranged roughly in parallel rows and CA-SBR-3186, near the Soda Mountains, has 174 randomly dispersed cairns (Taylor *et al.* 1987:82-83). Excavations were conducted at a total of 16 cairns between these two sites. No significant artifacts or datable materials were recovered (Taylor *et al.* 1987:88-92). Despite the paucity of direct evidence it was argued by Taylor *et al.* (1987:99-100) that the cairns might function as water catchment features. This runs counter with Rogers' (1966:49-52) earlier conclusion that large concentrations of cairns, for his early horizons (San Dieguito I-III), had a ceremonial function. There are at least ten trails that connect the Kelso Dunes with the north side Granite Mountain canyons, all of which have seasonally available water in tanks and springs. Site CA-SBR-5188, however, is the only trail with cairns. It also leads directly to the largest petroglyph site (CA-SBR-1651) in the range. This seems to be more supportive of Rogers' religious association for rows of cairns.

A rock alignment, CA-SBR-9941, was discovered on the eastern periphery of the Bristol Mountains, 10 km southwest of Willow Springs Basin. The site has two alignments located on an alluvial terrace with a well cemented desert pavement surface just north of a natural route through the southern portion of the range (Fig. 15). The largest alignment is basically an elongated "U" that is 174 meters in length and 3 to 15 meters wide, oriented along an azimuth of 320 to 330 degrees (true north). The enclosed end is on the south and it occasionally exhibits two to four intermittent parallel lines along its long axis. The appearance of the design is similar to some of the rock alignments in Death Valley that are illustrated in Hunt (1960: Fig. 44 and 45). The smaller element is a curvilinear line (5 by 18 meters) that resembles a snake. The eastern terminus of the line has a small rock cairn (70 by 60 cm) and the western end has a 14 by 15 cm white quartz cobble. Several techniques have been utilized in creating the alignment. At the southern end, and for the majority of its length as it proceeds north, the

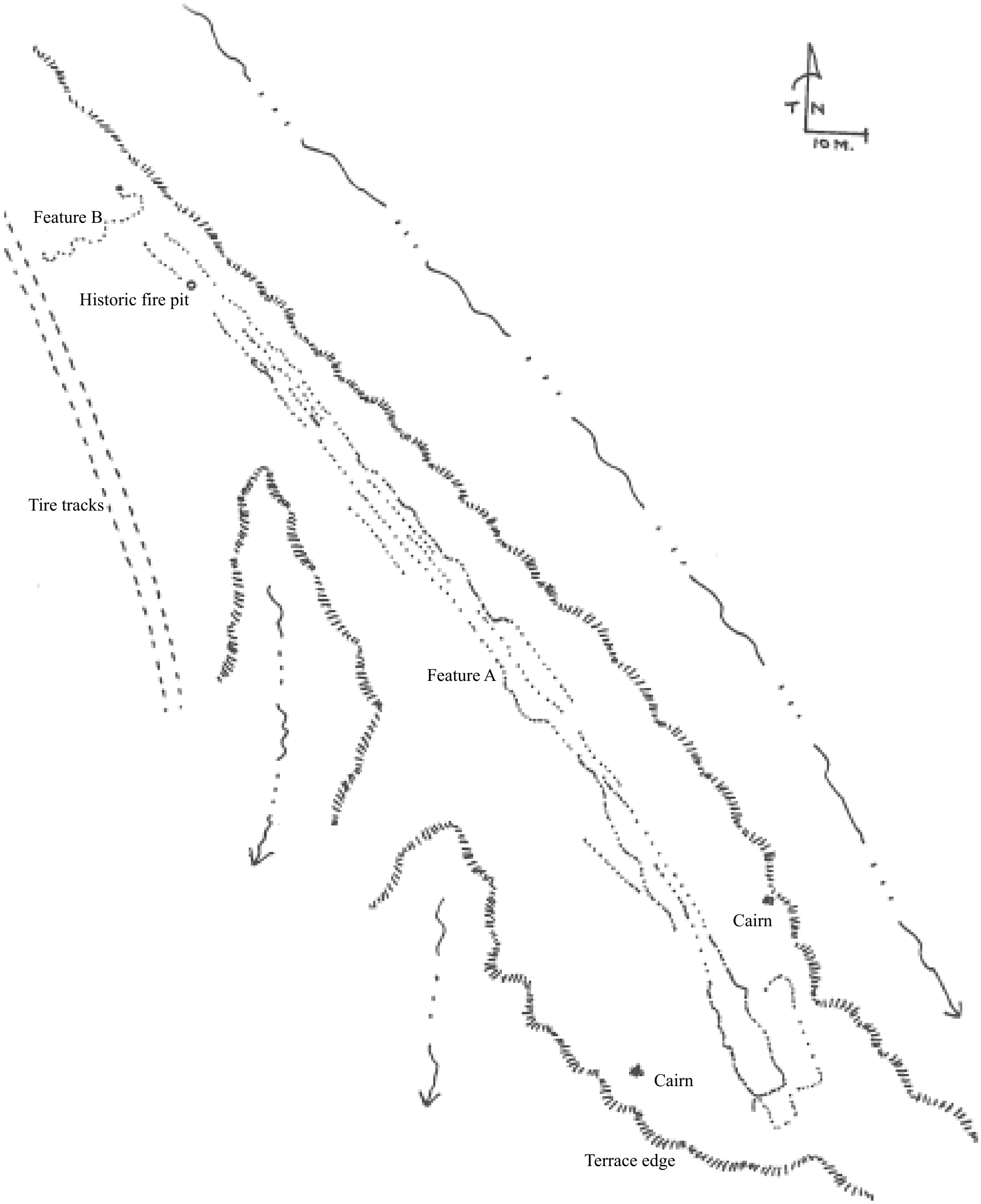

Fig. 15. Site map of rock alignment, CA-SBR-9941.

cobbles are butted end-to-end. In some areas of the figure, however, the stones are spaced with the gaps varying between 25 and 75 cm apart, although most are 5 to 10 cm distant. One portion, of approximately 1.8 meters, exhibits almost identically sized stones that have been positioned laterally to the line at a diagonal of 45 degrees to the axis. The size of the individual cobbles employed vary from five to 40 cm in size but a few portions of the parallel lines are constructed entirely with rocks under 10 cm in size. There also appears to have been a deliberate attempt to invert some of the stones since the iron oxide accretion, that forms on the underside of desert pavement rocks, turned upright creates a reddish hued row of cobbles. These do not represent accidental overturning by livestock or historic people as the inverted stones are as equally cemented into the desert pavement surface as the darkly patinated stones.

Earthen art, or ground figures, were first investigated by Rogers (1966) in the 1920s (see von Werlhof 1987:2-4 for a summation of the research on the subject). They occur in a variety of different forms such as intaglios (or geoglyphs), windrows, trail circles, cairns and cairn clusters, and rock alignments (McCarthy 1986:33,35). Intaglios are most commonly associated with the Lower Colorado and Gila River Valleys. Jay von Werlhof (1996:154) lists 159 of the known 179 geoglyph figures in these locales. There are only three known windrows (McCarthy 1986:35) with the only example in the Mojave Desert being the Topoc Maze (CA-SBR-219) south of Needles. Rock alignments are well distributed from Nevada into Sonora, but the majority (71 out of a total of 142) cited by von Werlhof (1996:154) are located in the Mojave Desert. The most comprehensive description of the alignments has focused on the Panamint, Eureka, Greenwater, and Death Valleys (Hunt 1960; McCarthy 1986:33-41; von Werlhof 1987). In the East Mojave, rock alignments were found at three sites on the Twentynine Palms Marine Base. Four enclosed circular and oval rock features are at CA-SBR-7890, one which is 55 meters in diameter. Two linear alignments, the longest being 12 meters in length, were recorded at CA-SBR-7945 and a single 42 meter long linear feature exists at CA-SBR-7948. All three sites had associated debitage, bifaces, and milling stone fragments (McDonald and McCarthy 1994:76-83), whereas, the Bristol Mountain alignment was devoid of any artifacts. Other rock alignment sites in the proximity of the Granite Mountains occur in the Rodman Mountains, Troy Lake, Afton Canyon, Crucero, Soda Lake (von Werlhof 1987:3-4), and Broadwell Mesa (von Werlhof 1996:153, 155).

The function of rock alignments is unknown but ritual and ceremonialism are the most prevalent explanation. Jay von Werlhof (1987:14-21) builds an extensive case for their involvement with shamanism, although much of it is circumstantial. Intaglios are a different story, with ethnographic research with the Quechan and Mohave connecting their construction to the *keruk* (mourning) ceremony, warring activities, and possible territorial markers (Johnson 1985; Altschul and Ezzo 1994:51-67; Bakash 1994:15-48). Given the location of the Bristol Mountain site on an alluvial terrace, removed from potable water, habitation sites, or any apparent exploitable resource, a ritual connection for the rock alignments seems plausible.

The age of rock alignments cannot be determined at this time. Warren and Ore (1978:179-187) dated articulated *Anodonta* shells on Lake Mojave beach lines. On the basis of association with dated deposits of shell, a number of rock alignments were assigned a suggested date of 6,000 BC (1978:186). By comparison, intaglios appear to be much more recent. Eleven geoglyphs at eight different sites in the Sonoran Desert were sampled in 1993 by Ron Dorn and Persis Clarkson. Using cation-ration AMS dating they obtained a suite of temporal values ranging from 840 to 2,790 BP (in von Werlhof 1995:62). The Bristol Mountain rock alignment suggests a great antiquity given its heavy patination and deep cemented position in the desert pavement surface. Further chronological investigation of earthen art is a subject that definitely needs future attention.

Rock Art

Fifty-nine sites containing rock art were recorded during the course of this study, representing 35% of the total sites surveyed (Table 14). The sites were divided between those exhibiting only pictographs and those exclusively with petroglyphs, at 25 and 21 respectively. Both modes of manufacturing images were employed at 13 sites. In actual numbers of images petroglyphs predominate with 1,285 elements as compared to 1,067 painted motifs. In the areas adjacent to the Granite Mountains that were included in the rock art investigation, pictographs were present at 22% of all the rock art sites, while in the Granite Mountains specifically, pictographs were present 62% of the time. This disparity may be due to rock type or the increased availability of rockshelters in the Granite Mountains which would afford increased preservation of the painted designs.

The majority of rock art was found on the eastern bajada of the range (1,296 total elements), although Willow Springs Basin, on the southern bajada, has the highest number of sites (n=14). Pictographs were present at a greater number of sites in all of the Granite Mountain areas except for the northern bajada where petroglyphs were present at all of the rock art sites and outnumbered pictographs 514 to eight. This may be more a reflection of the predominance of darker metamorphic rock and the lack of rockshelters in the northern portion of the range that would make them less suitable for the production and survival of painted images. Overall throughout the entire study area, 56% of the rock art sites were found in association with habitation sites with 90% of the pictographs being associated with rockshelters and some artifacts.

Only one site (SBR-9549) exhibited cupules. Six depressions and several grooves were ground into the interior vertical wall of a rockshelter. Cupules are rare in the East Mojave and to the authors' knowledge only exist at six other sites in the region (SBR-291, -366, -535, -820, and two unrecorded sites). Going east into Clark County, Nevada, cupule sites seem to become more prevalent.

Table 14. Distribution of Rock Art by Environmental Zone.

	Zone (n/96)					
Number of	Upland	Bajada	Wash	Riparian	Dune	TOTAL
Petroglyphs	95	603	515	71		1284
Pictographs	128	562	261	128		1079
Petroglyph sites	4	15	6			25
Pictographs sites	5	10	6			21
Sites with both	4	4	3	2		13
Cupule sites		1				1
Rock alignment sites		1				1
Total number of sites	13 (22%)	30 (51%)	15 (26%)	2 (3%)	0	59

Research Results

Chronology

Establishing chronological parameters for the prehistoric occupation and utilization of the Granite Mountains is rather difficult since there has been no controlled excavations nor any absolute dates from any source. Charcoal, bone, wood, and woodrat middens are found in archaeological contexts, but none have been sampled by radiocarbon dating. Only surface finds of temporally related artifacts are available for use in attempting to establish chronometric values.

It is a common practice to employ the identification of diagnostic projectile points as one form of temporal data for establishing a chronology (e.g. Thomas 1981:7-43). However, there has been ongoing debate over the reliability of using projectile point typologies as time markers (see Flenniken and Raymond 1986:603-614 and Bettinger *et al.* 1991:166-172 for examples of the opposing views). As a case in point, defining a Pinto Period time frame (ca. 7,000 BP to 4,000 BP) from surface finds is dependent upon correlating it to the presence of Pinto points. Schroth (1994) has seriously questioned the reliability of the Pinto projectile point as a time marker. Basgall and Hall (2000:237-276) hypothesize that there is in the southern Great Basin a definable bifurcate-stemmed dart point that chronologically coincides with the Pinto Period. Gilreath and Hildebrandt (1997:70-87) obtained obsidian hydration data on 113 projectile points from the Coso Volcanic Field. They found that the chronological sequence for Desert Series (Desert Side-notched and Cottonwood), Saratoga and Rose Springs, Humboldt, and a thin Elko were consistent with the ordering used by most Great Basin archaeologists. However, their data suggested that a thick Elko, Little Lake (Pinto), and Great Basin Stemmed (Lake Mojave and Silver Lake) were contemporaneous throughout the Lake Mojave and Pinto periods.

With the above qualifications in mind, the following will use the standard projectile point chronological sequence. Three microcrystalline Pinto points have been found in the Granite Mountains and these then are currently the earliest vestiges of a prehistoric presence. The Gypsum Period (ca. 4,000 BP to 1,500 BP), is characterized by Gypsum, Elko, and Humboldt dart points, although Humboldt points may actually represent knives (Sutton 1996:232). These three point types represent 33% of the projectiles found in the Granite Mountains. Ten percent of the projectiles in the range are Rose Springs which is the hallmark of the Saratoga Springs period (ca. 1,500 BP to 1,000 BP) and represents the introduction of the bow and arrow. The Late Prehistoric Period (ca. 1,000 BP to contact), characterized by Cottonwood Triangular and Desert Side Notched points, has the largest projectile representation with 52%. The occurrence of a wide distribution of temporally diagnostic projectile points is not unique just to the Granite Mountains but occurs in many East Mojave sites. Points encompassing the periods from the Gypsum into the Late Prehistoric are also present at Rustler Rockshelter (Davis 1962; Sutton 1995), Clark Mountain (Rafferty 1994), the Kingston Range (Neraas 1983), and Mitchell Caverns (Pinto 1989:23-28). A different pattern with the predomination of Late Prehistoric points is found at Surprise Spring, based on an earlier collection by the Campbells (Altschul 1990), and Afton Canyon in which 93 out of 100 diagnostic projectiles were Cottonwood Triangular points (Schneider 1989). Hall and Basgall (1994:85) found at Fort Irwin that Lake Mojave and Pinto Period points tended to be made of fine-grained igneous (basalt, rhyolite and felsite) while the Gypsum Period reflected a wider variability in lithic material used for points and bifaces. In the Granite Mountains all of the Pinto-style and Gypsum points are microcrystalline, the Elko and Humboldt points are varied in their composition, and the arrow points are overwhelmingly manufactured from microcrystalline and obsidian (Table 7). The nondiagnostic lithic tools show an equal variety of raw materials (Table 6). The changes in raw materials used in flaked stone tools may indicate changes in trade or land use. It could also reflect that the fine-grained igneous tools are more durable and possessed of better long-term serviceability, and that microcrystalline and obsidian are more easily pressure flaked to produce smaller-sized arrow points (cf. Hall and Basgall 1994b:89).

The other major category of time sensitive artifacts are ceramic sherds which are present on 56% of the sites in the Granite Mountains. Classification was done by general types and wares since identification was made in the field. The two principal ceramics, Tizon Brown and Lower Colorado Buff, have long periods of production ranging from AD 700-750 to the historic period (Jones 1990:85-89). Shoshonean/Paiute brown wares appear in the southern Great Basin around AD 1000 (Rhode 1994:127). North Creek type Virgin Anasazi ceramics were manufactured on the Arizona Strip and southwestern Utah from AD 1100-1225 (Wells 1991:110).

One incised slate tablet was found at CA-SBR-547 and is probably associated with the Gypsum Period (2000 BC to AD 500). At Gatecliff Shelter in Nevada incised stone was associated with other materials that radiocarbon dated from 3300 BC to AD 1480 (Tuohy 1986:232).

Glass artifacts and items manufactured from metal denote an obvious historic connection. Many sites with a mixture of aboriginal deposits and historic materials, like glass and metal, are sometimes attributed to being later Euro-American intrusion when they are actually post-contact Native American in nature (Basgall and Hall 1994a:74). The incised glass object from CA-SBR-9826/H, discussed above, is on bottle glass transformed to a purple hue by exposure to sunlight interacting with manganese oxide within the glass. Bottle glass made from the 1880s until 1915 commonly had manganese as an ingredient (Thomas 1974:22). The glass projectile point from CA-SBR-9527 is also time sensitive. George Brimhall in 1864 observed that Southern Paiutes were using bottle glass projectile points on their arrows (as appears in Euler 1966:115). It was not uncommon for Native Americans to recycle debris from mining or cowboy camps (Basgall and Hall 1994a:74). The glass trade beads, found at two sites, are obviously also historic items in the Mojave Desert. However, the spire-lopped *Olivella* beads have such a long temporal tradition as to be nondiagnostic other than to offer a possibility of great antiquity.

As will be discussed below, there seems to be three styles of rock art which have temporal associations. Despite the fact that they currently can be used only in relative dating, they do indicate another chronological sequence that can be used in support of more conventional techniques.

Given the above cross-dated artifacts, the Granite Mountains show evidence of having been intermittently occupied from at least between 4,000 to 7,000 BP into the historic era by Native American peoples. Based on the quantity and distribution of artifacts, it would appear that the most extensive habitation and procurement activities occurred during the Late Prehistoric Period. However, given the active deposition from sheetwash and eolian forces there is a distinct possibility of buried earlier components within the Granite Mountains.

Cultural Affiliation

Southwestern archaeologists have shown some degree of success in trying to delineate the boundaries of social communities and interactive spheres (e.g. Plog 1994). The Southwest is blessed with many in situ descendants of prehistoric societies, at least 2,500 years of basically sedentary settlements based on horticulture, and abundant trade in temporally and spatially diagnostic ceramics. Researchers in the East

Mojave, and the Great Basin in general, have a more difficult task in attempting to ascertain cultural affiliation and ethnolinguistic identity. The arid interior is a region of highly mobile hunter-gatherers living in a xerophytic physical environment whose limited resource base placed restraints upon population development. The descendants of these foragers have been forced to relocate from their traditional lands within the region; and, in the historic era, they were either decimated by disease or acculturated into the Euro-American culture. This has created some difficulties in gaining ethnographic data in some portions of the desert interior.

The "big question" deals with the spread of the Numa, Uto-Aztecan speakers, from their "homeland" in the southwest corner of the Great Basin east into the Colorado Plateau, Rocky Mountains, and the Great Plains. Lamb (1958), in analyzing the internal relationships within the Numic language branch, came to the conclusion that from a point of origin in the vicinity of Death Valley, around AD 1000, three Numic branches spread north and east across the intermountain west. Bettinger and Baumhoff (1982) produced a model that explained how this happened based on competing foraging strategies, giving the advantage to the Numa as "processors" (collectors) who processed a wide range of abundant but labor-intensive resources as opposed to the "pre-Numic" people who were "travelers" (foragers) and utilized low-intensive, high yield but limited resources. An opposing viewpoint stated that the Numa already had a long term in situ history in the central Great Basin and expanded from there to the periphery as adjacent cultures like the Anasazi, Fremont, Lovelock, and Chewaucanian adaptations retreated during warm-dry climatic episodes (Aikens and Witherspoon 1986; Aikens 1994). Since that time, a controversy has continued over the spread of the historic tribes in the Great Basin (see Madsen and Rhode [1994] for a variety of theories and proposals), although a recent study in Nevada seems to support the Aikens and Witherspoon model (Pippin 1998:108). The crux of the issue is that archaeological data and language do not necessarily prove to be corresponding. Shoshone brown ware ceramics, Desert Side Notched points, and the distinctive attributes of some twined and coiled basketry have been suggested as the diagnostic artifacts that denote the Numa (Sutton and Rhode 1994:10). But as Jones (1994:73-74) points out, a number of studies have shown that similarities exist between the brown ware ceramics of the Numa, Fremont, Anasazi, Mogollon, Athapascans, and Hispanics; Desert Side Notched projectile points are distributed as far as Fremont sites in Utah, the Upper Republican sites on the Great Plains, Apache sites in New Mexico, and throughout California; and basketry, although a better ethnic indicator, still presents some problems.

The Chemehuevi represent the southernmost extension of the Numic spread in the Great Basin. In the Bettinger and Baumhoff model (1982), the eastward expansion of the Numa commences around AD 1000. Donnan (1964), based on his excavation of Southcott Cave and Davis' (1962) work at Rustler Rockshelter, proposed that the Chemehuevi were in place in the East Mojave by AD 1400. At Mitchell Caverns, Pinto (1989) found a winnowing tray and two seed beaters that are felt to be characteristic implements of Numic seed harvesting. The winnowing tray was radiocarbon dated at 480 ± 100 BP which would agree with Donnan's estimates. The only archaeological evidence of the Chemehuevi in the Granite Mountains is hypothesized to be a Cottonwood Triangular projectile point made from green bottle glass, historic trade beads, and the black-sketched pictographs at CA-SBR-547H, -9328, and -9335 which are quite tentative. The distinction between Chemehuevi and Mohave is blurred by their eventual mutual acculturation.

Most of the ceramics in the region predate the Chemehuevi and indicate Arizona origins. The artifact associated with the River Patayan is Lower Colorado Buff Ware. The River Patayan in the East Mojave become the historic Hokan speaking *Ahamakhav* or Mohave (Hale and Harris 1979). Tizon Brown is the hallmark of another group, the Cerbat or Upland Patayan, who are ancestral to the Hokan speaking Pai of northwest Arizona (Landis 1993). This ethnic distinction may be of dubious validity in the East Mojave. As stated earlier, Lower Colorado Buff Ware and Tizon Brown may represent a geographical not a cultural difference (cf. Lyneis 1988). The evidence is compelling for a Desert Mohave and continued Hokan presence west of the Colorado River. There is also a small Anasazi influence in the area evidently attracted by the mining of turquoise northeast of Baker (Drover 1980; Leonard and Drover 1980). Small quantities of Virgin Anasazi ceramic sherds were found at two sites in the Granite Mountains and a larger sample was present on Clark Mountain (Rafferty 1994:6-12). Ceramics representative of the Kayenta Anasazi, Prescott Anasazi, and the Cohonina are also present in the East Mojave (King 1981:227-29). These are all Formative Period sherds from the Southwest and date to AD 900-1250. In the Granite Mountains these ceramic types occur in minimal numbers and would appear to be more likely the result of trade than an actual occupation.

Prior to the ceramic Patayan Period, Donnan (1964) proposed a Non-Ceramic Yuman (Patayan) Horizon and a Pre-Yuman Horizon, the ethnicity of which is unknown. King (1981) has proposed that prior to 1000 BC the earliest culture was composed of Penutian and Hokan speaking groups. He states that at 1000 BC a Uto-Aztecan people appeared who are ancestral to the Hopi or the Pima. Although intuitively this may be possible, it lacks empirical evidence in the archaeological record. The Archaic projectile points of these periods have a spatial distribution that covers most of California, the Mojave and the Sonoran Deserts, the Great Basin, and the Colorado Plateau (Matson 1991). The problem is that projectile points rarely reflect languages and the farther back temporally one goes the more ephemeral cultural identity becomes, especially when faced with diagnostic artifacts with wide distribution. Even in the Late Prehistoric Period, the identification of ethnic affiliation is problematic. Sutton's (1989b) concept of interactive spheres may be a preferable approach in trying to untangle the melange of uncertain cultural groups. As Jones (1994:74) points out: "We are poorly equipped archaeologically to answer historical questions of this sort because we have limited ability to track culture, ethnic groups, or language archaeologically." Determining the cultural affiliation of archaeological sites in the Granite Mountains presents more uncertainties than givens.

Subsistence and Settlement Patterns

Relative to the majority of the Mojave Desert, the Granite Mountains were an attractive place for seasonal habitation due to their abundant springs and extensive vertical displacement of the landscape which allowed for the existence of a variety of biotic communities. Tables 2 and 15 list those plants that have subsistence, medicinal, and utilitarian uses that exist specifically in the Granite Mountains. The plants noted are those mentioned in the ethnography of the Southern Paiute and the Chemehuevi in particular as cited in Lawlor (1995), Sutton (1989a), Kelly and Fowler (1986), Jenkins (1982), King (1981), Laird (1976), Kelly (1964, 1936, and 1934), and Steward (1938). Obviously in other areas of the East Mojave additional food sources would be available which are not present in the Granite Mountains.

Which floral and faunal resources in Tables 2 and 3 were actually used remains to be proven. Aboriginal subsistence remains that were actually observed in the course of this study consisted of mammal bone fragments, longitudinally split long bones, and tortoise carapace and plastron. Many of the bone fragments were burnt and the dimensions of the long bones

Table 15. Medicinal Plants of the Granite Mountains and Immediate Environs (from Kelly 1936).

Common Name	Species	Use
cheesebush	*Hymenoclea salsola*	colds, measles, smallpox
indigo bush	*Dalea fremonti*	sores
spurge	Euphorbia (5 species)	sore eyes, stomach ache
juniper	*Juniperus osteosperma, californica*	smallpox
Indian tea	Ephedra spp. (4 species)	kidney disorder
jimsonweed	*Datura meteloides*	psychotropic
wild tobacco	*Nictina trigonophylla*	psychotropic

would probably indicate an artiodactyl. Tortoise represented a common food source, particularly in the spring, and their shells were used as containers (Schneider and Everson 1989). The only plant resources seen were carbonized remnants of pinon pine cones and what appear to be pine nuts. Whether this was a natural phenomena from wildfire or culturally derived could not be determined. Excavation in several different environments within the range will be necessary to ascertain what food resources were being utilized.

The use of analogy between an ethnographic model and the archaeological evidence offers one approach in trying to recreate the subsistence strategy used in a seasonal round. There have been some major cyclical climatic changes in the East Mojave in the last 11,500 years (Spaulding 1990:194-195; Altschul *et al.* 1998; Pippin 1998:21-34), which make any model provisional. The use of ethnographic analogy in a similar arid lands environment was employed by Matson (1991:223-231) in the Cerbat Mountains of northwest Arizona. The comparison of his archaeological investigations from survey transects with the accounts of the Hualapai seasonal round achieved a good degree of relative correlation. Ethnographic accounts that have resulted in similar affinity include Steward (1938), Bean (1972), Bean and Saubel (1972), Zigmond (1981), and Kelly and Fowler (1986) among others. The subsistence model for the Granite Mountains, which follows, is based on resource procurement patterns proposed for the Amargosa-Mojave Basins by Knack (1980:146-157), Clark Mountain by Jenkins (1982), the Silurian Valley by Reedy (1998:761-779), the East Mojave in general by King (1981:54-69), and a consideration of the floral and faunal inventories of the range. It is obviously tentative but models are offered as a point of departure for future studies to either substantiate or reject.

The seasonal cycle began in the Spring, the exact time being somewhat dependent upon the annual variance in the climate and the exhaustion of the food resources stored for the winter. There was a move to temporary camps at lower elevations because the warmer temperatures there would result in earlier maturation of desirable subsistence crops. A variety of greens could be eaten, most with little preparation, on the spot. Cactus flower buds (*Opuntia spp.*), Joshua tree, and yucca buds also could provide immediate food sources (Jenkins 1982:73-74). These were prepared by roasting or parboiling (Reedy 1998:764). The most important spring food was the agave (*Agave desertii*) in the uplands (King 1981:11). Remnants of large roasting pits on Clark Mountain, in the Mescal, Ivanpah, and Providence Mountains, Vontrigger Hills, and the Spring Mountains of southern Nevada attest to the harvesting of agave, cholla, and yucca buds in the region. Agave does exist in the Granite Mountains but no classic rock-lined, dome-shaped roasting pits have been identified such as the ones that exist near Foshay Pass in the Providence Mountains 10 km (6 miles) away. In the Granite Mountains CA-SBR-9341 has a large roasting pit but it is not rock banked. In areas that had mesquite (*Prosopis glandulosa*), the spring blossoms and the green pods could be gathered and eaten in the early summer (Bean and Saubel 1972:108-109). In late spring the transition to seed producing shrubs started to occur with the most important being blazing star (*Mentzelia albicaulis*). In a few dispersed locales away from the Colorado River, limited horticulture was practiced and garden plots were planted in the spring. In Nevada at Ash Meadows, Cottonwood Spring (Spring Mountains), Manse, and Pahrump Spring, incipient agriculture was practiced. Piute Creek was the major example in California (Jenkins 1982:64). Farming near the Granite Mountains was observed by Carr in 1860 at Cornfield Springs. “Just below the spring the Indians have cleared away the rocks and bushes and planted pumpkins and watermelons. The vines look very well and will produce good crops. The Indians have run small ditches around the garden, by means of which they can irrigate it thoroughly” (Casebier 1972:34). Irrigated horticulture was practiced by a Chemehuevi shaman at Arrowweed Spring (Laird 1976:11). Both locations are in the southern Providence Mountains within 16.5 kms (10 miles) and 5 kms (3 miles), respectively, of the Granite Mountains.

In summer, hard seeds from a multitude of grasses and shrubs were the focus of gathering. The process began in the lowlands and moved into the higher elevations with the advance of the season and the maturation of crops. This also allowed somewhat of an escape from the summer heat. The Kelso Dunes with its ricegrass (*Achnatherum hymenoides*) was a focal point that attracted family groups from all over the East Mojave (King 1981:11). In other areas needlegrass (*Achnatherum speciosum*), galleta grass (*Pleuraphis rigida*), dropseed (*Sporobolus crytandrus*), love grass (*Eragrostis cilianensis*), wild rye (*Elymus elymoides ssp. brevifolius*), and deergrass (*Muhlenbergia rigens*) all produced edible seeds (Jenkins 1982:38-40). The grass seeds were usually ground into a flour, mixed with water and made into a flat bread. Equally important were all the sages (*Salvia spp.*), particularly chia (*Salvia columbariae*). Berries from the desert thorns (*Lycium spp.*), squaw bush (*Rhus trilobata*), and serviceberry (*Amelanchier utahensis*) were available but less important. Large stands of mesquite do not currently exist in the Granite Mountains, but in those small scattered enclaves where it does exist, it could be harvested beginning in mid-summer dependent upon elevation. Mesquite on archaeological sites in the range occurs from 920 to 1580 meters in elevation. Mesquite in other parts of the East Mojave is one of the principal staples for the entire gathering year (Bean and Saubel 1972; Schroth 1987). One of the more intriguing summer foods was the excretion from an aphid (*Hyalopterus arundinis*) which was gathered from the common reed (*Phragmites australis*). This “honey dew” or “bug sugar” was highly sought after (Jenkins 1982:48).

In the fall a diversity of foraging activities took place in preparation for storing foods to last through the winter. All over the East Mojave the emphasis shifted to the highlands for the harvest of pinon pine (*Pinus monophylla*). The Mid Hills, Kingston, Clark, New York, Providence Mountains, and, of course, the Granite Mountains were all areas that had the potential to provide extensive yields of pine nuts, although their year to year production could fluctuate (King 1981:11). This harvest was absolutely critical since pine nuts would become one of the major staples for the winter months ahead (Madsen 1986). Sutton (1984) has shown that *P. monophylla* is much more reliable than previous researchers had thought. Therefore, “subsistence models should result in the prediction of higher population densities, more restricted settlement patterns, and a more stable social organization during the prehistoric period” (Sutton 1984:245). In addition to pine nuts, seeds from pigweed (*Amaranthus fimbriatus*), late maturing grasses, and acorns from the small groves of canyon live oak (*Quercus chrysolepsis*) could be secured (Jenkins 1982:77-78). The other principal source of food were the "dates" from both local species of yucca (*Yucca schidigera* and *Y. baccata*) (Jenkins 1982:37). The few agricultural plots that existed would also be harvested at this time for corn, beans, squash or pumpkins, sunflowers, gourds, pigweed, devils claw, and introduced Old World cultigens like watermelon, muskmelon, and wheat (Kelly and Fowler 1986:371).

Winter camps would be located in proximity to water toward the bottom edge of the pinon-juniper woodlands to take advantage of deadfall for firewood. Subsistence would depend basically on stored foods from the fall. If the need developed, agave leaves, juniper berries (*Juniperus osteosperma* and *californica*), and cactus pads could be added (Jenkins 1982:78-79). In fact throughout the entire gathering year a whole second tier of plants could be used as needed, such as bladderpod (*Isomeris arborea*), yucca root, sagebrush seeds (*Artemisia tridentata*), princes plume (*Stanleya pinnata*), or acacia beans (*Acacia gregii*), which were usually bypassed because of their bitter taste or the fact that they were too labor intensive for the return they yielded (Jenkins 1982:41-46). Simms (1985) and Reedy (1998:771-777) have listed the nutritional value of many of the principal Great Basin and East Mojave plant and animal food sources with their return rate in calories gained. Interestingly, many of the analyzed plants are higher in protein values as compared to calories (Reedy 1998:774).

Hunting throughout most of the year, particularly for small game, was done on an opportunistic basis. Although meat was highly desirable it was chiefly a dietary supplement (cf. Steward 1938). In the fall, while families were in the uplands to collect pine nuts, bighorn sheep (*Ovis canadensis nelsonii*) were hunted on the mountain peaks. Since numerous families might come together for the pinon harvest, organized drives of rabbits might be conducted. In the winter and summer months bighorn continued to be hunted because cold weather or the need for water, respectively, would drive the sheep to lower elevations making them more accessible. Small game, however, provided the bulk of protein intake. In order of frequency this would include jackrabbits (*Lepus californicus*), cottontails (*Sylvilagus audubonii*), rodents, birds, insects, reptiles, and in times of dire hunger, carnivores (Jenkins 1982:51-63). Lagomorphs were taken with bow and arrow and rabbit nets during drives, but rodents were usually trapped. Two bundles of snares were found in a small boulder cave in the Ord Mountains, southeast of Barstow, that attest to the ingenious traps that could be utilized in catching rodents. An associated coil basket, with embedded grass particles, was dated at AD 150 (Echlin *et al.*1981). The hides and skins from mammals were an important by-product from hunting. Bighorn hides were used for shirts, pants, and moccasins; blankets were made from rabbit skin; and bobcat skin was preferred for arrow quivers (Jenkins 1982:50).

The settlement pattern associated with subsistence activities of hunter-gatherers has been conceptualized by Binford (1980) into two idealized organizational strategies that he labeled as collectors and foragers. Collectors tend toward being more sedentary and send out procurement parties to acquire resources and return to a central village to store the food. Foragers tend to cache very little and move with the seasonal availability of food from one resource to the next. Since these are two extreme manifestations, the reality of the strategy used in the Granite Mountains is probably an oscillation between the two extremes. The protohistoric Cahuilla, a Takic speaking group to the southeast, would be an example of collectors. Bean and Saubel (1972:19-21) found that they established sedentary villages in the middle of the most productive food-gathering area; "No village was located more than sixteen miles from all of its food-gathering ranges, and approximately 80 percent of all food resources used by a village could be found within five miles." In the Owens Valley ethnographic accounts tend to limit hunter-gatherer procurement to within two hours walk of their base camp. On broken terrain this would suggest a radius of about five km (three miles) and on open terrain twice that distance (Bettinger 1982:45).

Despite the potential food sources (76 identified plant species that cover a yearly gathering cycle, see Table 3), the archaeological record does not seem to support any sedentary villages. The two "village" sites identified by previous researchers, while quite large, are open sites that offer no protection from winter precipitation, wind or summer heat, and are a considerable distance from potable water. Neither offers much surface indication of milling, ceramic sherds or the variety of tool types one would expect with year-round habitation. Semi-permanent settlement could be a possibility in the Granite Mountains for an extended family unit. Among the Cahuilla, who possessed extensive groves of oak and mesquite, private ownership of property by individuals, extended families, and lineages not only occurred but were reinforced by ritual restrictions and sib relationships (Bean 1972:125-129; Bean and Saubel 1972:21-22). Laird (1976:9) also mentions the Chemehuevi "ownership" of ranges and springs. There then exists the possibility that an extended family which regarded the Granite Mountains as their territory, lived there semi-permanently and attended the fall gatherings at locations like Pahrump Spring for mourning ceremonies, celebrations, and marriage arrangements, and traveled to procure other food sources in times of shortage or trade for high quality toolstone.

It would appear, however, that the forager scheme described by Steward (1938), with a winter camp and temporary camps in seasonal resource areas, is more the settlement pattern in the Granite Mountains. There has been only one winter camp identified in the literature in the East Mojave. This is in the vicinity of Mitchell's Caverns and evidently involved some type of domed house (King 1981:10). Some rockshelters in the Granite Mountains could have provided winter habitation for small groups but the possibility of a large winter camp does not seem probable from the existing evidence. Southern Paiute in other areas have used rockshelters for winter quarters (Kelly and Fowler 1986:371). Base camps, and possible winter camps, are all located on the east side of the range. Granite Cove and White Fang, Dripping and Cove Springs, Snake Springs, and Cottonwood Cove all have a series of sites within their confines that combine extensive milling, artifact diversity and density, developed midden, and rock art with a proximity to permanent springs, numerous rockshelters, and the contact between the pinon-juniper and bajada ecotone zones. The presence of food processing and ceremonial activities have a correlation with base camps. While projectile points, bifaces, scrapers, and manos may be "personal gear" and not necessarily be in their original context, milling stones, particularly bedrock varieties, are found in their use-context and are site-specific evidence of food production. Grinding thus would indicate consumption which equates with habitation (cf. Binford 1979:262-63). Granite Cove, White Fang, and their associated sites have a combined 38 bedrock milling features and 15 portable milling stones; the Dripping and Cove Springs site area has nine bedrock milling features and 23 milling stones; Snake Springs has 11 bedrock features and 39 portable milling stones; and the Cottonwood Cove district has 19 bedrock metates and 16 portable metates. The rock art inventory of total petroglyph and pictograph elements runs 743, 54, 164, and 219 elements respectively. No other summary of attributes at contiguous sites is comparable. Beyond the Granite Mountains, the three adjacent sites at Arrowweed Spring in the southern Providence Mountains offer evidence of another base camp with 15 bedrock milling features, nine portable milling stones, and 44 petroglyph elements.

The distribution of some of the temporary camp sites is predictable. The bajada areas of Willow Springs Basin and Granite Pass offer the greatest variety of vegetal resources and have the largest number of temporary camps and the highest site densities. The primary resource base in both locales is not obvious since such a variety of possibilities exists in this area of the Granite Mountains. Given that 41 out of the 55 sites in the basin and the pass offer shade on-site, it could be suggested that they were important in late spring or early summer. Under those conditions it would seem that the seasonal attraction was the great variety of cacti, grasses, sage, and extensive stands of buckwheat, Indian tea, desert thorn, and Mohave yucca. Neither area is endowed with immediate water although ephemeral tanks briefly exist during wet periods and the number of intermittent springs and seeps have an increased volume of flow. Willow Springs Basin has the highest number of springs in the whole range, thirteen at least, but they are anywhere from .5 to 3.5 kms distance from the sites, up the very steep southern face of the mountains, and hard to reach due to the very rugged terrain. Dependable water in the Granite Pass area is from 1.3 to 2.5 kms distant. Since both regions have so many sites relative to the other areas it would indicate either large groups of habitants or repeated utilization over a period of time. The latter seems the more probable. Midden only exists at 13 of the 55 sites in those two areas which seems to suggest that many of the sites were not reused for too many seasons before choosing another nearby camp.

At the opposite extreme the southwestern and western bajada have a paucity of sites—four sites on the west side of the Granite Mountains, and four sites on the southwest. This seems related to the lack of immediate springs and their afternoon sun exposure an aspect which has resulted in sparser and less varied plant life.

In the pinon-juniper uplands of the range there are four rather level areas that were investigated that have concentrations of temporary sites. Out of the 23 sites, 20 of them are temporary camps that are apparently related to pinon pine procurement. Chateau Plateau has eight sites clustered within 700 meters of a spring on the largest level area in the mountains at 1740 to 1810 meters elevation. The sites have a combined 18 bifaces and projectile points, a high density by Granite Mountain standards, which might be indicative of the fall bighorn hunts. Bighorn Basin has four very large sites (each averaging 890 square meters) immediately adjacent to springs, pinon pine, and agave. The sites had a total of 12 projectile points and bifaces which also might reflect hunting importance. The third area is a small hanging terrace called Hidden Valley at 1450 meters which has several intermittent springs. In addition to the pinon pine and juniper the valley has agave and canyon live oak. The last upland flat on a southern extension from the summit is very small and difficult to access but compensates with a spring, a large rockshelter, and the presence of mesquite, pinon, and agave. The other six highland sites are all on ridgelines that provide access to the more level areas described above. All of these sites lack immediate water, and while some served as transient camps only, others also provided temporary camps for gathering.

The four sites along the periphery of the Kelso Dunes are probably related to the procurement of ricegrass. Numerous trails lead from the dunes to the mouths of the Granite Mountains' northern canyons, all of which contain intermittent springs and tanks. There are 17 sites located here, 12 which have milling features that may be related to plant-food gathering on the dunes. This area has the heaviest concentration of petroglyphs in the Granite Mountains, seven sites with 514 elements, and the only trail with any features (CA-SBR-5188 with its 71 rock cairns). This seems to denote a ceremonial importance that may or may not have been associated with gathering. As Lawlor (1995:366) notes the "… Chemehuevi and other Southern Paiute saw plants as having less power than animals and thus requiring very little ritual." But obviously some ritual purpose was at work here which may be more related to the Patayan and Desert Mohave.

On the basis of diagnostic artifacts, few conclusions can be reached on the temporal utilization of specific environmental zones in the Granite Mountains. While the three Pinto points were all found on the eastern bajada, it would appear that from the Gypsum Period on all of the ecotone areas were being used. From studies in other regions changes in subsistence adaptations have been identified. In southern Nevada, Pippin (1998) found a definite increase in milling after 5,000 BP, that pinyon exploitation was firmly established by 3,000 BP, and that with the onset of drought in 900 BP the foraging radius definitely increased as base camps were moved closer to more reliable water sources. It would seem that similar trends probably occurred in the Granite Mountains but the data have not yet been collected to substantiate such conclusions.

It should be mentioned that no indication of human remains were found. Although inhumations are know to exist in the region, the practice of cremation has a long tradition in the Mojave Desert with one found in a cave south of Ludlow being radiocarbon dated to 5,960 ± 130 BP (Osborne 1993). Prehistorically the Patayan practiced broadcast cremation and historically so did the Mohave and Chemehuevi (Schroeder 1979:106; Kroeber 1925:750; Kelly and Fowler 1986:380). Eventually, probably because of Mormon influence, the Chemehuevi shifted to burial with only the belongings of the deceased being burned (Kroeber 1925:599; Kelly and Fowler 1986:380). The surface evidence of a cremation will be difficult to observe in many areas due to active site formation processes.

Cultural Interaction

The Granite Mountains and the adjacent Kelso Dunes, Brown Buttes, Van Winkle and southern Providence Mountains provide the source for much of the food and natural resources needed for subsistence and survival of prehistoric peoples in the region and could easily be obtained in the course of annual subsistence activities. However, trade or long distance procurement with other regions did occur as indicated in the archaeological record. The most common reflection of this practice is seen in the debitage and flaked lithic tools found in the Granite Mountains and its immediate environs. Of the total number of all categories of flaked stylized stone tools encountered in the survey (n=169), 62% are made from materials transported from distant sources. Considering projectile points alone, imported lithic materials comprise 81% of the total. Only in the flaked tool types used in the processing of foodstuffs are indigenous sources predominant (54%).

Microcrystalline, in a manifest of forms, is the most common imported lithic material utilized in the Granite Mountains. On the 127 sites that exhibit debitage, microcrystalline materials are present at 78% (n=99) of those sites as compared to 72% (n=91) and 46% (n=59) for the locally available rhyolite and quartz, respectively. Agate, chalcedony, and jasper do not exist in the Granite Mountains (Gahn and Gibbons 1979:4). However, agate in a myrid of different color combinations, chalcedony, and red and yellow jasper occur in large quantities in the mountains and foothills to the west. Numerous locations in the Bristol Mountains, southern Cady Mountains, the Hector Hills, Lavic Siding, Pisgah Crater area, and Ash Hills are all major sources of silica materials. Jasper, agate, chalcedony, and chert all occur to the east in the Hackberry Mountains, the New York Range, and the southern end of the Castle Mountains (Henry 1948:30-37; Strong 1971:52-65). Wilke and Schroth (1989:146-174) describe in detail evidence of aboriginal prospecting at one such source (CA-SBR-5872) in the latter location.

Obsidian is present as debitage on 17% (n=29) of the sites. There are some deposits of obsidian in the East Mojave. Fairly large chunks of obsidian occur just east of Ludlow. Smaller clasts of obsidian, or "apache tears," are found north of Bagdad in the Bristol Mountains, eroding from the tuff on the east slope of the Providence Mountains, and in the Woods Wash area (Strong 1971:57-60). There is a prominent source of obsidian on the north end of the Castle Mountains at the Juan Site (26 CK 3849, Wilke and Schroth 1989:156-157). There is also mention of obsidian on the "back side" of Amboy Crater (Henry 1948:37). Given the prehistoric preference for obsidian as a chipped stone material, there is a possibility that some of the volcanic glass tools in the study area may have originated from even more distant sources but that remains to be proven. No tests for obsidian source determination have been conducted in this portion of the East Mojave.

The other obvious trade item would be the presence of seashell. The minimal occurrence of *Olivella biplicata*, *Ostrea lurida*, and *Haliotis sp.* indicates a connection with coastal Southern California. Shell beads and ornaments, in particular *Olivella biplicata* beads, are traded extensively throughout the Great Basin and into the Southwest (Bennyhoff and Hughes 1987). One isolated unmodified rockshell, either a *Oceneba sp.* or a *Thais sp.*, was found on the southern edge of the Kelso Dunes. Its origin and temporal circumstances are uncertain.

In any trade relation aboriginal people of the Granite Mountains had foodstuffs to offer. The mechanics of this trade are unknown as to whether the local populations traveled to distance sources or were the recipients of traders. King's (1981:11) reference to a number of bands journeying to the Kelso Dunes to gather ricegrass would seem to offer a prime opportunity for the exchange of goods. Annual fall festivals or ceremonies, such as the one described by Steward (1938:184) for the Southern Paiute at Pahrump, would also provide contact for interaction. The occurrence of hematite in the Granite Mountains and the nearby southern Providence Mountains would seemingly offer another trade item but the iron oxide is so widely distributed in the mountain ranges of the East Mojave (Christensen and Dickey 1996:20) that this probably had low value.

Rock Art

A total of 59 rock art sites in the range and surrounding areas represents strong evidence that rock art played a very significant role in the prehistoric lifeways of people using the Granite Mountains. Pictographs in the East Mojave were discussed by Christensen and Dickey (1996), while Granite Mountain rock art was previously documented in Christensen *et al.* (1999b). Since the submission of the latter paper for publication, 10 additional rock art sites were documented. There was no appreciable change to element distributions from the earlier studies except for one category. Site CA-SBR-9817 had 30 scratched images (Fig. 16), the most scratching of any site in the region. A brief summary of previously published and updated materials, since it relates to chronology and cultural affiliation, is included here.

The analysis of the rock art was initially classified by morphological categories. Petroglyphs and pictographs were examined separately, because of the differences in the mode of manufacturing, but were both categorized by the same 40 design motifs since they share the same element inventory. Petroglyphs were produced with a medium to large hammerstone using what appears to be in most cases direct percussion. Diagonal dents, from lateral strikes, and scratching are rare. Pictographs were painted in various shades of red 88% of the time. Black and white pigment was used in much lesser amounts (9% and 2% respectfully) and bichrome elements were even rarer (n=12). Pictographs were generally painted with fingers with very few instances of sketching with a pigment stick or painting with a brush of some sort. The distribution of pecked and painted motifs has some distinct differences (see Table 3 in Christensen *et al.* 1999b) but here those distinctions will be discussed in four general categories. Removing the indiscernible and amorphous elements, petroglyphs are 46% linear in design, 38% circular, 9% are a combination of curvilinear and rectilinear elements, and 7% are representational with 91% of those being anthropomorphic. Pictographs are 70% linear, 22% circular, 5% are combination motifs, and 3% are representational with all depicting anthropomorphs. Other than some historic paintings of horses, there are no aboriginal pictographs of quadrupeds yet discov-

Fig. 16. Scratched and pecked glyphs at CA-SBR-9817.

ered in the East Mojave. The reason for these differences do not appear to be temporal nor stylistic but may reflect differences in function, and perhaps even the gender of the artist (Christensen and Dickey 1996:48-50).

On the basis of superimposition of petroglyphs, and on rare occasions pictographs, there seems to be three chronological episodes of rock art production. The oldest style is Great Basin Abstract, sometimes referred to as the Western Archaic Tradition and includes both pecked and painted images (Fig. 17). This probably correlates to the pre-Numic populations and has been suggested by many to have extensive antiquity (e.g. Whitley 2000:44). Despite the hypothesized cultural affiliation of the Western Archaic Tradition, vestiges of it survive into the historic period with both Numa and Hokan speakers (Christensen and Dickey 1998:40). For unknown reasons these earlier motifs are reworked and seemingly copied. The bulk of Granite Mountains rock art falls into this cultural tradition. The next oldest rock art is the "Grapevine Style" that is proposed to be the work of the Patayan or ancestral Mohave (Christensen and Dickey 2001:193-194). This style of petroglyphs and pictographs, which is more rectilinear, symmetrical, and geometric than the Western Archaic Tradition, is more prevalent adjacent to the Colorado River. It forms a small component of the rock art of the Granite Mountains with CA-SBR-1757 having the best examples of this style in the range. The most recent appearing rock art, black sketched pictographs, may be Chemehuevi in origin. This conclusion is based on their similarity to possible Southern Paiute rock art in other areas of the southeastern Great Basin (Christensen *et al.* 1999b:61). Only three sites (CA-SBR-547, 9328, and 9335) in the Granite Mountains show this style. Other than a single glass trade bead at CA-SBR-547, there is no artifactual evidence of a possible Chemehuevi presence at these sites.

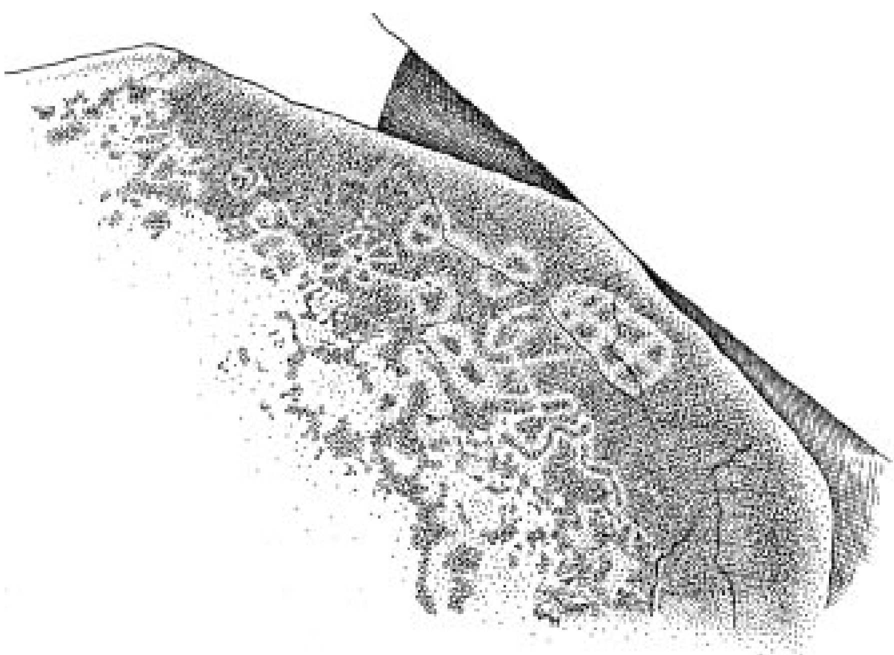

Fig. 17. Abstract petroglyphs at a large habitation site, CA-SBR-9342.

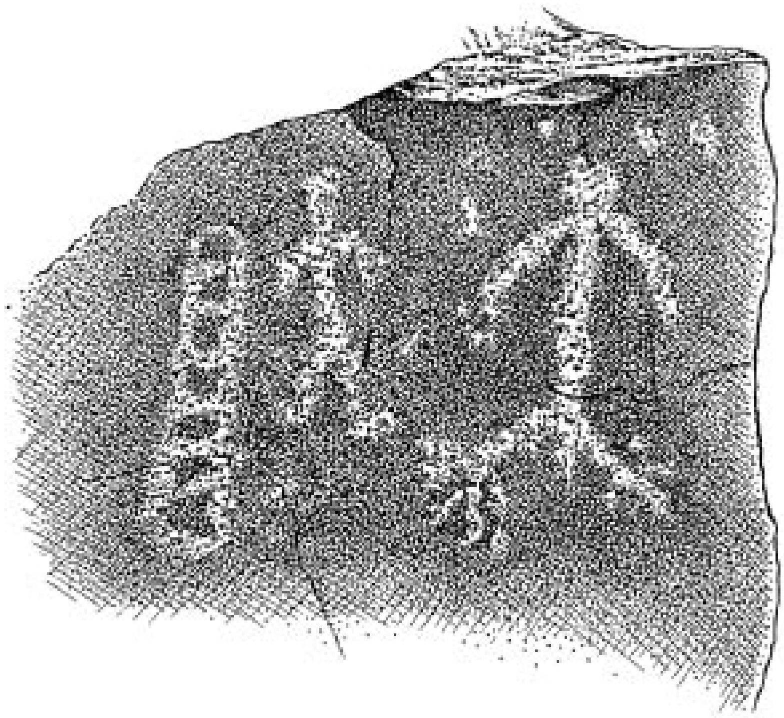

Fig. 18. Public and prominent petroglyph boulder, CA-SBR-9520.

There are currently more known painted images in the range than the rest of the Mojave Desert combined. Rock art in the Granite Mountains, in general, is comparable to the other great concentrations in the East Mojave like Piute Creek, Lanfair Valley, Woods Wash, Aikens Wash and Cow Cove. All of these sites have major importance as places of supernatural power. Ceremonial and ritualistic importance is attached to these locales even if we currently do not have the ability to comprehend the symbolism and iconography involved. Bean *et al.* (1991:3) in a discussion of the Cahuilla landscape, note that rock art sites "are assumed to have had ritual connotations when made, and are still considered sacred." Mountains, caves, and springs are sources of supernatural power (Bean *et al.* 1991:3-4; Whitley 1998) and the Granite Mountains would certainly deserve attention for those factors alone.

The context of the rock art sites is interesting. In most Archaic rock art there is no line of demarcation between the sacred and the secular. Rock art in the Granite Mountains occurs at eight base camps, 24 temporary camps, one transient camp, nine milling sites, lithic scatters, or cache sites, and 17 have rock art as their principal function. Assuming that the artifactual components of the sites are contemporaneous with the rock art, which currently cannot be proven, the ritualistic function of paintings and glyphs existed in the profane world of everyday subsistence activities. Although the great majority of the rock art is depicted in private away from the immediate public view (36 of the 59 sites), it is still within the context of habitation and procurement activities. In sites that have pictographs, 90% are associated with rockshelters and some degree of artifactual assemblage. Interestingly, all seven of the northern bajada rock art sites and five of the six southern Providence Mountains sites are public so it would seem a different function may be operating there (Fig. 18). Whether the rock art is visible or hidden it still points to the fact that rituals were an integral part of everyday life.

Related to the above idea is function. As has been stated in numerous prior works (e.g. Hedges 1992; Christensen and Dickey 1996; Whitley, Simon, and Dorn 1999; Whitley 2000) shamanism is the operative religious system of the Desert West in the Archaic period. Shamanism, however, is not simply limited to an individual vision quest to obtain power as proposed by Whitley (2000:89-91); it also involves a myriad of different concerns and objectives such as curing, weather control, and initiation rites. In Cahuilla society, Bean (1972:125) indicates how rock art was used to mark territorial units of private ownership and Patencio (1943:xiii, 96, 102-3) reminisces about how rock art indicated sources of water and was used to mark trails. In a study of rock art associated with storage facilities in the Escalante River drainage of southeast Utah, Hartley and Vawser (1997:58) found a high redundancy of depicted images that was interpreted as communicating a "message of ownership or affiliation that served as an advertisement of access restrictions." Regardless of the purpose, rock art was a normal part of the cultural system being especially prevalent in areas that received repeated or long term occupation. Native Americans do not separate the sacred from the ordinary since spiritual and supernatural power is pantheistic. Rock art may be an integral component of the total subsistence strategy. At the same time, the unique physical appearance of the massive granitic outcrops of the southeastern Granite Mountains must have contributed a special enhancement to its spiritual connotations which may have resulted in either an exceptional need to produce rock art or to participate in its supernatural power.

Conclusion

Archaeological survey in the Granite Mountains indicates a high degree of prehistoric utilization of the range over an extended period of time. The degree of importance that the Granite Mountains portray within the context of the prehistoric landscape may be difficult to quantify into a modern schemata, but the significance of the range to prehistoric hunter-gatherers is certain. There are three major attributes which highlight this hypothesis.

The variety and sheer volume of sites is the first point of consideration. To determine if the land-use pattern of the Granite Mountains is unique or the norm, a comparison with similar surveys of mountain ranges in the East Mojave would be useful. However, this is difficult to accomplish owing to differences in environmental settings from area to area, differences in the methodology employed by researchers, and the fact that such studies are limited. There is not much data available for such comparisons. With these qualifications in mind, probably the most comparable findings are the University of California at Santa Cruz's investigation of the Kingston Range (Neraas 1983:183-216). They employed intuitive survey in a variety of different ecological zones and found 62 prehistoric sites. This included eight base camps, 19 temporary camps, and a substantial number of activity areas. A much more systematic survey was done in three BLM Planning Units in the Northeast Mojave Desert (Coombs 1979). They employed two different strategies to investigate close to 17,000 acres: a cross-stratified random sample, using three general environmental variables, and a random block sample. Their 1/8 mile by one mile transects included some samples in the Kingston range and Clark Mountain (29%) but the rest were done in the surrounding valleys and playas. Excluding isolated finds, they found 117 prehistoric sites (both in and outside their sample plots) which included one base camp, 24 temporary camps, and again, a variety of special use sites. Lithic scatters comprised 67% of the total site inventory (Coombs 1979:98, 104). By comparison, although a much smaller area was surveyed, the Granite Mountains and environs contained 170 prehistoric sites, including nine base camps and 76 temporary camps. Diversified activity areas were present but habitation sites and food processing stations accounted for 71% of all sites and lithic reduction sites as a single component were a mere 4% of the total.

The disparity in site density between the Granite Mountains, Kingston Range, and Clark Mountain could be attributed to three variables: the availability of springs, food resources, and rockshelters. In Hall's (1981:70-193) inventory of springs and seeps in the East Mojave, he lists three springs in the Kingstons and eight on Clark Mountain. In contrast, the Granite Mountains have more than 50 springs and seeps. The range also has one of the most diverse biotic environments in the desert. While the Kingstons and Clark also possess plant variety, neither have anything comparable to the Granite Mountains' proximity to the concentrated ricegrass growth on the Kelso Dunes. Coombs (1979:98, 104) identifies nine rockshelter sites and Neraas (1983:183-216) mentions an unspecified number of shelters and overhangs. The Granite Mountains, due to an extensive monzonite boulder field, have 74 rockshelters with cultural materials (44% of all sites). These observations are rather general and in order to achieve more meaningful correlations, much more sampling with a standard implementation needs to be accomplished in more extensive regions.

A second area of interest is the importance of upland resources. Despite surveying only four of the higher elevation basins, 23 sites were recorded in this area of the Granite Mountains. Whether this represents exploitation of some specific resource such as pine nuts, agave, or bighorn sheep or a prudent subsistence shift resulting from short-term drought conditions is not known. Based upon the surface presence of diagnostic projectile points, there does not seem to be any easily identifiable temporal period associated. Upland sites have been recorded in the New York Mountains, Kingston Range, Clark Mountain, and the Providence Range; however, the uplands have been under explored and would certainly warrant more concentrated attention by researchers. It would be assumed that the New York and Providence Mountains, and the Mid Hills, which connects the two ranges, with 36, 52, and 41 springs and seeps respectively (Hall 1981:70-193), and numerous granitic rockshelters, would offer a comparable physical environment to the Granite Mountains to test the degree of upland utilization by prehistoric people.

The last attribute of significance is rock art. The East Mojave has a plethora of rock art sites, particularly petroglyphs, but their distribution and density are anything but uniform. The sheer volume of rock art images is indicative that some areas were viewed as a source of power and supernatural significance. The ideological implications of this fact are interesting since they go beyond the processual insights of subsistence and settlement patterns. For example, the huge concentration of petroglyphs at Piute Creek (Dickey 1994:3-32), a spring with one of the highest volumes of flow in the entire region, would be expected given the repeated connection between springs and sites (Ritter and Coombs 1990:35). But at the same time the numerous and large rock art sites around the periphery of Lanfair Valley, the Baker lava beds, or in Woods Wash are more puzzling due to the paucity of water and food resources in their immediate area. This suggests that with rock art, the expediency of manufacturing petroglyphs and pictographs at a given moment and the significance of location within a landscape are more important considerations than subsistence and favorable environmental factors (Christensen 1993:27-63). The Granite Mountains with 59 sites and 2,352 elements underscores its importance as an elite location of ritual activity. The presence of at least three different styles, starting with the Western Archaic Tradition, also suggests that ceremonial endeavors by different cultures have occurred there for some time. The presence of “Grapevine Style” rock art in the Granite Mountains is consistent with its distribution in the East Mojave (Christensen and Dickey 2001:192-193) and indicates the Patayan use of the area. The minimal occurrence of sketched black pictographs attest to possible Chemehuevi occupation.

The purpose of publishing the descriptive results of this surface survey is twofold. First, by putting some data on one desert range out for review, we would hope it would encourage intensive surveys in other areas of the East Mojave in order to delineate regional differences and similarities. And secondly, survey logically points out the need for excavation. Chronological control and much more extensive data recovery can only be gained through excavation. As with most investigations, our work in the Granite Mountains has raised a multitude of unanswered questions about prehistoric arid land adaptations that awaits the attention of future researchers.

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Appendix A: Recorded Sites in the Granite Mountains and Adjacent Areas.

CA-SBR	Setting	Elevation	Environment	Descriptive Type	Functional Type
315	Open	1280	Bajada	Single Fea.	Food process.
352	RS	1280	Bajada	Multi Fea.	Base camp
418	Open	1190	Bajada	Multi Fea.	Base camp
543	RS	1170	Bajada	Multi Fea.	Temp. camp
544/H	RS	1220	Riparian	Multi Fea.	Base camp
547/H	RS	1310	Bajada	Multi Fea.	Base camp
1564	Open	900	Wash	Single Fea.	Rock art
1754/H	RS	1260	Bajada	Multi Fea.	Temp. camp
1755	Open	1140	Bajada	Single Fea.	Temp. camp
1756	Open	1010	Wash	Multi Fea.	Temp. camp
1757	Open	1000	Wash	Multi Fea.	Temp. camp
1758/H	RS	1240	Riparian	Multi Fea.	Base camp
1763/H	Open	1140	Wash	Multi Fea.	Temp. camp
1765	Open	1280	Wash	Single Fea.	Rock art
1766	RS	1300	Bajada	Artifact Scat.	Food cache
1805/H	Open	1200	Bajada	Multi Fea.	Temp. camp
1859	RS	900	Wash	Artifact Scat.	Transient camp
1860	Open	780	Wash	Multi Fea.	Rock art
1864	Open	1090	Wash	Single Fea.	Food process.
1868	RS	1040	Bajada	Multi Fea.	Temp. camp
1869	Open	1030	Wash	Multi Fea.	Temp. camp
1973/H	RS	1300	Bajada	Multi Fea.	Temp. camp
3041	RS	1130	Bajada	Multi Fea.	Temp. camp
3790	RS	1180	Bajada	Multi Fea.	Temp. camp
3792/H	RS	1340	Bajada	Multi Fea.	Temp. camp
3793	Open	1360	Riparian	Multi Fea.	Temp. camp
3800	Open	1150	Wash	Artifact Scat.	Lithic Prod.
4661/H	RS	1265	Bajada	Artifact Scat.	Transient camp
4663	RS	1280	Bajada	Single Fea.	Rock art
4914	RS	1210	Bajada	Multi Fea.	Base camp
4915	Open	1140	Bajada	Multi Fea.	Food process.
4919	Open	1060	Bajada	Artifact Scat.	Transient camp
5182	Open	720	Bajada	Single Fea.	Trail
5183	Open	690	Bajada	Single Fea.	Trail
5184	Open	670	Bajada	Single Fea.	Trail
5185	Open	680	Bajada	Single Fea.	Trail
5186	Open	680	Bajada	Single Fea.	Trail

Appendix A (con't). Recorded Sites in the Granite Mountains and Adjacent Areas.

CA-SBR	Setting	Elevation	Environment	Descriptive Type	Functional Type
5187	Open	670	Bajada	Single Fea.	Trail
5188	Open	735	Bajada	Single Fea.	Trail
5189	Open	680	Bajada	Single Fea.	Trail
5190	Open	680	Bajada	Single Fea.	Trail
5191	Open	620	Bajada	Single Fea.	Trail
5395	RS	1210	Bajada	Multi Fea.	Temp. camp
5396	RS	1200	Bajada	Multi Fea.	Temp. camp
5397	Open	1090	Wash	Artifact Scat.	Transient camp
5597	RS	1240	Bajada	Multi Fea.	Temp. camp
8247/H	RS	1170	Bajada	Multi Fea.	Temp. camp
8268	RS	1050	Bajada	Multi Fea.	Temp. camp
8269	RS	1100	Wash	Single Fea.	Rock art
8270/H	RS	1120	Wash	Single Fea.	Rock art
8271	RS	1100	Bajada	Multi Fea.	Temp. camp
8396	RS	1210	Bajada	Single Fea.	Rock art
8397	RS	1770	Upland	Multi Fea.	Temp. camp
8398	RS	1790	Upland	Single Fea.	Rock art
8399	RS	1780	Upland	Multi Fea.	Temp. camp
8400	RS	1240	Bajada	Single Fea.	Rock art
8401	Open	1340	Bajada	Multi Fea.	Temp. camp
8716	RS	1270	Upland	Single Fea.	Temp. camp
8717	Open	1300	Upland	Artifact Scat.	Lithic prod.
8719	Open	1150	Bajada	Multi Fea.	Food process.
8844	Open	1065	Bajada	Single Fea.	Lithic prod.
8845	RS	1300	Bajada	Single Fea.	Rock art
8988	RS	1050	Bajada	Multi Fea.	Temp. camp
8989	RS	1090	Wash	Multi Fea.	Temp. camp
8990	RS	990	Bajada	Multi Fea.	Temp. camp
8991	Open	1040	Wash	Multi Fea.	Temp. camp
8992	RS	1015	Wash	Artifact Scat.	Transient camp
8993	Open	995	Wash	Multi Fea.	Food process.
8994	RS	1050	Wash	Single Fea.	Food process.
8995	Open	950	Bajada	Single Fea.	Transient camp
8996	Open	680	Bajada	Multi Fea.	Lithic prod.
8997	Open	720	Bajada	Artifact Scat.	Lithic prod.
8998	Open	1160	Bajada	Single Fea.	Lithic prod.
8999	Open	750	Dune	Multi Fea.	Food process.

Appendix A (con't). Recorded Sites in the Granite Mountains and Adjacent Areas.

CA-SBR	Setting	Elevation	Environment	Descriptive Type	Functional Type
9310	Open	1300	Upland	Single Fea.	Temp. camp
9311	RS	1520	Upland	Single Fea.	Temp. camp
9313	RS	1420	Upland	Multi Fea.	Temp. camp
9314	RS	1440	Upland	Multi Fea.	Temp. camp
9315	RS	1450	Upland	Artifact Scat.	Transient camp
9316	RS	1330	Bajada	Multi Fea.	Temp. camp
9317	RS	1340	Upland	Single Fea.	Rock art
9318	Open	1360	Upland	Single Fea.	Temp. camp
9319/H	Open	1000	Bajada	Artifact Scat.	Transient camp
9320	RS	980	Bajada	Multi Fea.	Food process.
9321	RS	970	Bajada	Multi Fea.	Food cache
9322	Open	970	Bajada	Single Fea.	Food process.
9323	Open	1200	Bajada	Artifact Scat.	Food process.
9324	Open	1165	Bajada	Artifact Scat.	Food process.
9325	Open	820	Bajada	Multi Fea.	Food cache
9326	Open	820	Bajada	Multi Fea.	Base camp
9327	Open	820	Bajada	Single Fea.	Food process.
9328	RS	1120	Wash	Multi Fea.	Temp. camp
9329	RS	1190	Bajada	Single Fea.	Rock art
9330	RS	1180	Wash	Multi Fea.	Temp. camp
9331	Open	1130	Bajada	Single Fea.	Temp. camp
9332	RS	1120	Wash	Multi Fea.	Temp. camp
9333	Open	1140	Bajada	Multi Fea.	Temp. camp
9334	RS	1310	Bajada	Artifact Scat.	Food process.
9335	RS	1240	Bajada	Single Fea.	Rock art
9336	Open	1310	Wash	Multi Fea.	Temp. camp
9337	Open	1100	Bajada	Artifact Scat.	Transient camp
9338	Open	1220	Upland	Multi Fea.	Temp. camp
9339/H	Open	1300	Upland	Artifact Scat.	Temp. camp
9340	RS	1290	Upland	Artifact Scat.	Temp. camp
9341	Open	1310	Upland	Multi Fea.	Temp. camp
9342	RS	1300	Upland	Multi Fea.	Base camp
9343	Open	1410	Upland	Artifact Scat.	Food process.
9344	Open	1410	Upland	Artifact Scat.	Food process.
9345/H	Open	1150	Bajada	Single Fea.	Temp. camp
9346	RS	1160	Wash	Multi Fea.	Food process.
9347	Open	1100	Bajada	Single Fea.	Temp. camp

Appendix A (con't). Recorded Sites in the Granite Mountains and Adjacent Areas.

CA-SBR	Setting	Elevation	Environment	Descriptive Type	Functional Type
9400	Open	660	Dune	Artifact Scat.	Food process.
9519	Open	710	Dune	Artifact Scat.	Temp. camp
9520	Open	820	Wash	Multi Fea.	Temp. camp
9521/H	Open	950	Riparian	Multi Fea.	Temp. camp
9522/H	RS	990	Bajada	Single Fea.	Food process.
9523	Open	1010	Bajada	Artifact Scat.	Lithic prod.
9524	Open	1210	Bajada	Multi Fea.	Temp. camp
9525	Open	1450	Upland	Multi Fea.	Temp. camp
9526	Open	1260	Upland	Single Fea.	Temp. camp
9527	Open	1280	Upland	Multi Fea.	Temp. camp
9528	Open	920	Wash	Multi Fea.	Food process.
9529	RS	1440	Upland	Multi Fea.	Temp. camp
9530	RS	1580	Upland	Multi Fea.	Temp. camp
9531	RS	1340	Bajada	Artifact Scat.	Food cache
9532	Open	1200	Bajada	Artifact Scat.	Food process.
9533/H	Open	1190	Bajada	Artifact Scat.	Transient camp
9534	Open	1260	Bajada	Artifact Scat.	Food process.
9535	Open	870	Bajada	Single Fea.	Lithic prod.
9536	RS	1200	Bajada	Single Fea.	Rock art
9538	Open	1185	Bajada	Multi Fea.	Food process.
9539	Open	1190	Bajada	Multi Fea.	Transient camp
9540	Open	1210	Bajada	Artifact Scat.	Food process.
9541/H	RS	1235	Bajada	Single Fea.	Food cache
9542	RS	1210	Bajada	Multi Fea.	Temp. camp
9543	RS	1210	Bajada	Single Fea.	Rock art
9544	RS	1210	Bajada	Single Fea.	Temp. camp
9545	RS	1200	Bajada	Artifact Scat.	Temp. camp
9546	Open	1200	Bajada	Multi Fea.	Temp. camp
9547	RS	1200	Bajada	Single Fea.	Temp. camp
9548	Open	1180	Bajada	Single Fea.	Transient camp
9549	RS	1185	Bajada	Multi Fea.	Base Camp
9550	RS	1190	Bajada	Multi Fea.	Temp. camp
9551	RS	1200	Bajada	Artifact Scat.	Food process.
9552	RS	1200	Bajada	Artifact Scat.	Food process.
9553	RS	1210	Bajada	Single Fea.	Transient camp
9554	Open	1190	Bajada	Multi Fea.	Temp. camp
9555	RS	1200	Bajada	Multi Fea.	Temp. camp

Appendix A (con't). Recorded Sites in the Granite Mountains and Adjacent Areas.

CA-SBR	Setting	Elevation	Environment	Descriptive Type	Functional Type
9556	RS	1200	Bajada	Artifact Scat.	Transient camp
9557	Open	1200	Bajada	Artifact Scat.	Transient camp
9558	Open	1185	Bajada	Multi Fea.	Temp. camp
9559	RS	1210	Bajada	Single Fea.	Temp. camp
9560	Open	1180	Bajada	Multi Fea.	Temp. camp
9561	Open	1180	Bajada	Artifact Scat.	Food process.
9562	RS	1140	Bajada	Multi Fea.	Temp. camp
9563/H	Open	1190	Bajada	Single Fea.	Food process.
9815	Open	790	Dune	Multi Fea.	Temp. camp
9816/H	Open	1155	Bajada	Single Fea.	Rock art
9817	Open	910	Bajada	Single Fea.	Rock art
9818	Open	1670	Upland	Single Fea.	Temp. camp
9819	RS	1740	Upland	Multi Fea.	Temp. camp
9820	Open	1680	Upland	Single Fea.	Temp. camp
9821	RS	1760	Upland	Single Fea.	Temp. camp
9822	RS	1810	Upland	Multi Fea.	Temp. camp
9823/H	Open	1790	Upland	Single Fea.	Temp. camp
9824	Open	1760	Upland	Single Fea.	Temp. camp
9825	Open	1350	Upland	Single Fea.	Temp. camp
9826/H	RS	1350	Upland	Multi Fea.	Temp. camp
9827/H	RS	1365	Upland	Multi Fea.	Temp. camp
9941	Open	740	Bajada	Multi Fea.	Rock alignment