

# Chasing Ghosts? Rethinking the Prehistory of the Late Holocene Mojave Desert

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## Abstract

It is commonly assumed that people lived year round in the Mojave Desert over most of the Holocene, apart from the time between 5,000 and 4,000 BP when it is believed the desert was largely abandoned. Research into Late Holocene adaptations in the Mojave Desert invariably model settlement and subsistence systems to include the presence of permanent or semi-permanent villages or base camps, even though such sites have never been definitively identified. An examination of the Mojave Desert data unencumbered by the premise of permanent villages/base camps suggests that none were present, that during the Late Holocene, the bulk of the Mojave Desert was effectively a large common pool resource zone wherein a large number of resource patches were utilized by upland- or river-oriented groups living along the edges of the desert. This new model is presented herein.

## Introduction

Researchers investigating the prehistory of the Mojave Desert have developed a long line of models, sequences, and chronologies to organize and understand the known and anticipated archaeological record of the region (Rogers 1931, 1939, 1945, 1966; Wallace 1962; Davis 1969, 1970, 1974, 1976, 1978; Moratto 1984; Warren 1984, 1994; Warren and Crabtree 1986; Basgall 1993, 2007a, 2007b; Sutton 1996, 2013, 2016a, 2017; Sutton et al. 2007). While the details of these various schemes (the most recent Late Holocene sequence is shown in Table 1) differ, often in significant ways, all have included the basic premise that people lived year round in the Mojave Desert throughout most of prehistory, although the possibility of abandonment for extended periods has been noted (e.g., Sutton et al. 2007:232). Specifically, it is generally believed that the Mojave Desert was largely abandoned between about

5,000 and 4,000 BP due to unfavorable environmental conditions (e.g., Rhode 2001; Wigand and Rhode 2002; Sutton et al. 2007:241, 2016a, 2017; also see Basgall et al. 1988; McGuire and Hall 1988; Basgall and Hall 1992, 1993; Cleland and Spaulding 1992, 1993; Allen 2004). It is further thought that once environmental conditions improved at the beginning of the Late Holocene, the Mojave Desert was reoccupied, this time by Gypsum groups who lived there throughout the year (Warren 1984; Sutton et al. 2007).

Scholars working on Late Holocene Mojave Desert prehistory consistently model settlement systems that include permanent residential sites (villages or base camps; “the hub of all subsistence activities” [Binford 1980:9]). Thus, such sites are generally seen as a permanent habitation localities, hubs, generally occupied year-round and from which logistical trips originate. For the purposes of this paper, a village is defined as a “large” site with a “substantial” midden containing architecture, evidence of men, women, and children, evidence of ritual activities, an associated cemetery, and evidence of occupation during all four seasons.

A prime example of such a village in the Mojave is the Cottonwood Creek site (CA-KER-303), located in the far western Mojave Desert. This site is quite large (ca. several acres), has a midden in excess of 2 m deep, a cemetery within it, and is dated between 3,000 and 300 BP (Sutton 1988a). An approximately 2.5 percent sample was excavated between 1972 and 1978, and dozens of features were found, including three structures

Table 1. The Current Late Holocene Cultural Chronology from the Mojave Desert.

Cultural Complex	General Dating	Marker Traits
Late Prehistoric	ca. 900 BP–contact	Cottonwood Triangular and Desert Side-notched points, pottery, decrease in the use of obsidian
Rose Spring	ca. 1800–900 BP	Rose Spring and Eastgate series points (bow and arrow), extensive use of obsidian, considerable milling equipment, major increase in site numbers, large settlements at some springs
Gypsum	ca. 4000–1800 BP	Gypsum and Elko series points, preference for cryptocrystalline tool stone, sites smaller and in a greater variety of locations, evidence of ritual activities

Note: Adapted from Sutton et al. (2007:Table 15.1).

(Sutton and Robinson 1982). Also recovered were literally hundreds of thousands of artifacts of various types, including some 55,000 *Olivella* beads (Harvey 1999; also see Sutton 1988a), and large quantities of faunal and botanical remains. Although little analysis of these materials has been completed, there seems little doubt that the site was a large and permanent village. Other such village sites, although perhaps less complex, are known along the fringe of the southwestern Mojave Desert (Sutton 2016b) and into the San Bernardino Mountains (e.g., CA-SBR-1913) (Sutton and Schneider 1996).

A permanent occupation of any given area would not inevitably necessitate a major village. Such a permanent occupation could manifest itself in a series of base camps linked together in a seasonal round. However, the cumulative attributes of such a grouping of base camps in a single system should exhibit the same basic attributes as major villages, particularly in having evidence of men, women, and children and mortuary remains in at least some of the sites. The presence of midden deposits, even large and relatively deep ones, do not alone demonstrate any permanent or semi-permanent occupation of an area since such site attributes can be the result of numerous visits by seasonal task groups.

Perhaps an example of this general type of permanent multisite occupational structure is that of Koso people from the village of Mita'ta (Coso Hot Springs) in the Coso Mountains along the northwestern fringe of the Mojave Desert (as described by Steward [1938]). In

the winter, people lived in pit houses at the village, ate stored seeds, and hunted rabbits. In April, some families moved to Hugwata (either upper and/or lower Haiwee Springs, located several miles to the north of Coso Hot Springs), where they ate stored seeds and gathered greens. These people usually went to Üyuwum'ba (cf. Cold Spring, aka Cole Spring) in June. In May some people went to Owens Lake for larvae (Steward 1938:73), notably brine fly (cf. *Ephydra* sp.) larvae and pupae (see Sutton 1988b:47–48).

In the early summer some families joined together (possibly with some Tübatulabal people from the southern Sierra Nevada) for a communal pronghorn hunt, either in the Indian Wells Valley or southern Owens Valley (Steward 1938:81–82). The hunt involved men driving the animals into a corral trap (without wings), where they were shot by archers (Steward 1938:82). In mid-summer some families would go to Saline Valley, or sometimes to Death Valley, to gather mesquite (Steward 1938:82). In late summer between July and September, most families would go the Coso Range to gather and store seeds (Steward 1938:82).

In early fall, September or October, families not already there would go to the Coso Range to gather pinyon, perhaps joined by people from Üyuwum'ba, and might winter there if the crop was good. If the crop was poor, they might go to the Panamint Mountains for pinyon (Steward 1938:82). In the fall some families went to Owens Lake to hunt ducks (Steward

1938:82). Large communal rabbit drives were held in the fall and were conducted in Rose Valley, Darwin Wash, the area around Cold Spring, Little Lake, and Olancho (Steward 1938:82–83). In the winter people returned to the village at Coso Hot Springs.

The above account illustrates a flexible settlement system that involved a central village and a series of seasonal camps, camps that archaeologists would probably see as base camps, a few of which were occupied for extended periods during the year. Interestingly, Steward's account does not mention the Koso using the Mojave Desert to the south of the Cosos, although pronghorn might sometimes be hunted in the Indian Wells Valley. Apparently, the ethnohistoric Koso made little use of the Mojave Desert proper.

Another example of the ethnographic use of the Mojave was provided by William McHaney, a Euroamerican who in the 1880s had spent time traveling with the Serrano as they hunted and gathered in the desert north of Twentynine Palms (Walker 1931). Based on the information obtained from McHaney, Walker (1931:11–20) presented a variety of data, such as that while the Serrano knew all the springs and waterholes, they also constructed “gravel-covered reservoirs,” or “blind tanks” (Walker 1931:12), also called “sand cisterns” (Steward 1929:94). A list of resources used by the Serrano was also provided by Walker (1931:14–16). McHaney reported that the Serrano moved around to exploit mesquite, pinyon, ducks, and mountain sheep, leaving their belongings at a camp to use upon their return (Walker 1931:15). Camps were of varying sizes, with small ones occupied by single families, although there were a few large ones with middens and many broken milling tools. Camps were generally located near springs or “covered water-holes” in the mesquite and dunes along the shores of dry lakes and “frequently in the more mountainous sections close to jumbles of boulders” (Walker 1931:14–18). Trails connected all the spots, and trail markers were used. Some rock art was identified, including petroglyphs

and pictographs in red, black, and white (Walker 1931:18; also see Steward 1929:93–94). Although not explicitly stated by McHaney, the use of the described area by the Serrano was seasonal, with their primary villages located in the San Bernardino Mountains.

Of note is that Late Holocene base camps have never been firmly identified within the Mojave Desert proper (the very late Mojave River area being an exception). While this issue has been acknowledged, it has not deterred the continued use of the “base camp” premise. Even in those cases where a highly mobile population is envisioned, those settlement systems are still modeled as being contained within the desert (e.g., Basgall et al. 1998:317).

An additional issue in the continuing attempts to model Late Holocene settlement and subsistence systems is the second premise that Gypsum and Rose Spring represent cultural entities and so would have their own settlement systems. Both Gypsum and Rose Spring are characterized largely by their projectile points and are typically viewed as representing time periods (e.g., Warren 1984; Sutton 1996). However, inherent in the definition of these time periods is the assumption that a specific cultural system was in operation during those times. Following this logic, the Gypsum and Rose Spring periods were “elevated” to cultural complexes by Sutton et al. (2007). The Late Prehistoric archaeological materials are assumed to be the ancestors of the Mojave Desert ethnographic groups whose settlement patterns are projected across the entire desert.

A reexamination of the evidence unfettered by the premise of year-round residence by Late Holocene groups inspires a very different model. Here, it is proposed that the bulk of the Mojave Desert was used on an opportunistic and ephemeral basis by the various groups living along the edges of the desert, in effect, constituting a single large common pool resource zone (e.g., Eerkens 1999; also see Byrd 2010). Thus, the territories of the various Late Holocene Mojave Desert

groups would have been “centered” in the upland or Colorado River “edges” of the desert while their desert territories were secondary and overlapping. This same pattern of frequent but ephemeral use of the desert interior by small groups was still in operation during ethnographic times in the Mojave Desert and suggests that “desert” groups such as the Desert Mojave and Desert Kawaiisu might be artifacts of postcontact situations and/or anthropologists’ biases rather than actual aboriginal sociopolitical situations.

To be sure, the Vanyumé did live year round along the Mojave River (Sutton and Earle 2017), but apparently only after about 1,000 BP (e.g., Sutton 2009). In addition, it seems clear that there were occasional long-term residential bases at specific localities (e.g., the Cronese Basin) (Drover 1979; Schneider 1994) as conditions warranted, but such settlements were generally late and not permanent.

In addition, it is argued here (contra Sutton et al. 2007) that Gypsum and Rose Spring are not cultural complexes at all, but simply reflect the diffusion of new technologies and other traits into the Mojave Desert at different times, first an adoption of Elko points by existing populations ca. 4,000 BP and later the adoption of the bow and arrow using Rose Spring and Eastgate points after about 1,800 BP (e.g., Yohe 1992, 1998). These technologies would have been embraced by the various groups inhabiting the edges of the Mojave Desert and by other groups in western North America; thus, while Elko and Rose Spring points still serve as temporal markers, they are not cultural markers. Demoting the Gypsum and Rose Spring complexes simply to distinct technologies essentially returns them to their original meanings but better fits the data. By the Late Prehistoric, the apparent ancestors of the ethnographic groups were using the desert in much the same way as proposed herein for the Gypsum and Rose Spring entities.

By dropping the notion that Gypsum and Rose Spring were cultural entities with their own settlement and

subsistence systems that included some sort of year-round residence in the Mojave Desert, the archaeological record can be reinterpreted in a very different manner. As such, a new model of Late Holocene settlement and subsistence is warranted and presented below.

### **The Mojave Desert**

Covering much of southeastern California, the Mojave Desert (Figure 1) also extends into portions of Arizona and Nevada and covers some 25,000 square miles. It is classified as a warm temperature desert (Jaeger 1965; Rowlands et al. 1982), and the Joshua tree (*Yucca brevifolia*) is the standard vegetative marker. Elevations are generally between 610 m and 1,520 m (2,000 ft and 5,000 ft) with the highest point being Charleston Peak (3,633 m [11,918 ft]) and the lowest being in Death Valley at 86 m (282 ft) below sea level. Temperatures range from below freezing in the winter to more than 130 degrees F (54 degrees C) in the summer.

The Mojave Desert encompasses numerous major biotic communities containing a multitude of species utilized by Native peoples (e.g., Barrows 1900; Mason 1957; Bean and Saubel 1972; Bean and Vane 1972; Zigmond 1981; Ebeling 1986; Sutton 1988b). Keeler-Wolf (2007: Table 22.2) described 17 major vegetation types within the Mojave Desert in five major geographic zones: (1) lower basins and playas; (2) desert riparian; (3) bajadas, hills, and washes; (4) upper bajadas and mountain slopes; and (5) uplands.

#### ***Lower Basins and Playas***

These areas typically contain alkali sink and mesquite communities. Vegetation includes iodinebush (*Allenrolfea occidentalis*), saltbush (*Atriplex* spp.), saltgrass (*Distichlis spicata*), bugseed (*Dicoria canescens*), and mesquite (*Prosopis* spp.). An alkaline marsh would form along playa margins in years with substantial

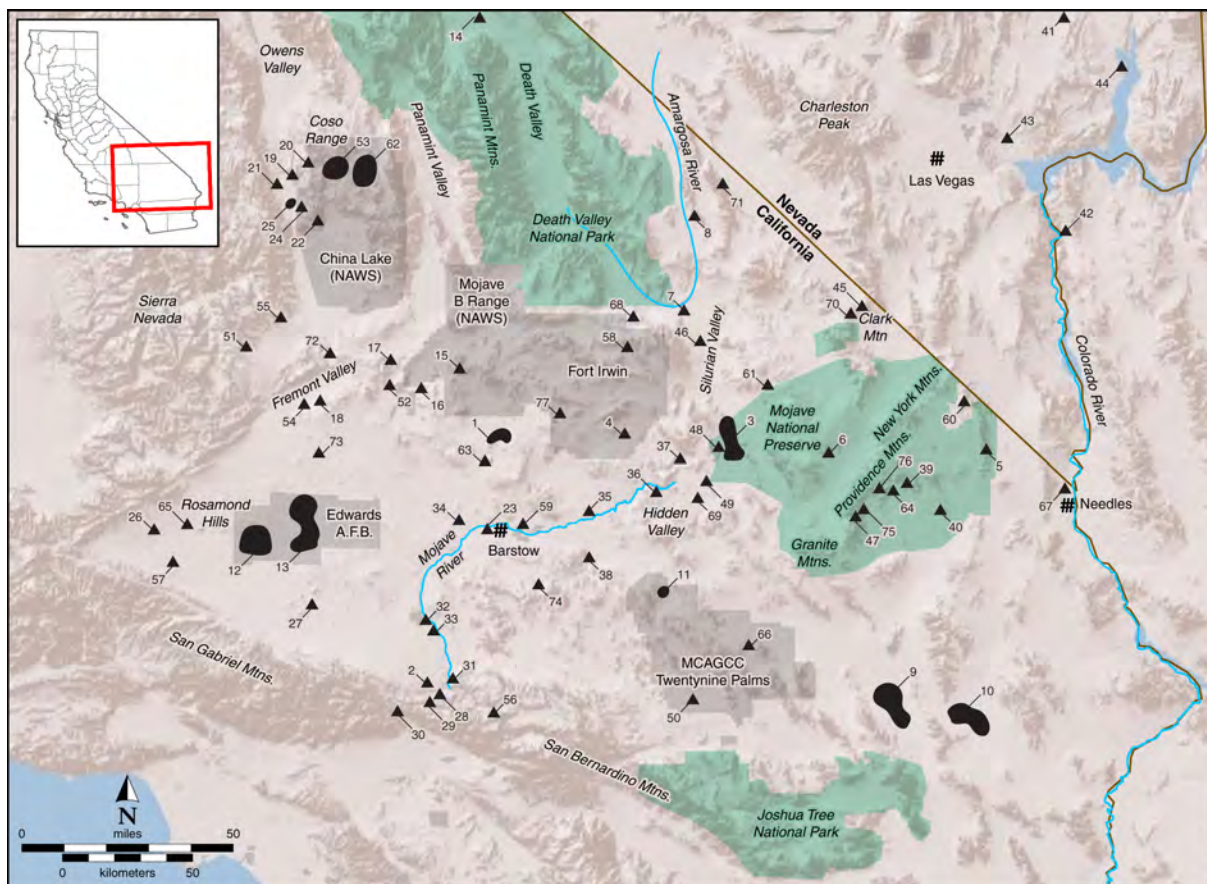


Figure 1. General map of the Mojave Desert, showing major physiographic features and sites noted in the text. Geographic Places: 1. Superior Lake, 2. Juniper Flat, 3. Soda Lake, 4. Bitter Spring, 5. Piute Spring, 6. Marl Spring, 7. Saratoga Spring, 8. Tecopa Hot Spring, 9. Cadiz Lake, 10. Danby Lake, 11. Lavic Lake, 12. Rosamond Lake, 13. Rogers Lake. Archaeological Sites and Localities: 14. Mesquite Flat, 15. Seep Spring (CA-SBR-51), 16. Blackwater Well (CA-SBR-2322/H), 17. Bedrock Spring (CA-SBR-1197), 18. Koehn Lake (CA-KER-875), 19. Rose Spring (CA-INY-372), 20. Ayers Rock (CA-INY-134), 21. Coso Junction Ranch (CA-INY-2284), 22. Mita'a (CA-INY-475/H), 23. Lenwood (CA-SBR-1549), 24. Pagunda (CA-INY-3826), 25. Little Lake, 26. Cottonwood Creek (CA-KER-303), 27. Lovejoy Springs (CA-LAN-192), 28. Siphon (CA-SBR-6580 and -7691), 29. Muscupiabit (CA-SBR-425/H), 30. Guapiabit (CA-SBR-1913), 31. Deep Creek (CA-SBR-176), 32. Turner Ranch (CA-SBR-66/182), 33. Oro Grande (CA-SBR-72), 34. Hinkley (CA-SBR-189), 35. Harvard Hill (CA-SBR-11787), 36. Afton Canyon (CA-SBR-85), 37. Cronese Lake sites (CA-SBR-259, -260, -128, -6017, -6018, and -4198), 38. Newberry Cave (CA-SBR-199), 39. Rustler Rockshelter (CA-SBR-288), 40. Vontrigger Spring (CA-SBR-413), 41. Stuart Rockshelter, 42. Willow Beach, 43. Gypsum Cave, 44. Atlatl Rockshelter, 45. Clark Mountain (CA-SBR-4889), 46. Salt Spring (CA-SBR-8466), 47. Mitchell Caverns (CA-SBR-117), 48. Soda Springs Rockshelter (CA-SBR-363b), 49. Mojave Delta (CA-SBR-1989), 50. Surprise Spring (CA-SBR-424/H), 51. Sage Canyon, 52. Red Mountain, 53. Coso Volcanic Field (CVF), 54. Cantil (CA-KER-2211), 55. Freeman Spring (CA-KER-6106), 56. Rock Camp, 57. Fairmont Butte (CA-LAN-898), 58. Fort Irwin Quarry (CA-SBR-4522), 59. Elephant Mountain Metate Quarry, 60. Castle Mountain Metate Quarry (CA-SBR-5932), 61. Halloran Springs mines (CA-SBR-130, -131), 62. Coso Rock Art District, 63. Black Canyon, 64. Council Rocks (CA-SBR-291), 65. Eggshell Cave (CA-KER-341), 66. Foxtrot (CA-SBR-161, -9565), 67. Topock Maze, 68. Denning Spring (CA-SBR-3829), 69. CA-SBR-221 (cairn complex), 70. CA-SBR-798 and -806 (ring middens), 71. Nopah Cave (CA-INY-2535), 72. Bickel (CA-KER-250) and Last Chance (CA-KER-261), 73. California City Cave (CA-KER-517), 74. Ord Shelter (CA-SBR-2846), 75. Cave No. 5, 76. Southcott Cave (CA-SBR-334), 77. CA-SBR-6400.

lake stands and would probably have supported a number of plants, such as tules (*Scirpus* sp.), cattail (*Typha* sp.), and rushes (*Phragmites* sp.).

### ***Desert Riparian***

Desert riparian plant communities are present in the Mojave River and some of its tributary washes. Some sections of the Mojave River carried surface water year-round, although its flow varied by season, and in many places it was not available on the surface. In those places where geological conditions forced the river's flow to the surface, extensive areas of riparian vegetation were often present.

This riverine riparian environment contained a large number of plant species, including salt grass (*Distichlis spicata*), cattail (*Typha* spp.), bulrush (*Scirpus acutus*), rushes (*Juncus* spp.), Frémont cottonwood (*Populus fremontii*), a variety of willows (*Salix* spp.), giant reed (*Arundo donax*), arrowweed (*Pluchea sericea*), wild grape (*Vitis* sp.), Carrizo grass (*Phragmites australis*), honey mesquite (*Prosopis glandulosa*) and screwbean (*P. pubescens*).

### ***Bajadas, Hills, and Washes***

Perhaps the most extensive biotic community in the bajadas, hills, and washes is the creosote bush scrub community (Munz 1974; Vasek and Barbour 1977; Rowlands et al. 1982; MacMahon 1985; Keeler-Wolf 2007). The dominant plants in this community are the creosote bush (*Larrea tridentata*) and burrobrush (*Ambrosia dumosa*), while other plants can include saltbush (*Atriplex* spp.), rabbitbrush (*Chrysothamnus* spp.), sagebrush (*Artemisia* spp.), greasewood (*Sarcobatus vermiculatus*), cholla (*Cylindropuntia* spp.), Anderson lycium (*Lycium andersonii*), brittlebush (*Encelia farinosa*), tobacco (*Nicotiana obtusifolia*), and Mormon tea (*Ephedra nevadensis*). Wash communities could also contain catclaw (*Acacia greggii*), desert willow (*Chilopsis linearis*), and mesquite (*Prosopis* spp.).

### ***Upper Bajadas and Mountain Slopes***

Plants in this general community consist of Joshua trees (*Yucca brevifolia*), other yuccas (*Y. schidigera* and *Y. baccata*), juniper (*Juniperus californicus*), Muller oak (*Quercus cornelius-mulleri*), sage (*Salvia* spp.), cholla (*Cylindropuntia* spp.), buckwheat (*Eriogonum* spp.), catclaw (*Acacia greggii*), brittlebush (*Encelia farinosa*), sagebrush (*Artemisia* spp.), amaranth (*Amaranthus* spp.), and desert almond (*Prunus fasciculata*).

### ***Uplands***

Some of the higher mountains (above ca. 915 m to 1,220 m) retain sufficient moisture to support a pinyon-juniper woodland. Major plants include pinyon (*Pinus monophylla*), juniper (*Juniperus californicus*), yucca (*Yucca baccata*), antelope brush (*Purshia glandulosa*), Mormon tea (*Ephedra* spp.), cholla (*Opuntia erinacea*), sagebrush (*Artemisia* sp.) and various annuals (e.g., *Astragalus*, *Cryptantha*, *Gilia*, *Mentzelia*, and *Phacelia*). Such communities are present in the Panamint, Providence, New York, Charleston, and Clark mountains.

### ***Fauna***

The fauna of the Mojave Desert includes mammals, reptiles, birds, and insects. Most desert mammals are small rodents (Hall and Kelson 1959; Jaeger 1965; Jameson and Peeters 1988), the most prominent of which are kangaroo rats (*Dipodomys* spp.), desert woodrats (*Neotoma* spp.), and antelope ground squirrels (*Ammospermophilus leucurus*). Medium-sized mammals consist of black-tailed hares (or jackrabbits; *Lepus californicus*), cottontail rabbits (*Sylvilagus audubonii*), coyotes (*Canis latrans*), spotted skunks (*Spilogale putorius*), gray foxes (*Urocyon cinereoargenteus*), kit foxes (*Vulpes macrotis*), bobcats (*Lynx rufus*), and several species of bats (cf. *Chiroptera* spp.). Large mammals in the region include pronghorn

(*Antilocapra americana*), mule deer (*Odocoileus hemionus*), and bighorn sheep (*Ovis canadensis*) (Zevloff 1985:349).

A large variety of reptiles also reside in the area (Stebbins 1966; MacMahon 1985:59–60), most notably the desert tortoise (*Gopherus agassizii*). In addition, there are numerous lizards, including chuckwallas (*Sauromalus ater*), zebra-tailed lizards (*Callisaurus draconoides*), desert iguanas (*Dipsosaurus dorsalis*), horned lizards (*Phrynosoma platyrhinos*), and whiptail lizards (*Cnemidophorus* sp.). Finally, a number of snakes are present, including rattlesnakes (cf. *Crotalus* sp.), gopher snakes (*Pituophis* sp.), and kingsnakes (*Lampropeltis* sp.).

The many types of birds present include numerous passerine species. Raptors include hawks (cf. *Buteo* sp.), prairie falcons (*Falco mexicanus*), and golden eagles (*Aquila chrysaetos*). Ravens (*Corvus corax*), Gambel's quail (*Callipepla gambelii*), roadrunners (*Geococcyx californianus*), and owls (various genera) are also present in the region. Waterfowl (such as *Anas* spp.) have been observed in recent times.

A large number of invertebrates, mostly insects, inhabit the region. Many insects were used as food by Native peoples (Sutton 1988b), while other insect products (e.g., lac resin) were used in technology (Sutton 1990a; Stacey et al. 1995, 1998).

### **Resource Patches**

As is apparent from the brief discussion above, the Mojave Desert contains a large number of ecozones and habitats of various sizes that would have contained many resources of economic (food, medicine, raw materials) and ritual value. The distribution and diversity of ecozones would have created thousands of mostly small biotic resource patches across the desert, each with its own characteristics of resource content, intensity, timing, and duration (Table 2). In

addition, many abiotic patches, based on geology and geography, were also present. Some of these patches, such as areas where workable stone was present, were permanent, static, and available at any time of the year. Other patches, such as a field of seed plants that sprouted due to a thunderstorm, were ephemeral in both time and space. Resource patch monitoring must have been an integral aspect of groups utilizing the Mojave Desert.

The decision of a group whether to travel to and use a particular patch would have depended on the nature and content of the patch, as each would theoretically contain multiple resources. This would have necessitated a determination of the value of one patch over another, as in a patch choice optimal foraging model (see Pyke et al. 1977; Smith 1983; Ritchie 1998). The central key to the decision of which biotic patch to use is information regarding its condition, information gained primarily through resource monitoring (Pyke et al. 1977:144). Abiotic resource patches, which are typically not considered in patch-choice models, would not generally require monitoring.

### **Late Pleistocene to Middle Holocene Mojave Desert Prehistory**

General summaries of the prehistory of the Mojave Desert have been presented by Warren (1984), Warren and Crabtree (1986), Sutton (1988a, 1996), and Sutton et al. (2007). Sutton et al. (2007) introduced a revised chronology for the overall Mojave Desert that distinguished between periods and complexes, with periods representing a span of time that may contain multiple cultural adaptations and with complexes representing specific archaeological cultural entities within each period. Sutton et al. (2007:Table 15.4) proposed seven broad cultural complexes spanning the Late Pleistocene through the Holocene; Paleoindian, Lake Mojave, Pinto, Deadman Lake, Gypsum, Rose Spring, and Late Prehistoric. The delineation of these complexes was intended to replace the common use of

Table 2. General Resource Patches and Archaeological Expectations in the Greater Mojave Common Pool Resource Zone.

Patch Type	Site Type	Social Unit	Predictability	Frequency	Examples
<b>Perpetual Resource Patches</b>					
perennial springs	large seasonal sites with midden and domestic refuse, use of nearby resource patches	task groups to several families	very good	uncommon	Surprise Spring, Newberry Spring, Salt Spring, Soda Spring
abiotic raw materials	extraction localities (quarries and mines) and associated short-term camps and reduction localities (small to large lithic scatters, individual reduction events, often merged together)	task groups	excellent	common	Coso obsidian source, pavement quarries, Elephant Mountain metate quarry, turquoise mines, salt mines, clay mines
ritual places	small to large temporary camps reoccupied over time, some single use places	variable	excellent	uncommon	rock art sites (Coso, Black Canyon, Foxtrot), geoglyphs, Seep Spring, Counsel Rocks, Eggshell Cave
<b>Recurring Resource Patches</b>					
abundant seasonal biotic resources (e.g., pinyon, mesquite, and yucca)	large seasonal sites with midden and domestic refuse	families	excellent	uncommon	sites around Rosamond and Rogers Lake, yucca ovens
limited seasonal biotic resources (e.g., small seeds)	small to large seasonally reoccupied sites with milling equipment, lithic debris	task groups	good	very common	many examples
large game hunting	wing traps, cairn complexes, associated small camps	male task groups	moderate	common	no examples of traps but probably many hunting camps
small animal procurement	day spot, small lithic scatters, trap features, processing localities	families	fair	very common	Bickel and Last Chance sites
biotic raw materials (e.g., basketry materials, medicinal plants, tobacco)	day spot, few remains	female task groups	good	common	difficult to recognize, no reported examples
storage	caches of equipment, supplies, and resources stored in sheltered localities, probably associated with resource patches	task groups	good	probably common	Ord Shelter, Mitchell Caverns
<b>Transitory Resource Patches</b>					
short-term biotic resources (e.g., unexpected stands of small seed plants)	small temporary sites with milling equipment, lithic debris	task groups	poor	very common	few such specifically recognized sites
temporary horticultural plots	modified landscape and associated small camp	families	poor	very rare	difficult to recognize, no reported examples
<b>Long-Term Resource Patch Exceptions</b>					
infrequent but long-term biotic resource localities (e.g., multi-year lake stands)	long-term habitation sites with midden and domestic refuse	families	initially poor, then excellent	rare	Cronese lakes
<b>Ancillary Places</b>					
travel routes	trails, cairns, circles, shrines, small overnight camps	task groups	excellent	common	Mojave Trail, trails to permanent resource localities, everyday trails
opportunistic resource patches	small lithic scatters, material prospects, single event hunting sites, isolated hearths	individuals	poor	probably common	few such specifically recognized sites
resource monitoring	small camps, often associated with other activities	generally task groups	poor	probably common	few such specifically recognized sites



temporal periods with units of archaeological culture and to move away from the application of environmental regimes as the defining criteria of past cultural systems.

Most recently, a new model of Late Pleistocene through Middle Holocene Mojave Desert prehistory was presented (Sutton 2016a, 2017). In this model a new tradition, Mojavean, was proposed and seen as a single cultural entity consisting of several patterns and phases identified by adaptational responses (tactical adjustments) to changing environmental conditions. Three patterns with phases within the Mojavean Tradition were proposed—Lakebed (I and II), Lake Mojave (I and II), and Pinto (I, II, and III). The patterns and phases of the Mojavean Tradition are bound together by continuities and overlaps in technology, an evolving use of the same landscapes through time, overlapping and related subsistence systems, and a continuing focus on artiodactyls (e.g., Warren 1986, 1991, 2002, 2010).

The overall adaptive systems of the Lakebed, Lake Mojave, and Pinto patterns would have been similar in strategy but would have differed in tactics. The tactical inventory (e.g., Sutton 2000) of the various patterns and phases would have expanded and contracted as people made decisions regarding cultural adjustments to environmental conditions. Thus, each phase is defined by a suite of tactics (including material culture traits), some of which would have overlapped with those of other phases. As conditions changed, some tactics were dropped and others added in a constantly dynamic series of adjustments to increasing aridity, from Lakebed to Lake Mojave to Pinto. Sutton (2016a, 2017) proposed that Pinto III people, faced with deteriorating environmental conditions, generally abandoned the Mojave Desert and moved into its upland edges. The proposed Mojavean Tradition ended with Pinto III ca. 5,000 years ago. It has always been the premise that these early groups were permanent residents of the desert, a pattern projected into the Late Holocene

as well. The assumption that these early groups lived year round in the desert is accepted herein, an important starting point to understand the divergence of the archaeological record of the Late Holocene.

### **Late Holocene Mojave Desert Prehistory**

The most recent general treatment of Late Holocene Mojave Desert prehistory was that of Sutton et al. (2007; following Warren [1984] and others), who proposed the existence of several cultural complexes. It was argued that while the Mojave Desert had been abandoned by about 5,000 BP, conditions had improved such that by about 4,000 BP (e.g., Rhode 2001; Wigand and Rhode 2002), Gypsum complex people had moved into the Mojave Desert and established permanent residential bases, followed similarly by peoples of the Rose Spring and Late Prehistoric complexes.

#### *The Gypsum Complex*

It has been suggested that the Gypsum complex appeared in the Mojave Desert about 4,000 BP and persisted until replaced by the Rose Spring complex at about 1,800 BP (e.g., Sutton et al. 2007:241). Characterized by a variety of projectile point forms (including Elko and Gypsum series points), Gypsum artifact assemblages also contained quartz crystals, paint, and rock art, all considered evidence of ritual activities (e.g., Davis and Smith 1981; Warren and Crabtree 1986). Other artifacts included numerous bifaces and grinding implements.

The Gypsum complex was thought to have begun when environmental conditions improved (somewhat wetter and cooler) from the Middle Holocene. Sutton et al. (2007:241) suggested that settlement and subsistence was probably focused near springs and streams and that there was an increase in trade and social complexity in the early part of this complex. The lack of major Gypsum sites was believed to relate to the ephemeral nature of Gypsum settlement.

### ***The Rose Spring Complex***

Around 1,800 BP, Rose Spring and Eastgate points appeared, likely reflecting the introduction of the bow and arrow into the Mojave Desert from the north (e.g., Yohe 1992, 1998), presumably replacing the atlatl/dart technology of the Gypsum complex. This new cultural complex has been referred to as Rose Spring. Other hallmarks of this complex, at least in the western Mojave Desert, include a considerable increase in the number of sites (viewed as evidence for a population increase), the appearance of well-developed middens, and dramatic changes in artifact assemblages (e.g., Sutton 1988a, 1996; Gardner 2002, 2007; Faull 2007). Other than the signature projectile points, common artifacts of the Rose Spring complex include stone knives and drills, stone pipes, bone awls, various milling implements, marine shell ornaments, and the substantial use of obsidian (Sutton 1996; Warren and Crabtree 1986). Rose Spring sites have been found near springs, washes, and along lakeshores. The presence of wickiups, pit houses, and other types of structures at some sites suggests intensive habitation. The Rose Spring complex was thought to persist until about 900 BP.

During the latter portion of the Rose Spring complex, and lasting well into the Late Prehistoric, a period of drought, known as the Medieval Climatic Anomaly (MCA), occurred and is generally dated between about 1,200 and 650 BP (e.g., Lamb 1965; see also Jones et al. 1999; Gardner 2007). The timing and intensity of climate change during the MCA varied regionally, although the warmest phases appear to have taken place during the mid-twelfth century (Anderson and Smith 1991:40; Graumlich 1993:253). Extended droughts attributable to the MCA were interspersed with brief periods of climatic amelioration (Graumlich 1993:254).

### ***Late Prehistoric Complexes***

Beginning about 900 BP and ending at historic contact, a time known as the Late Prehistoric, the number

of sites decreased, and it seems that populations declined. These Late Prehistoric complexes were thought to reflect the ancestors of the ethnographic groups of the Mojave Desert. Late Prehistoric artifact assemblages contained Desert Side-notched and/or Cottonwood Triangular projectile points, buff and brown ware pottery, shell and steatite beads, slate pendants, incised stones, and a variety of milling stones (e.g., Warren and Crabtree 1986).

The role of the MCA is unclear at this time, but it seems that the desert became increasingly arid. Although Late Prehistoric settlement systems remain unclear, people seem to have retreated to springs and wells, particularly along the fringes of the desert, and there is evidence of sustained occupations (e.g., Rector et al. 1983; Altschul et al. 1989; Schneider 1989), as well as smaller seasonal or special-purpose sites (e.g., Sutton 1991; Allen 2013) in those areas. Late Prehistoric groups would have also included short-lived “incursions” into the desert by outside groups, such as the Ancestral Puebloans (Virgin Anasazi).

### ***The Ethnographic Setting***

The ethnographic groups of the Mojave Desert (following Kroeber 1925; Heizer 1978a; Ortiz 1979; d’Azevedo 1986) include Kawaiisu (and Desert Kawaiisu), Kitanemuk, Serrano, Vanyumé (see Sutton and Earle 2017), Cahuilla, Chemehuevi, Mojave, Desert Mojave, Koso, Timbisha Western Shoshone, and possibly Tübatulabal (Figure 2). In addition to the regular sources of ethnographic information, recent ethnographic overviews of segments of the Mojave Desert have been prepared for military bases (Earle 2004a, 2004b; Baksh and Hilliard 2005), the National Park Service (Earle 2009), and others (Earle 2015). In most of these studies, the ethnographic groups were shown to have set (but overlapping) borders and were considered to have permanent claims to their allotted portions of the desert.

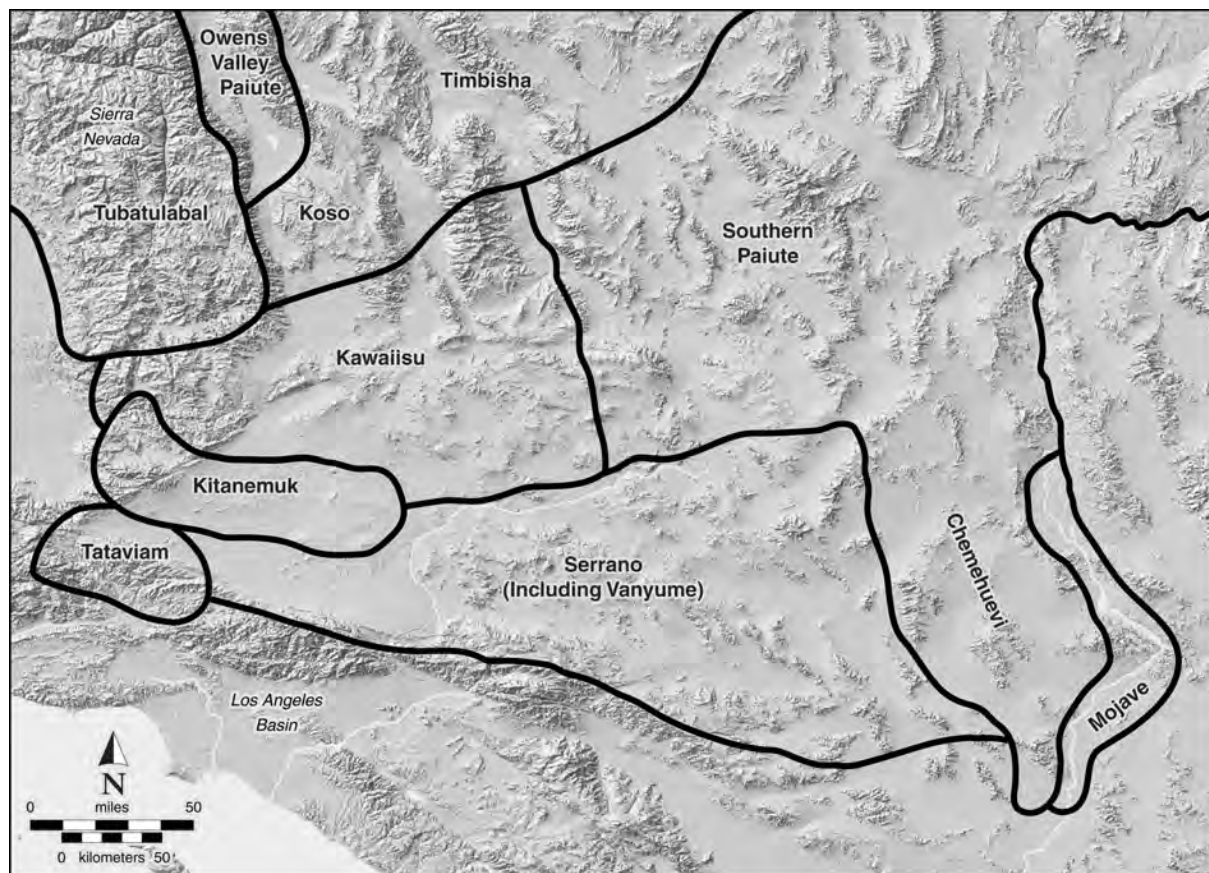


Figure 2. General map of the ethnographic Mojave Desert (generally after Heizer [1978a] and d’Azevedo [1986]).

### *Existing Data Sets and Models of Late Holocene Settlement and Subsistence*

Considerable survey work has been conducted across the Mojave Desert, with systematic studies initiated by the Bureau of Land Management (BLM) in the late 1970s (e.g., Ritter and Coombs 1990) and continuing on military bases in the region (e.g., Sutton et al. 2007:Table 15.1). Data from these studies have been used to propose a number of models regarding settlement and subsistence of Late Holocene groups, focused primarily on Gypsum groups. In modeling Gypsum settlement, it was generally assumed that their primary residential bases were within the desert, thus constituting a year-round “occupation” of the region.

It has been proposed that when Gypsum groups entered the Mojave Desert, they brought with them a more complex material culture than had been seen before, including new point types (e.g., Elko and Gypsum) and evidence of ritual activities, such as quartz crystals and rock art (e.g., Davis and Smith 1981; Warren and Crabtree 1986). It has been observed (e.g., Basgall 2004) that Gypsum components tend to be more numerous in the northern Mojave Desert and somewhat scarce in the southern and eastern reaches of the desert.

The view of the Rose Spring complex is similar (see Sutton et al. 2007:241–242). Conditions appear to have improved during Rose Spring times with populations increasing, sites located near spring and stream

localities, and expanded use of the resource base. Rose Spring sites often contain large, dark middens, suggestive of more intensive use. In general, it is thought that such sites were the base camps of a collector-like settlement system within the desert proper.

Models of Late Prehistoric adaptations are few and primarily taken from the ethnographic record using the direct historical approach. A necessarily brief discussion of these various models is offered below.

### **The North-Central Mojave Desert**

Extensive research has been conducted on the archaeology of the north-central Mojave Desert, primarily at Fort Irwin. Surveys of the Fort Irwin area have discovered relatively few sites, less than one site per km<sup>2</sup> (e.g., Basgall and Hall 1994; Byrd and Palette 2000; Byrd et al. 2001; Wohlgemuth 2006). Somewhat higher site densities (between 1.5 and 5.3 sites per km<sup>2</sup>) have been recorded in the Silurian Valley to the east of Fort Irwin (Byrd 1998).

A number of models regarding Gypsum and later settlement for the Fort Irwin area have been proposed. Warren (1986:3–11; also see Warren et al. 1984) suggested that Gypsum groups had a “bifocal subsistence pattern” with an intensification of both large game hunting and hard seed processing. Warren (1986:3–11; also see Wallace 1977) hypothesized that groups had “residential bases at low elevations along the Mojave and Amargosa rivers and at Mesquite Flats,” with task groups leaving these base camps for field camps at higher elevations to procure resources. Warren (1986:3–16) also argued that beginning in Gypsum times, people intensified the use of a variety of ecozones to make up for the loss of riparian ecozones due to drier conditions.

Hall and Basgall (1994:82, 89; also see Basgall and Hall 1994) characterized the Gypsum record in the north-central Mojave Desert as “short encampments

by relatively small groups of people engaged in a range of subsistence-settlement activities” with “expedient” tool assemblages that reflected a “geographically expansive and residentially mobile land-use system” with a “broad-spectrum resource base.” They further argued that Gypsum residential deposits contained a full range of tool types (including milling equipment) and faunal remains, suggesting a stable occupation of some sort (Hall and Basgall 1994:92). However, Basgall (2000:133) later argued that Gypsum groups were residentially mobile opportunistic foragers.

Employing tenets of ecological theory, McGuire and Hildebrandt (2005; Hildebrandt and McGuire 2002; but see Broughton and Bayham 2003; Broughton et al. 2008) suggested that rather than being mobile foragers, Gypsum groups lived in established settlements located in areas of low ranked but stable resources, such as along the Mojave River. At such settlements, women, children, and older men could obtain nearby resources while the younger men would go into the interior to procure toolstone and to hunt higher ranked “prestige” resources, such as mountain sheep. Thus, it was suggested that the Gypsum settlement pattern reflected a central place foraging model with two major components based on gender, a model similar to that proposed for the Carson Desert of west-central Nevada (Zeanah 2004).

In reviewing the Gypsum presence in the Fort Irwin area, Byrd et al. (2005:168) reported that Gypsum occupations were sporadic and ephemeral, an unexpected result given the apparent improvement in climate and assumed associated increase in water and biotic productivity (e.g., Wells and Anderson 1998; Koehler et al. 2005). Byrd et al. (2005:168, Table 45) suggested that this change reflected “fundamental shifts in settlement strategies and work organization” by Gypsum groups with assemblages specialized toward biface production and hunting with an associated decrease in milling equipment, thus signifying a decrease in

residential activity from the preceding Pinto pattern and an increase in “prestige” hunting (e.g., artiodactyls) (see Hildebrandt and McGuire 2002; McGuire and Hildebrandt 2005). Finally, Byrd et al. (2005:171) argued that much of the north-central Mojave Desert would have been a “marginal hinterland” where hunting and toolstone procurement were largely conducted from “major base camps” located along the Mojave River or in other favorable locations. Still, they did suggest some level of “generalized and presumably gender- and age-balanced residential occupation” in the region (Byrd et al. 2005:172), citing the presence of milling equipment in some Gypsum components (also see Basgall 2000:131).

Based on an analysis of pavement quarries at Fort Irwin, Byrd et al. (2009:135; also see Giambastiani 2008) proposed that the Gypsum settlement system was one of seasonally occupied but residentially stable base camps located in areas where sufficient resources could be obtained by women, such as at a few springs and along the Mojave River to the south. This model generally followed the model proposed earlier (Byrd et al. 2005; also see Bamforth 1990). Byrd et al. (2009:137) did not argue that Gypsum populations were smaller, only that their use of the landscape was different.

In contrast to the models noted above, Altschul et al. (1998:133) saw a “curious shift in settlement” at the beginning of the Gypsum period, with “habitation” moved away from water to remote locations, often caves and rockshelters. Altschul et al. (1998:133) suggested the possibility that this could reflect a shift in emphasis from plant to animal resources, with rockshelters being “ideal base camps for hunting parties.” They further suggested that “by the end of the Gypsum period the Mojave Desert was likely part of the home range of a number of groups” (Altschul et al. 1998:135), each probably centered on the edges of the desert and each using portions of the desert interior on an occasional basis. This is similar to the model proposed herein for the wider Mojave Desert.

For the Rose Spring period and later, the north-central Mojave Desert was proposed to be a common pool resource zone (Eerkens 1999). As such, it would have had no resident population and was only a portion of one or more overall settlement system(s).

### **The Western Mojave Desert**

Most surveys conducted in the western Mojave Desert have been small scale, the BLM sample survey (Coombs 1979a; also see Ritter and Coombs 1990) being an exception. The cumulative survey work on the area military bases (Edwards Air Force Base [EAFB] and Naval Air Weapons Station [NAWS] China Lake) has generated considerable data. A large number of sites has been reported around the Rosamond and Rogers lake complex at EAFB (e.g., Byrd et al. 1994) and many more at NAWS (see Kaldenberg 2010).

In the Coso Range in the northern portion of NAWS, numerous sites of a variety of types have been found (e.g., Hildebrandt and Ruby 1999, 2006). Also located were several ethnographically known Koso Shoshone villages, including Mita'ta (CA-INY-475/H) at Coso Hot Springs (CA-KER-425/H) (Steward 1938:81; CLEMD 2012:5–17) and Pagunda (CA-INY-3826) at Little Lake (Steward 1938:81; also see Pearson 1995; Byrd and Reddy 2004).

There were a number of major prehistoric villages along the edges of the western Mojave Desert, at least some of which were established during Gypsum times. These include the Rose Spring site (CA-INY-372) (Lanning 1963; Yohe 1992), which contained a stratified record dating from Gypsum times; the Ayers Rock site (CA-INY-134) that also had a Gypsum component (Redtfeldt 1962; Whitley et al. 2005); and Coso Junction Ranch (CA-INY-2284) (Gumerman 1985; Allen 1986; Whitley et al. 1988), which contained an extensive midden and structures. Farther to the southwest, the major “village” at Cottonwood Creek

(CA-KER-303) (Sutton 1988a) appears to have been established about 3,000 BP.

Other major sites are known along the southeastern flank of the western Mojave Desert (Sutton 2016b). These appear to have Gypsum components overlaid by Rose Spring and Late Prehistoric components. One of these is Lovejoy Springs (CA-LAN-192) located on the floor of the southeastern Antelope Valley, which contained Pinto, Gypsum, Rose Spring, and Late Prehistoric components (Price et al. 2009:182–184). The component classified as Gypsum contained a great deal of milling equipment, inhumations with shell beads, and an Elko series projectile point. Price et al. (2009:59) noted that the assemblage was similar to Encinitas Tradition components to the south, and Sutton (2016b:276) argued Lovejoy Springs reflected an occupation by Greven Knoll II or III people (Encinitas groups; see Sutton and Gardner 2010), groups not typically viewed as having a presence in the Mojave Desert.

Based on excavations at several sites in the Fremont Valley, Sutton (1988c, 1991, 1996, 2016c) proposed a Gypsum settlement pattern that was centered in the southern Sierra Nevada with secondary use of the desert areas to the east, especially along riparian habitats (e.g., Cache Creek flowing from the southern Sierra Nevada). It was further hypothesized that Rose Spring populations, being the beneficiaries of a “better” environment, moved their core area down into the western Mojave Desert and then used the southern Sierra Nevada as a secondary area. In this model the major site at Koehn Lake (CA-KER-875) (Sutton 2016c) would have been a major village. Finally, at the end of Rose Spring times, Sutton suggested that the system shifted back to the one seen in ethnographic times, with the Kawaiisu core area being the southern Sierra Nevada with use of the desert on an occasional basis.

However, in the lower, interior portions of the western Mojave, comparatively few sites are known. King

(2004) suggested that the Late Prehistoric record of the China Lake Basin was ephemeral, typically taking the form of isolated artifacts (e.g., arrow points or beads), milling stations, and scattered thermal features (often associated with milling equipment) (see Gilreath and Hildebrandt 1997; Gilreath and King 2003; Rosenthal and Eerkens 2003). This suggested only occasional use of the area.

Farther south in the Mojave B Range of NAWS, relatively fewer sites are known, although work there has been limited. Known sites are primarily temporary camps (including rock shelters), single task sites, and workshops (e.g., Monastero 2007; Wells and Backes 2007, 2010; Allen 2010; Wells 2016). Pictographs found at some of these sites are suggestive of styles associated with the Kawaiisu, Tübatulabal, Koso Shoshone, Tataviam, and even Colorado River groups. In addition, a few exotic items such as shell beads (Brown and Barbier 2014), Southwestern pottery, and non-Coso obsidian have been found, suggesting interaction (e.g., visitation or trade) by a variety of groups. Wells and Backes (2010; also see Monastero 2007) argued that people used the area for seasonal hunting and gathering. Walsh (2010) proposed that the Seep Spring site (CA-SBR-51) in that same area was a focal point for multiple Late Prehistoric groups venturing into the hinterlands from their core areas (Walsh 2010:109).

Near Superior Lake west of Fort Irwin, survey and testing programs revealed a similar pattern of few sites, most of which are small and reflect foraging behaviors (e.g., Bouey and Mikkelsen 1989; Smith 2004; Duke 2010). On the other hand, several sites (e.g., CA-SBR-6400) with substantial residential structures dating to Gypsum times have been found (Ruby et al. 2010:Table 159), although the Gypsum use of the area was still considered ephemeral (Ruby et al. 2010:221).

Allen (2010, 2011, 2013) studied four “landscapes” (or site complexes) located in the interior of the

western Mojave, Red Mountain, Pilot Knob, North Eagle Crags, and Indian Spring. Allen's work at these landscapes (plus another at Sage Canyon) reflects more than a decade of fieldwork, the recordation of a large number of sites, excavations at some 20 sites, and considerable analysis.

At Red Mountain, Allen (2013) found a number of sites clustered around a spring with a record spanning Gypsum, Rose Spring, and Late Prehistoric times, but mostly dating to Rose Spring times (Allen 2013:257). A variety of site and feature types, including middens, rock art, hunting blinds, rock rings, and bedrock milling features, were found, and several sites contained substantial midden (ca. 100 cm) deposits. The earliest components date to Gypsum times but are minor and not well understood. The Rose Spring components include milling equipment and probably petroglyphs. The milling equipment and small number of Rose Spring points suggest that plant exploitation was more important than hunting (Allen 2013:260). The Late Prehistoric record at Red Mountain was different, with the major site from that time being located on a ridge rather than in a low protected area. Also found were four rock rings, suggestive of structures (Allen 2013:261).

Allen (2013) interpreted the record at Red Mountain to reflect a permanent occupation. However, the presence of midden is not alone sufficient to classify a site as permanent, and the general absence of architecture, human remains, and any substantial evidence of the presence of women and children suggests seasonal occupations by task groups.

At the Pilot Knob, North Eagle Crags, and Indian Spring landscapes, all located near each other in the Mojave B Range of NAWS, Allen (2010, 2011) found numerous sites, including some with Gypsum and Rose Spring components, but they were all small camps, some with rock art, rock rings and alignments, trails, and importantly, a "symbolically powerful"

prominent natural formation of brightly colored rock (Pilot Knob) (Allen 2011:20).

Several other sites (small hunting camps) are known in the same general vicinity as those studied by Allen. These sites also contain Gypsum, Rose Spring, and Late Prehistoric components and include Blackwater Well (CA-SBR-2322/H) (Kaldenberg et al. 2009) and CA-SBR-1197 near Bedrock Spring (Reed and Wight 2015).

Allen (2011, 2013) studied a fifth landscape, Sage Canyon, located in the foothills of the southern Sierra Nevada. Allen (2011, 2013) believed that one of the sites in that canyon, Boulder Spring (CA-KER-226/H), was a base camp or village established ca. 1,000 BP and occupied into historic times. Other sites in Sage Canyon contained both Gypsum and early Rose Spring components, and Allen (2013) noted some change in the use of lithic materials between those components, with the Rose Spring components having a higher frequency of chert and of biface production, interpreted as preparation for hunting expeditions into the adjacent Sierra Nevada. Other sites in Sage Canyon date as early as late Gypsum times, ca. 2,500 BP, but none are base camps (Allen 2013:266).

### **The Mojave River Region**

Reasonably large surveys have been conducted along the Mojave River (e.g., Smith 1963; Simpson 1965; Coombs 1979a). The area encompassing the Mojave River is where most of the models of Gypsum settlement assume base camps should be (e.g., Warren 1986; Bamforth 1990:73; Byrd et al. 2009). However, no such base camps have been identified there, and the few large habitation sites that are known contain only minor Gypsum components. In the upper Mojave River region of the San Bernardino Mountains, there are several sites that contain significant Gypsum components, including the Siphon site (CA-SBR-6580) (Sutton et al. 1993), CA-SBR-7691

(Parr et al. 2000), and Muscupiabit (CA-SBR-425/H) (Gardner and Sutton 2009; Grenda 1988). However, none of these components are Mojave Desert in character, and they are much better seen as reflecting Encinitas Tradition people (Greven Knoll) (see Sutton and Gardner 2010). Other large sites in that same area, such as CA-SBR-1913 (Sutton and Schneider 1996), Deep Creek (CA-SBR-176) (Altschul et al. 1989), and the Juniper Flats area (Alcorn 1996), do not contain Gypsum components.

In the Victorville area the large Turner Ranch site (CA-SBR-66/182), a proposed location for the Vanyumé village of Topipabit (Gust et al. 2015), appears to contain only a Late Prehistoric component that included house depressions, inhumations, cremations, and a variety of “late” artifacts (Smith 1963:87). Farther downriver is the Oro Grande site (CA-SBR-72), and while it does have a Gypsum component, it consists only of a human and animal trackway (Rector 1983; Rector et al. 1983), while the remainder of the site dates much later.

Along the Mojave River near Hinkley, west of Barstow, a small site (CA-SBR-189) was tested by Leonard (1980). It contained a small Gypsum component (Elko points) but was not a major camp.

A bit farther downriver near Camp Cady east of Barstow, the Harvard Hill site (CA-SBR-11787) (McKenna 2005) seems to have been a large habitation locality but does not contain a Gypsum component. To the east of that locality, the major habitation site at Afton Canyon (CA-SBR-85) (Schneider 1989) again lacks a significant Gypsum component. The sites at East Cronese Lake near the terminus of the Mojave River (CA-SBR-259 and -260) (Drover 1979) appear to have been part of a major habitation locale associated with periodic lake stands, but not during Gypsum times. A Gypsum component was found at Newberry Cave (CA-SBR-199) (Smith et al. 1957; Davis and Smith 1981) south of the Mojave River, but it was not

a residential base and may have been used by specialized task groups (Garfinkel et al. 2016).

In sum, while there is a minor Gypsum presence along the Mojave River, no Gypsum base camps or villages have been found, and there is no evidence to suggest that Gypsum populations used the area as home bases. The major occupation of the Mojave River area appears to date after ca. 1,000 BP.

### **The Eastern Mojave Desert**

The eastern Mojave Desert has seen considerably less research than the north-central or western Mojave. In an overview prepared for the Mojave National Preserve, Byrd et al. (2011:63) suggested that the Gypsum settlement pattern would have been similar to that postulated for the Fort Irwin region, but with base camps located near productive resource tracts, such as upland mesic zones of the New York, Providence, Granite, and Clark mountains rather than the Mojave River. Moreover, in those areas of marginal resource productivity, there should be fewer Gypsum residential sites, although there should be more special purpose sites, such as for hunting, lithic procurement, and ritual activities (Byrd et al. 2011:63). They also argued that Gypsum groups should have focused on highly ranked resources, including artiodactyls, mesquite (also see Warren 1984:419), and pinyon, with “minimal emphasis placed on other lower ranked foods like small seeds, agave, green cone pinyon and, perhaps, tortoise” (Byrd et al. 2011:70).

While Late Holocene components in the eastern Mojave Desert are relatively uncommon, camps have been identified and excavated at Rustler Rockshelter (CA-SBR-288) (Davis 1962; Sutton 1992, 2005), Vontrigger Springs (CA-SBR-413) (Sutton et al. 2000), Stuart Rockshelter (Shutler et al. 1960), Willow Beach (Schroeder 1961), Gypsum Cave (Harrington 1933; Heizer and Berger 1970; Gilreath 2009), Atlatl Rockshelter (see Warren 1984:Table 8.13), Clark Mountain (CA-SBR-4889) (Lerch 1985a;



Rafferty and Blair 1987; Rafferty 1994), Salt Springs (CA-SBR-8468) (Rogers 1939; Byrd et al. 1998:Table 86), and Mesquite Flat in northern Death Valley (e.g., Wallace 1958:12, 1977:116-122; Hunt 1960). Other sites, such as Mitchell Caverns (CA-SBR-117) (Pinto 1989), Cave No. 5 (Sutton and Yohe 1988), and Southcott Cave (CA-SBR-334) (Sutton et al. 1987) were used as storage facilities. However, none of these sites contained sufficient materials to be classified as base camps. Wallace (1977:121; also see Warren 1984:419) suggested that the Mesquite Flat sites that contained Elko points were effectively base camps, with associated food-gathering camps in the nearby mountains.

Several general surveys have been conducted in the eastern Mojave Desert, beginning with the reconnaissance work of Rogers (1929, 1931). Other surveys include those conducted in the New York-Providence-Granite Mountains region (True et al. 1966; Desautels and McCurdy 1969), several BLM sample surveys of the region (Coombs 1979b; Brooks et al. 1981; also see Ritter and Coombs 1990), and a number of small CRM-related surveys (e.g., Nichols 2004). In addition, a major survey was conducted in the Silurian Valley (Byrd 1998). In each case, while many sites were discovered, no major base camps were identified.

Investigations in the Granite Mountains (Christensen et al. 2001) resulted in the recordation of numerous sites, mostly dating after 4,000 BP, but primarily dating to the Late Prehistoric. The settlement pattern was assumed to have been “permanent” and was hypothesized to consist of winter base camps with surrounding smaller seasonal camps. Christensen et al. (2001) identified nine such “base camps,” all with middens near springs, along with many “temporary camps” and other site types. The sites were interpreted as reflecting use by pre-Numic people, the Desert Mojave, and the Chemehuevi. The presence of a great deal of rock art suggested to Christensen et al. (2011;

also see Dickey 1994; Christensen and Dickey 1996; Christensen et al. 1999a) that the Granite Mountains were a center of ritual activity over the last 4,000 years. Survey work in the Cady Mountains to the west revealed relatively few sites (Sutton and Parr 1991) and no rock art.

In their examination of the Late Prehistoric land use patterns of the Soda Lake region, Arend and Roth (2015:196) reported that “One of the most interesting results of the survey is the paucity of large multicomponent sites in the project area. Instead, it appears that specific sites were tied to the procurement of specific resources, and that these were located on the landscape to facilitate resource procurement.” Excavations at the Soda Springs Rockshelter (CA-SBR-363b) (Schroth and Joesink-Mandeville 1987; Roth and Warren 2008; Ruzicka et al. 2009; also see Cameron 1984) revealed that the primary use of the site was during the Late Prehistoric, with a minor Gypsum component. At the nearby Mojave Delta site (CA-SBR-1989), excavations revealed a similar time of occupation, although no Gypsum component was discovered (Roth and Thomas 2011; also see Arend and Roth 2015).

### **The Southeastern Mojave Desert**

Despite the considerable survey work conducted at the Marine Corps Air Ground Combat Center (MCAGCC) at Twentynine Palms (e.g., Shackley 1992; Lechner and Giambastiani 2009), very little is known about Late Holocene settlement systems in that part of the Mojave Desert. A number of Gypsum components have been identified in the general area (e.g., Basgall 2000; Basgall and Pierce 2005; Giambastiani and Berg 2008; Dietler et al. 2011; Giambastiani 2011; Byerly 2014), particularly around several major playas. However, none of these sites contained evidence of extended habitation (e.g., architecture, extensive middens, activity areas) nor do any other sites in the area (Giambastiani and Berg 2008:172).

Thus, current views of Gypsum settlement in and around Twentynine Palms include some fairly stable lake localities (Giambastiani and Berg 2008:172) and the ephemeral use of a series of other playa localities (Giambastiani 2011). Byerly (2014:22) suggested that this pattern “may have incorporated larger scale transhumance systems encompassing surrounding high elevation settings (e.g., the San Bernardino and Desert mountains), at least during the Late Holocene;” in other words, base camps were located in upland settings along the fringe of the desert.

Surprise Spring (CA-SBR-424/H) (Altschul 1990; Jurich and Basgall 2006), a large site on the desert floor within mesquite dunes around a spring, was considered to have been a base camp. The site does contain a Pinto component, considerable post-1,000 BP materials (Richman et al. 1998:39), and a component (in Concentration E) as old as 4,000 years that may represent a small Gypsum presence (Jurich and Basgall 2006:45, 53). Thus, if CA-SBR-424/H was a base camp, it was apparently not used by Gypsum groups.

In the 1920s Elizabeth Campbell (see Warren and Schneider 2016) began a series of investigations in the southeastern Mojave Desert. A survey of the desert north of Twentynine Palms resulted in the discovery of sites in mesquite groves along lakeshores (Campbell 1931:39; also see Campbell 1936) and a number of caves where materials (e.g., ollas and arrow shafts) had been stored. Campbell (1931:40) observed that the “most productive sites” were within a 25-mile (ca. 40 km) radius of Twentynine Palms, suggesting a general overnight foraging radius of that distance from putative base camps in the Joshua Tree area (considerably farther than the distance [3.4 km] postulated by Morgan [2008:255] for daily foraging in the southern Sierra Nevada). Warren and Schneider (2012) analyzed site types by environmental zones at Joshua Tree National Park and found, as Campbell did, that the desert areas (at least within the Creosote

Bush zone) had relatively few sites and virtually no evidence of habitation, making it clear that people were living in the mountain areas and using the desert on a transitory basis.

### Discussion

Most researchers in the Mojave Desert have worked under the implicit assumption that since there were Gypsum and Rose Spring technologies (projectile points) there must have been Gypsum and Rose Spring cultural entities, each with a settlement pattern (e.g., Warren 1984; Sutton et al. 2007). Given this assumption, a number of models of Gypsum and Rose Spring settlement have been offered, each with putative base camps located along the Mojave River or in other resource rich localities such as the Providence Mountains. In a few cases, however, researchers suggested that base camps were in upland settings along the fringes of the desert (e.g., Altschul et al. 1998:135; Byerly 2014:22). Lyneis (1982:177) suggested that a major occupation of “valley floors” occurred during the Gypsum period.

The lack of identified Late Holocene base camps has been a challenging issue with the various models of Late Holocene settlement, and it was assumed that they must have existed even if they were not yet identified. One would expect such base camps to be complex archaeological entities containing a substantial variety and diversity of domestic remains and reflecting use by a wide range of social and activity groups. While there are some known sites with Gypsum and Rose Spring components that do appear to be base camps, all are located along the fringes of the Mojave Desert and not along the Mojave River or in the desert proper.

To be sure, there are many sites containing Gypsum and later components known across the Mojave Desert, but most reflect small, temporary, and/or specialized use. As noted previously, they include

Rustler Rockshelter (CA-SBR-288) (Davis 1962; Sutton 2005), Surprise Spring (CA-SBR-424/H) (Altschul 1990; Jurich and Basgall 2006), Salt Springs (Rogers 1939) (Byrd et al. 1998), and Gypsum Cave (Harrington 1933), as well as various sites at Sage Canyon (Allen 2013:169–170), Red Mountain (Allen 2013:259), Fort Irwin (Basgall et al. 1988; McGuire and Hall 1988; Basgall and Hall 1992:6), Twentynine Palms (e.g., Basgall and Giambastiani 2000; Giambastiani and Berg 2008), Death Valley (Hunt 1960; Wallace and Taylor 1955, 1959; Wallace 1958, 1977, 1988a, 1988b), and the Mojave National Preserve (Byrd et al. 2001). Gypsum components reflecting putative ritual behaviors include Newberry Cave (CA-SBR-199) (Smith et al. 1957; Davis and Smith 1981; Garfinkel et al. 2016) and possibly Mitchell Caverns (CA-SBR-117) (Pinto 1989).

A central place foraging model was proposed for the Late Holocene Mojave Desert, implicitly or explicitly, by a number of researchers. Such a model posits that a group would stay in one central place, with specialized task teams traveling to the resources and returning to the central place (Orians and Pearson 1979; also see Bettinger 1991:93–97). It is argued here that such “central” places would have been located on the fringes of the desert.

Thus, while it is clear that people did use the Mojave Desert during the Late Holocene, there is little evidence that they actually lived there year round. Given this, it seems reasonable to suggest that during the Late Holocene, the Mojave Desert was only used on an intermittent basis for the exploitation of specific resources at specific times or for other purposes, such as ritual practices (e.g., Altschul et al. 1998:135).

### **A New Model of Late Holocene Mojave Desert Prehistory**

The foregoing discussion of Late Holocene settlement patterns in the Mojave Desert should make it obvious

that a new approach to understanding settlement and subsistence is needed. It seems reasonably clear that during Gypsum and Rose Spring times, no complete settlement systems existed entirely within the Mojave Desert. Instead, segments of eight to ten separate settlement systems were present; each with a core area along the fringe of the desert and secondary areas extending into the interior of the desert, many of which were overlapping. This would have made the Mojave Desert effectively a large common pool resource zone lacking full-time population. Thus, it is difficult to detect and delineate ethnic boundaries across the region, a problem that can be seen in previous attempts to define borders between groups (e.g., Sutton 1980), rock art styles (e.g., Sutton 1982a), and interaction spheres (e.g., Sutton 1989).

The pattern during the Late Prehistoric, presumably ancestral to the ethnographic groups, seems a bit clearer in that there is evidence for a variety of different groups using the Mojave Desert, including Greven Knoll, Mojave, Ancestral Puebloans, and others, each using the region on an ephemeral basis. This is the same basic pattern seen at contact, with the core areas of ethnographic groups located on the edges with secondary zones within the desert, the Vanyumé being the late exception.

Thus, Late Holocene use of the Mojave Desert was substantial but not year round; virtually all sites were specialized and temporary in nature, with the desert being used repeatedly, ritually, and opportunistically. Sometime after about 1,000 BP, the Mojave River area was occupied on a year-round and permanent basis by the Vanyumé, but their newly acquired core area continued to be used by surrounding groups.

### ***On Late Holocene Cultural Complexes***

The scenario outlined above begs the question: if these Late Holocene complexes were not cultural entities, what were they? Gypsum has generally been defined

by a series of coeval artifact types and behaviors, including projectile point types (Elko and Gypsum), evidence of ritual activities (e.g., quartz crystals, paint, split-twig figurines, and rock art), numerous bifaces and milling implements, and the exploitation of artiodactyls, lagomorphs, rodents, and tortoises (e.g., Sutton et al. 2007:241). Gypsum components are thought to be smaller but more common than those of preceding groups and to exist in a greater diversity of locations.

Thus, Gypsum refers not to a cultural entity but simply to a new projectile point technology (primarily Elko but including Gypsum), one that came into the Mojave Desert from the north, where it is apparently much older (e.g., Smith et al. 2013). Elko points were adopted by the various groups then located along the fringes of the Mojave Desert, after which the point type diffused even farther east and south (e.g., McDonald et al. 1987). Thus, Gypsum is a time period (ca. 4,000 to 1,800 BP) marked primarily by Elko points adopted by diverse groups.

What about Rose Spring? Like Gypsum, Rose Spring is seen here as simply a new technology (bow and arrow with Rose Spring and Eastgate points) that came into the region from the north (Yohe 1992, 1998) and was adopted by various groups with existing secondary territories in the desert. Like Gypsum, Rose Spring is not itself a cultural entity and so has no specific settlement pattern.

The Late Prehistoric complexes reflect new technologies (e.g., Cottonwood and Desert Side-notched points), the influx of Californian material culture and Takic languages from the west along the southern edge of the desert (Sutton 2009, 2016b), an influx of people from the east (the Mojave and Ancestral Puebloans), and the movement of Numic groups east across the northern fringe of the desert and into the eastern Mojave Desert (e.g., Sutton 2010). All these groups and events would have left complicated patterns in the archaeological record.

#### *A “Greater Mojave” Common Pool Resource Zone*

Eerkens (1999) made the case that in ethnographic times the Fort Irwin area in the north-central Mojave Desert served as an intertribal common pool resource (CPR) zone, where sparse resources were shared by the four or five aboriginal groups surrounding it (Kawaiisu, Vanyumé, Chemehuevi, Las Vegas Paiute, and possibly Western Shoshone). Eerkens (1999:298) followed the definition of a CPR provided by Ostrom (1990:30) as a “natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its use.” Such an intertribal CPR system allows groups to obtain “resources without gaining prior permission or making any type of repayment, though they must follow mutually agreed upon rules (by all joint users) of the system” (Eerkens 1999:298). Such a system is different from a reciprocal access system (e.g., Smith 1988) in which resources are owned and given with permission (Eerkens 1999:298).

Eerkens (1999:306) argued that each of the aforementioned tribal groups utilized the resources of the north-central Mojave Desert in a sporadic and opportunistic manner “as they dispersed from their winter villages in spring.” Indeed, Steward (1938:254) noted that the Shoshone did not “habitually or exclusively” utilize any specific resource areas but exploited different patches of resources from year to year and that these gathering ranges greatly overlapped. As each of these groups traveled across the area and used resources there, each would have indicated to anthropologists that it was within their “territory,” thus creating the overlapping territorial assignments so familiar to us all (Eerkens 1999:306).

Eerkens (1999:297) further suggested that the Fort Irwin CPR functioned as a “buffer against resource shortfall during certain seasons ... while simultaneously creating a spatial buffer to diffuse social

tensions.” In contrast, Allen (1998:74) posited that the buffer may have been a product of competition rather than cooperative sharing. In any case, such a CPR would increase the diversity of available resources and serve as a backup to primary resources.

A second ethnographic CPR was documented in the southern portion of the Mojave Desert, an area used by the Serrano (Bean et al. 1981:269–271; Harrington 1986:III:RI. 101, Fr. 60, 442), including the Vanyumé (Sutton and Earle 2017) and likely a few neighboring groups such as the Cahuilla, Mojave, and Chemehuevi. This area, essentially the Mojave Desert north of the San Bernardino Mountains and east of the Mojave River, was called Támtak. It was an area of intermittent use, arid but consisting of a large number of patchy habitats, including mountains, valleys, springs, playas (with occasional ephemeral lakes), washes, dunes, and lava fields. These patches contained a great variety of resources, including pronghorn, bighorn sheep, lagomorphs, rodents, reptiles, mesquite, willows, and grasses. Some lithic resources, such as cryptocrystalline stone and obsidian from Bagdad (Bristol Mountains), Hackberry Mountain, and Providence Mountains gravels (see Byrd et al. 2011:Figure 25), may have also been obtained in the southern Mojave Desert.

It is proposed here that virtually the entire Mojave Desert constituted a CPR, one used to varying degrees by each of the groups living in their core areas on the fringes of the desert (Figure 3). This “Greater Mojave CPR” would have been established informally as “Gypsum” groups started to interact with each other as they began to reenter the desert. The majority of the use of this zone would have been temporary and ephemeral for the acquisition of specific resources or the visitation and maintenance of important places. On occasion, such as an unusual filling of the Cronese lakes, certain areas could contain long-lived residential bases (Drover 1979). Use of the Greater Mojave CPR would have continued up through ethnographic times.

However, it appears that sometime after about 1,000 BP, the Vanyumé began to establish the Mojave River corridor as their core territory (Sutton 2009:68; Sutton and Earle 2017). This process may have resulted in the division of the Greater Mojave CPR into northern (e.g., Eerkens 1999), southwestern, and eastern (e.g., Támtak) CPRs (Figure 4). The variable distribution of Desert series projectile points (Desert Side-notched and Cottonwood Triangular), obsidian, and pottery types during Late Prehistoric times (e.g., Warren 1984, 1988; Schneider 1988; Sutton 1989) may reflect this split. Such CPR zones may have been utilized by any number of surrounding groups, each with a unique cultural system and settlement pattern.

If the establishment of a core territory along the Mojave River by the Vanyumé did split the Greater Mojave CPR, it seems counterintuitive that the resulting common use areas would have extended right up to the major Vanyumé villages on the Mojave River. It seems more reasonable to think that the nature of the CPR around the Mojave River would have changed to a permission-based reciprocal model. This idea is supported by the Vanyumé extension of invitations to both the Panamint Shoshone and Kawaiisu to collect mesquite on the Mojave River (Earle 2004b:75, 105).

### *Changing Environments*

It is generally believed that the Late Holocene in the Mojave Desert began about 4,000 BP, when environmental conditions across the desert began to improve (e.g., Rhode 2001; Wigand and Rhode 2002). As water became more available and environmental productivity increased, the types and yields of biotic resources would have increased. Having used a few abiotic resources within the desert proper for the millennium before the environmental amelioration, people along the edges of the desert would have been familiar with those increasingly productive biotic resources. It seems likely that some exploitation of various desert resources very close to their upland

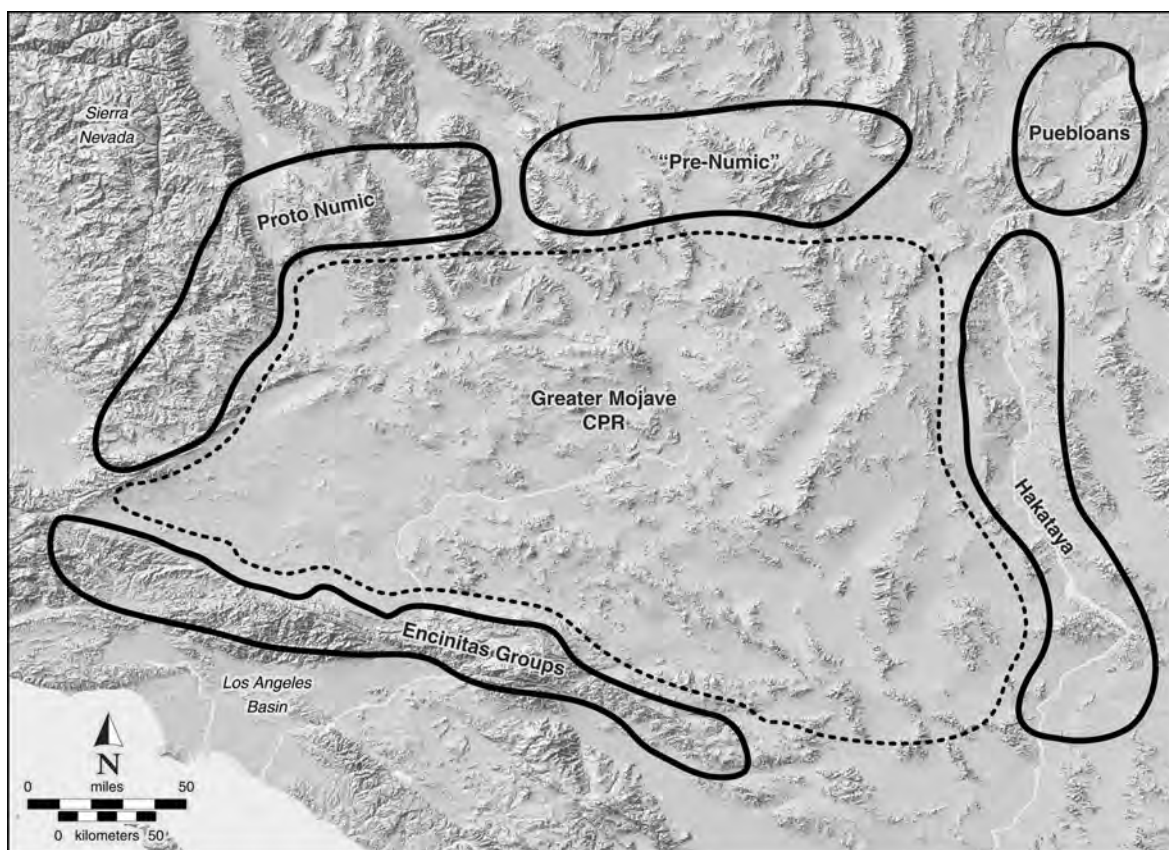


Figure 3. Proposed Late Holocene group locations (solid lines) and the postulated Greater Mojave Common Pool Resource Zone (dashed line), ca. 4,000 to 1,000 BP.

areas would have been ongoing, so the people would have retained the tactical knowledge necessary to efficiently exploit new resource patches deeper in the desert. Thus, sometime about 4,000 years ago, groups along the fringes would have begun to expand their secondary resource use zones into the Mojave Desert proper.

There was a general increase in moisture during Rose Spring times (e.g., Gardner 2007), and this resulted in increased spring flow and even resulted in some short-term lake stands, for instance at Koehn and Cronese lakes. At this time, groups located along the fringes of the Mojave Desert, particularly in the western Mojave, opportunistically expanded their core settlements into the desert, thus accounting for the fairly large number

of sites in that region with Rose Spring components. Subsequent droughts of the MCA (ca. between 1,100 and 650 BP) (Jones et al. 1999:153; also see Graumlich 1993; Stine 1990, 2000, 1994, 1998; Lloyd and Graumlich 1997) caused these groups to retreat back into the uplands (e.g., Allen 2013), resulting in the recorded ethnographic pattern.

### *New Technologies*

Around 4,000 BP, Gypsum weapons technology (points), probably from the north, was adopted by the various groups on the edges of the desert. Other traits also found their way into the Mojave Desert at about the same time but are not related to “Gypsum” per se, because they originated from other regions

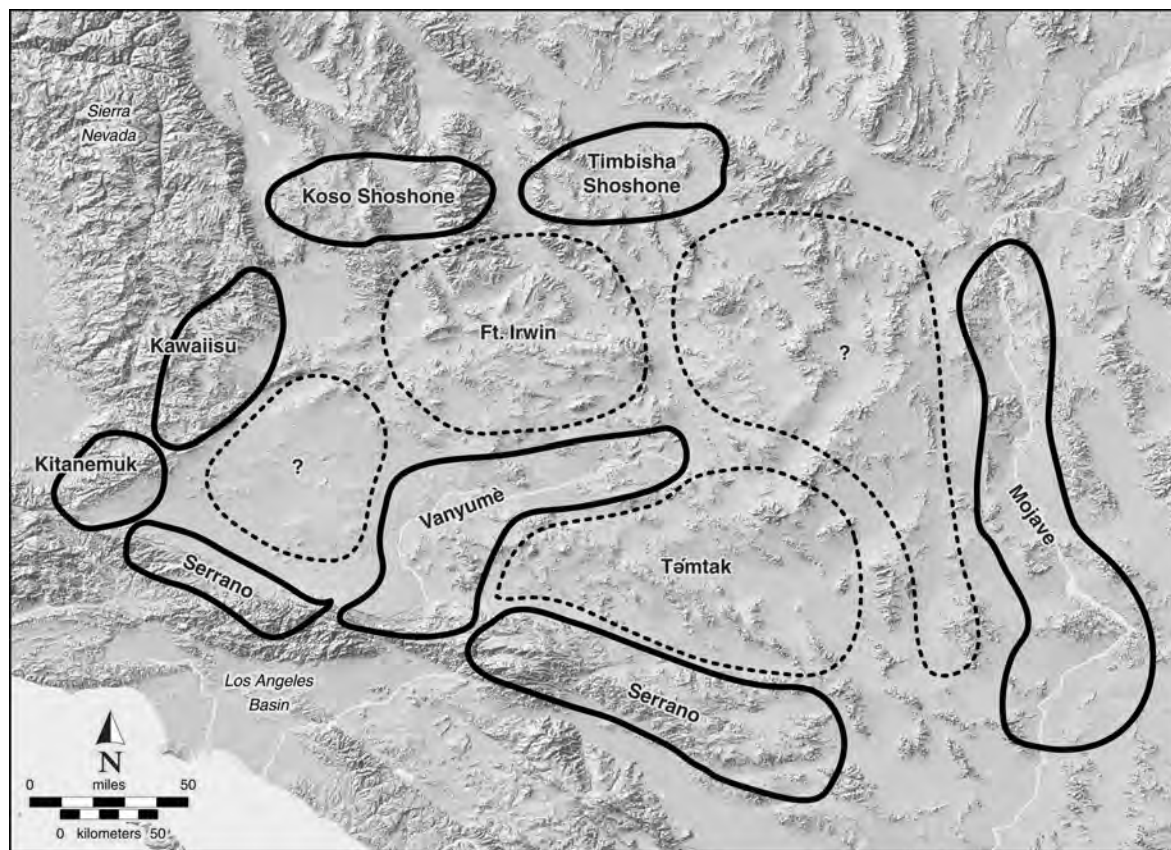


Figure 4. Proposed Late Holocene group locations (solid lines) and postulated common pool resource zones (dashed lines), after ca. 1,000 BP.

and entered the desert from different directions. The various traits carried by each of these groups as they reentered the desert would have coalesced at sites such as Newberry Cave, where Elko points from the north and split-twig figurines from the east were found together (Davis and Smith 1981).

After about 1,800 BP, bow and arrow technology, probably from the north, was adopted by Mojave Desert groups (Yohe 1992, 1998), as evidenced archaeologically by the appearance of Rose Spring and Eastgate points. The introduction of the bow and arrow, whose points required less stone, probably had an impact on the obsidian trade from the Coso Volcanic Field (CVF) (Ericson 1982; Allen 1986; Yohe 1992). The bow and arrow likely resulted

in increased hunting efficiency, perhaps causing a depletion of ungulates and other animals. While such an increase in hunting success should have had a ripple effect on other subsistence subsystems, groundstone assemblages at other “Rose Spring” sites in the western Mojave Desert, such as Cantil (CA-KER-2211) (Sutton 1991), Koehn Lake (CA-KER-875) (Sutton 2016c), Cottonwood Creek (CA-KER-303) (Sutton 1988a), and Freeman Spring (CA-KER-6106) (Williams 2009) remained robust. This suggests that there was not a specialization toward hunting (contra Bettinger and Baumhoff 1982; also see Gumerman 1985) and that “Rose Spring” sites in the desert reflect the exploitation of a variety of ecozones. This same pattern is also reflected in the central Mojave (Basgall et al. 1988).

### *People on the Edge*

By about 5,000 BP, the Mojave Desert had largely been abandoned, with Pinto III groups having moved to the better watered fringes of the desert, either to evolve into other cultural entities or to be replaced (see Sutton 2017). For the subsequent 1,000 years or so, these people would have continued to use some of the resource patches in the desert interior on a sporadic basis, leaving only a minor archaeological footprint. It seems likely that the majority of this use would have been centered on the exploitation of some abiotic resource patches (such as toolstone), as well as the utilization and maintenance of others (such as ritual places), although some use of biotic resources in the desert nearby the fringes likely occurred.

The people living on the edges of the desert during the abandonment (ca. 5,000 to 4,000 BP) would have been organized into a number of independent polities. These various groups would have begun to reuse the desert when conditions improved after about 4,000 BP, each with their own priorities and patterns of resource patch usage. While many of these groups adopted Elko point technology, none were “Gypsum” in the former sense of the term since they each had their own separate polities, cultures, ritual systems, languages, and settlement/subsistence systems. The same argument holds for the “Rose Spring” complex that reflects the adoption of the bow and arrow (as evidenced by Rose Spring points) by these same groups later in time. The Late Prehistoric groups are presumed to be the ancestors of the ethnographic groups in the region. In general, people along the edges after about 4,000 BP would have included Northern Uto-Aztecan (Numic and Takic), Encinitas, Ancestral Puebloan, Yuman groups, and perhaps unknown “pre-Numic” groups living along the northeastern edge of the Mojave.

#### **The Northern Uto-Aztecan**

The Northern Uto-Aztecan (NUA) linguistic family has traditionally been viewed as containing four

branches, Numic, Takic, Hopic, and Tübatulabalic (Campbell 1997:136). However, it has recently been argued that Tübatulabal is actually a Takic language and not a separate branch within NUA (Miller 1984:16, 18; Hill 2007).

While Hopic resides in the Southwest, the Numic and Takic branches of NUA meet in close geographic proximity in the southern Sierra Nevada and western Mojave Desert, including three of the six Numic languages and two of the seven Takic languages (or three if Tübatulabal is included), suggesting that this region was the general location of the differentiation of the various NUA branches and languages (following the postulates of Sapir [1916]; also see Voegelin [1958:49] and Foster [1996:64–65]).

Most see NUA as having moved into the southern Sierra Nevada/western Mojave Desert region sometime about 5,000 BP (Fowler 1972, 1983:Map 4), diverging into its various branches between about 4,500 and 3,000 BP (Hinton 1991:135). In contrast, Hill (2001, 2002) argued that NUA did not enter California until sometime after about 3,000 BP. Most recently, it was argued (Merrill et al. 2009) that proto-Uto-Aztecan (PUA) originated in the Great Basin, perhaps as early as 8,900 BP, and that PUA moved into the southern Sierra Nevada and western Mojave Desert sometime after 8,900 BP, with NUA splitting sometime about 7,500 BP (Merrill et al. 2009:21022). In any case, NUA would have been in place in the western Mojave Desert by at least 3,000 BP, and its two branches, Numic and Takic, would have occupied the western edges of the desert.

#### *The Numic*

It seems that Numic would have split into its three “mother” branches (Northern, Central, and Southern) by about 2,000 BP (e.g., Lamb 1958:99). Sometime about 1,000 BP, the three “mother” branches (Owens Valley Paiute, Western [Koso] Shoshone, and Kawaiisu) would have each calved off a “daughter”



language (Northern Paiute, Western Shoshone, and Southern Paiute/Ute, respectively) that then expanded north and east across the Great Basin (and beyond) after about 1,000 BP (Lamb 1958:99; Sutton 1987a, 1994; also see Madsen and Rhode 1994). The three “mother” groups (Owens Valley Paiute, Western Shoshone, and Kawaiisu) would have stayed in place while the Timbisha Shoshone and Southern Paiute moved eastward along the northern edge of the Mojave.

Kroeber (1925:580, 601, 1959:264) suggested the possibility that the Numic Kawaiisu moved west from the western Mojave Desert into the southern Sierra Nevada/Tehachapi Valley sometime around 500 BP. Sutton (2010:20–23) argued that if such a movement did occur, it was at about 1,000 BP. In either case, the Kawaiisu would have had their core territory in the western Mojave Desert before that move, and the recently proposed “Desert Kawaiisu” (e.g., Earle 2004b; Underwood 2006; Garfinkel and Williams 2011) may have been the source of that population movement. Archaeologically, there is a major site (village?) at Koehn Lake (CA-KER-875) in the desert adjacent to the southern Sierra Nevada that dates between about 1,300 and 600 BP (Sutton 2016c).

Alternatively, there are reasons to believe that a late Kawaiisu movement did not occur. Fowler (1972, 1983) believed that the Numic homeland originally included the southern Sierra Nevada, suggesting that they were already there for some time. In addition, there are no oral tradition data that suggest a Kawaiisu movement west (Sutton 1993). Finally, Kawaiisu ties to the southern Sierra Nevada seem to be long standing, including the presence of several large villages (Pruett 1987; Allen and Burns 2008) and the Kawaiisu place of origin (e.g., Sutton 1982b, 2001). This indicates some stability in the Kawaiisu use of the region. On the other hand, virtually all the Numic groups were expanding late in time, with the Kawaiisu being perhaps a notable exception (Sutton 1986,

1987a). Maybe they were not the exception, though; perhaps they did expand along with all the other Numic groups.

In the eastern Mojave Desert, Byrd et al. (2011:64) argued that the Chemehuevi moved into the region from the northeast late in time. This expansion was “considered to have been facilitated by an intensive seed processing-based economy that out-competed and displaced existing inhabitants: the Desert Mohave” (Byrd et al. 2011:64). This view mirrors that of the Bettinger and Baumhoff (1982) model of the Numic expansion, and Byrd et al. (2011:64) considered the presence of Desert Side-notched points and “Paiute” brownware pottery “to be prominent markers of the arrival of Numic groups” (also see Lyneis 1988). It is also possible that the Chemehuevi adopted some aspects of Mojave subsistence practices, such as horticulture (Kelly and Fowler 1986; Earle 2009).

### *The Takic*

An expansion of Takic groups appears to have begun at about the same time as the Numic, although several, the Kitanemuk and Tataviam, remained in place along the far western edge of the desert. Sutton (2009, 2016b) argued that beginning about 1,000 BP, Takic moved east along the Transverse Ranges on the southern edge of the Mojave Desert, with the Serrano language (and other traits) being adopted by existing Encinitas groups that were already using the desert.

The time after about 1,000 BP appears to have seen episodes of increased precipitation, and the Mojave River likely carried greater quantities of water. Along the Mojave River, riparian zones (e.g., Ohmart and Anderson 1982) were formed, and their general productivity increased. This new productive linear oasis was occupied by the Vanyumé (Desert Serrano), who established a series of major villages and who lived there through ethnographic times (Sutton and Earle 2017). The establishment of a Vanyumé “core”

territory along the Mojave River probably split the Greater Mojave CPR into several smaller CPRs, at least one of which (Támtak) was ethnographically documented (Bean et al. 1981:269–271; Harrington 1986:III:RI. 101, Fr. 60, 442). The other ethnographic groups whose core areas were along the edges of the desert continued to use resources within the desert and claimed those areas as part of their territories, many of which overlapped.

### **An Encinitas Region**

From about 4,000 to 1,000 BP, the Transverse Ranges (the San Gabriel and San Bernardino mountains) along the southwestern portion of the Mojave Desert appear to have been home to people with an Encinitas Tradition (Greven Knoll) (Sutton and Gardner 2010) assemblage (see Figure 3), subsequently replaced by “Californian” (e.g., Takic) assemblages after about 1,000 BP (Sutton 2009). This pattern has been documented at a number of sites along the northern slopes of the San Gabriel Mountains (Sutton 2016b) and in the Cajon Pass area at Muscubiabit (CA-SBR-425/H) (Gardner and Sutton 2009; also see Grenda 1988).

Farther east at the headwaters of the Mojave River, Greven Knoll components have been identified at the Siphon site (CA-SBR-6580) (Sutton et al. 1993) and CA-SBR-7691 (Parr et al. 2000). While little is known about a Greven Knoll (Encinitas) occupation further east in the San Bernardino Mountains, Allen (2016; also see Simpson et al. 1972) identified Greven Knoll I–III components at the Rock Camp site (CA-SBR-342) and at several other sites in the same vicinity (Searing et al. 2016).

Sites containing probable Greven Knoll components on the floor of the Mojave Desert appear to be few, although associated special purpose sites may as yet be unidentified. The lone known example is Lovejoy Springs (CA-LAN-192) (Price et al. 2009), located in the southwestern Mojave Desert. The site contains a

clear Encinitas assemblage but also has a component dated to the Late Prehistoric.

### **An Ancestral Puebloan Enclave**

It is believed that Ancestral Puebloan (Virgin Anasazi) populations were mining turquoise in portions of the eastern Mojave Desert between about 1,300 and 800 BP (Leonard and Drover 1980; Warren 1984:421–422; Lyneis 1995; Blair and Winslow 2004; Byrd et al. 2011). By that time, Ancestral Puebloan communities were present in the Muddy and Virgin river areas of the far eastern Mojave Desert (Lyneis et al. 1989; Lyneis 1992, 1995), so they were most likely familiar with the region. If turquoise was being directly mined by Ancestral Puebloans, it would be an example of the use of the Greater Mojave CPR for a specific purpose.

However, the evidence of an actual Ancestral Puebloan presence is “scanty” (Lyneis 1995:231) and is confined to some “Southwestern” tools at the mines (Leonard and Drover 1980; Blair and Winslow 2004) and small amounts of Southwestern pottery across the Mojave Desert (Rogers 1929; Ruby 1970; Drover 1979; Warren 1984; Lerch 1985a; Rafferty and Blair 1987; Schneider 1989). No Ancestral Puebloan communities are known in the vicinity of the turquoise mines, although Rogers (1929) suggested that such communities were present at the Mojave River Sink and Cronese Basin. Recent survey work in the area was unable to discover any evidence of an Ancestral Puebloan presence (Arend and Roth 2015).

It is also possible that Ancestral Puebloan people were not present in the eastern Mojave and that local groups (e.g., Chemehuevi and/or Mojave) were the actual miners who traded the material to the east (Drover 1980; Blair and Winslow 2004:183). The turquoise mines were known to the Southern Paiute and could be used by anyone who wanted to obtain material there (Kelly 1953:21:44), in essence, making it a common pool resource.

If Ancestral Puebloan people were actually present in this part of the desert, there is little reason to believe that they had any permanent settlement. The pottery likely represents trade items but probably does not signify the presence of any actual “farms” as implied by Rogers (1929:8), although it is possible that such facilities could reflect a temporary support system for the miners (Warren 1980:51).

### **The Yuman Presence: Hakataya**

It is widely believed that during, or even before, the Late Holocene, people speaking one or more Yuman family languages were present in the far western Southwest, the Colorado River area, and much of the Mojave Desert (Rogers 1945). Most of the archaeological attention to this presence has been focused on its manifestations after the introduction of pottery at about 1,500 BP. The archaeological expression of the pottery-bearing phases has been variously called Yuman, Hakataya, or Patayan (see Warren 1984:361).

In his use of the term, Rogers (1945) divided “Yuman” into three phases (I, II, and III), with its greatest extent in the Mojave Desert being that of Yuman I (Rogers 1945:Figure 1). The Yuman sequence was subsequently redefined as “Hakataya” (Schroeder 1957, 1979), whose influence across the Mojave Desert may have been fueled by trade with coastal groups (Warren 1984:423). Lower Colorado River pottery and Cottonwood points, along with the absence of Desert Side-notched points, are seen as markers of the Hakataya. The term “Patayan” has been adopted by some archaeologists to replace Hakataya, and it consists of three phases (I, II, and III) as defined by Harner (1958; also see Waters 1982). As the Patayans were specifically agricultural in orientation and the Mojave Desert “Yumans” were not, the term Hakataya is used here.

Based on his excavations at Rustler Rockshelter (CA-SBR-288), Davis (1962) proposed the existence of a

“Providence Complex” for the eastern Mojave Desert that consisted of three ceramic phases (I, II, and III). The sequence was expanded by Donnan (1964), who proposed four “pre-Yuman horizons” (Tule Springs, Lake Mohave-Playa, Pinto Basin, and Amargosa), a “non-ceramic” Yuman horizon (following Rogers 1945), a ceramic Yuman horizon, and a Shoshonean horizon. Warren (1984:395) thought that the “Providence Complex, possibly preceded by a ‘nonceramic Yuman’ assemblage,” could represent Hakataya influence in the southeast Mojave Desert, generally believed to indicate a Mojave presence in the region.

If Hakataya is a ceramic entity, what preceded it in the eastern Mojave Desert? A “pre-ceramic” Yuman phase was posited by Rogers (1945:173–174) to replace his Amargosa complex (presumably his Amargosa II and III phases [Rogers, as cited in Haury 1950], then redefined as Gypsum [Sutton et al. 2007]). If we follow the theme that Gypsum is not a cultural entity, then populations using Elko and Gypsum points were present in the eastern Mojave Desert, as can be seen at a number of sites such as Rustler Rockshelter (CA-SBR-288) (Davis 1962; Sutton 1992, 2005). These people must have reentered the Mojave after about 4,000 BP, and it seems most likely that they were Late Archaic groups living along the Colorado River who began to use the eastern Mojave Desert on an occasional basis, essentially a pre-ceramic Hakataya phase. They probably brought Southwestern traits with them, such as split-twig figurines (e.g., Coulam and Schroedl 2004).

Byrd et al. (2011) proposed that Colorado River (called Patayan) groups may have used areas around major springs in the eastern Mojave Desert, either seasonally or during periodic short-term and task-specific logistical trips. Such trips would have likely “focused on upland resources, such as pinyon and bighorn sheep, not readily available along the Colorado River” (Byrd et al. 2011:64). Byrd et al. (2011:64) also thought it possible that the Desert Mojave lived

in the region on a year-round basis fairly late in time. Byrd et al. (2011:64) suggested that such a presence “entailed large territories, seasonal movements tied to resource availability, and a fluidly flexible adaptive strategy that was centered around the well-watered uplands, including the Granite, Providence/New York, and Clark Mountains” and may have entailed some horticulture (Byrd et al. 2011:64). Any such use of the eastern Mojave Desert by river groups would have been facilitated by their familiarity of the region from long-standing trade activities between the Colorado River and the Pacific Coast.

### **“Pre-Numic” Groups?**

The northeastern Mojave Desert was occupied by people prior to the arrival of Numic (e.g., Southern Paiute) peoples there some 1,000 years ago. The identity of these people are unknown; sometimes identified only as “pre-Numic.” It is possible that they were ancestral to later Virgin Anasazi groups or that they represented an extension of Yuman groups north of the Colorado River. Whoever they were, they were replaced by Numic groups late in time.

### **Discussion**

In sum, there were a number of Late Holocene groups living along the fringes of the Mojave Desert exploiting desert resources. These included such diverse peoples as Greven Knoll and Ancestral Puebloans. Each would have had a separate and unique adaptation to their core areas and would have exploited the Greater Mojave CPR in different ways. No doubt some of these uses overlapped, adding to the complexity of the archaeological record.

### ***Late Holocene Settlement and Subsistence in the Greater Mojave Common Pool Resource Zone***

After about 4,000 BP, people used the Mojave Desert in a fundamentally different manner from what has

previously been hypothesized. It was a dynamic place, and considerable change and interaction between groups undoubtedly occurred. Nevertheless, it is suggested that there was no full-time occupation of the Mojave Desert, with the exception of the Vanyumé living along the Mojave River later in time. Use of the Greater Mojave CPR was restricted to specific resource patches, sometimes opportunistically, but generally planned.

### **Resource Patches and Utilization in the Greater Mojave Common Pool Resource Zone**

The Greater Mojave CPR contained a large number of resource patches; a few were perpetual, some were recurring, and many were transient (see Table 2). Most abiotic resource patches were perpetual, while most biotic resource patches were not. In exceptional cases long-lasting, but ultimately impermanent, patches formed and were exploited. After about 1,000 BP, the Mojave River became a permanent linear oasis and the core territory of the Vanyumé.

Patches are typically areas that contain a suite of resources, although some (e.g., quarries) might contain only one. The types of sites within patches would reflect the exploitation of that patch, although its use may have varied depending on when and which cultural groups used it. Not all patches were used by all groups using the desert. Certainly, for some groups, certain resource patches were simply too distant to efficiently exploit; for example, the Kawaiisu did not make use of mesquite patches in the far eastern Mojave. However, the larger issue is that each of the groups on the desert fringe had their own subsistence (and other) systems in which they prioritized resource needs. Some patches, such as those with active springs, would have been important in all such systems and used by many groups. However, other patches, such as places where rituals specific to a particular group were held, may have been utilized only by that group.

### *Perpetual Resource Patches*

A perpetual resource patch is one that would have been available at any time of the year. Such patches would include places where abiotic resources could be found. Regarding water, that would mean perennial springs. Other abiotic resources would be places where raw materials could be obtained, such as toolstone, salt, and/or clay. Places where rituals were performed would also be perpetual. Finally, travel routes, large and small, would be available as perpetual resources (depending on the political situation).

In general, biotic resource patches would not be considered perpetual since most such resources are typically only available seasonally. A possible exception might be firewood, but it seems unlikely that groups would travel any significant distance to obtain specific types of wood for fires, unless required by ritual.

Between about 5,000 and 4,000 BP, when the Mojave Desert was largely abandoned, many of the abiotic patches (e.g., quarries) would have still been used, circumstances that should be reflected in the archaeological record. However, it is likely that many of the biotic patches used before the abandonment were dropped for a time and then reused after ca. 4,000 BP; the archaeological record should reflect that interruption.

Another perpetual resource patch is the perennial spring. While there are many springs in the Mojave Desert, it seems unlikely that many would have contained any substantial quantities of useable water year round. Many that did were located along the slopes of the mountains along the edges of the Mojave. Away from the fringes, perennial springs within the desert were few, but include Bitter, Piute, Soda, Marl, Salt, Saratoga, and Tecopa Hot Springs, among others. Hall (1981; also see Mendenhall 1909; Thompson 1929; Byrd et al. 2011:Figure 5) reported several hundred springs and seeps (of varying quality) in the eastern Mojave Desert alone, many of which were clustered

along the higher elevations of the Providence and New York mountains (see Hall 1981:Figure 3). Southern Paiute names for a number of springs in the northeastern Mojave Desert were listed by Fowler (2002).

One would expect camps to be located near perennial springs. Such sites would presumably be fairly large, having been used seasonally and overprinted over long periods of time by task groups or even families utilizing nearby resources. Other archaeological manifestations, such as rock art to “tag” the spring, should also be present.

Abiotic raw material sources are also perpetual resource patches. The primary abiotic raw material used by people in the Mojave Desert was toolstone, mainly for flaked stone tools. Quarries or source localities are also known for other abiotic necessities, such as stone for ground stone tools, salt, pigments, and clay. Quarries for toolstone range from small outcroppings of flakeable stone used just a time or two to huge exposures of raw material encompassing several square miles and representing thousands of years of exploitation.

Perhaps the best known quarries in the Mojave Desert are the obsidian sources of the Coso Volcanic Field (CVF), located on the northwestern edge of the Mojave Desert and used throughout the Late Pleistocene and Holocene (Gilreath and Hildebrandt 1997). However, the CVF lies within the core area of the Koso Shoshone, which is not within the Greater Mojave CPR. Additional obsidian material is known to exist in several places in the east-central Mojave Desert, but that obsidian occurs as small pieces of float with no actual quarry and is not commonly identified in archaeological collections.

Several “hard rock” rhyolite quarries are known in the western Mojave Desert. The largest is at Fairmont Butte (CA-LAN-898), and most of the rhyolite artifacts in that region probably came from that quarry.

At some of the Fairmont Butte sites, rhyolite artifacts constitute over 90 percent of the total lithic assemblages (Glennan 1971; Robinson et al. 1976; Sutton 1982b, 1988a). Other rhyolite quarry areas are known in the Rosamond Hills (Sutton 1990b; Scharlotta 2010; also see Scharlotta 2014). A number of chalcedony and chert quarries are also known in the western Mojave (e.g., Harry 1992; Lerch et al. 2009).

The dominant toolstone quarry type in the Mojave Desert is the pavement quarry, primarily made up of macrocrystalline volcanics (e.g., basalt and rhyolite), macrocrystalline metamorphics (quartzite), or cryptocrystalline sedimentary silicates (CCS) (chert, chalcedony, and jasper). There is no question that toolstone use varied through time (e.g., Bamforth 1990, 1992), and a good case can be made that basalt and similar materials were more heavily utilized in the early and middle Holocene (Basgall 2000; Byrd et al. 2005) with CCS materials being more popular later in time (e.g., Byrd et al. 2009). Pavement quarries were used during Gypsum times (Bamforth 1990; Giambastiani 2008; Byrd et al. 2009) when there was an emphasis on the production of cores and/or bifaces for transport elsewhere.

The apparent change in toolstone preference from macrocrystallines in the Early and Middle Holocene to CCS stone in the Late Holocene might be explained by travel distance from the quarry to the residential camp. Basalt weighs about 3.0 g per cm<sup>3</sup>, while CCS weighs about 2.6 g per cm<sup>3</sup>. Thus, if it was necessary for people to transport raw materials from a quarry to their residential camp at a substantial distance, it would be more economical to carry CCS materials. Further, this shift in material preference occurred at about the same time Elko points were adopted. Manufacture of the wide and thin Elko points would have been much easier using CCS materials.

It seems likely that toolstone quarries were generally utilized as part of a direct procurement strategy in

which a planned trip to a particular quarry was made (Binford 1977, 1979; Gould and Saggers 1985).

Because of the increased costs of direct procurement, one would expect an emphasis on high-quality raw materials. This is not to say that people never visited quarries during the course of other activities (an embedded strategy) (Binford 1977, 1979, 1983). For example, if a hunting party was headed home empty-handed, the hunters may have chosen to stop by a quarry and at least take some toolstone home. Thus, the primary archaeological signature of quarries would be reduction for transport, rather than the manufacture of finished tools. As such, these sites would not generally contain evidence of finished manufacturing debris such as pressure flakes, although retooling might leave a minor signature. Further, such sites would consist of an amalgamation of small to large lithic scatters; innumerable individual reduction events merged together into a very large debris field, such as the one documented at CA-SBR-4522 on Fort Irwin, which is essentially a 4,000 acre pavement quarry (Stanton et al. 2013).

Wilke and Schroth (1989) classified lithic sources in the Mojave Desert as quarries (primary or secondary), lithic raw material prospects, and ephemeral stone acquisition and use sites. They proposed that quarries were “places where people obtained raw stone in quantity, presumably on a fairly consistent basis,” as part of a direct procurement approach (Wilke and Schroth 1989:170). In such cases, one would expect small camps, probably used by specialized task groups, to be associated with quarries. Wilke and Schroth (1989:171) further proposed that prospects (places with less stone than quarries) were visited as adjuncts to a direct procurement approach unrelated to stone procurement. That is, people visited prospects during the course of other activities, such as hunting or small-seed procurement, and rather than stone procurement, these other activities “actually determined the positioning of people on the landscape” (Wilke and Schroth 1989:171). In such

a case, one would expect the primary archaeological signature to be of the primary task, such as seed procurement, with the secondary task (prospecting) being less apparent. Finally, they defined ephemeral stone acquisition as taking place in locations where stone was “quickly flaked to the desired edge, used as a tool, and discarded on site” (Wilke and Schroth 1989:171), a tactic that would be expected, regardless of the procurement strategy.

Quarries intended for ground stone tool manufacturing would also be expected. One such example is the Elephant Mountain quarry (Schneider 1993; Schneider et al. 1995) in the central Mojave Desert just east of Barstow, where tabular slabs of andesite were quarried and shaped into metates and pestles. Some petroglyphs are situated along the southern edge of the site. Schneider et al. (1995:217) reported that the site was used as early as 3,000 BP and was still being used in ethnographic times.

Another metate quarry (CA-SBR-5932) is known in the Castle Mountains within the northeastern Mojave Desert (Schneider 1993). Here, naturally occurring tabular basalt was quarried to manufacture metates. Other site types, such as camps, rockshelters, lithic and pottery scatters, and petroglyphs, are known in the immediate vicinity, and they contain artifacts suggestive of use by different groups (Schneider 1993:239, 251). Schneider (1993:262–263) further noted that granitic dykes in various geologic formations in the eastern Mojave Desert also served as ground stone tool quarries, and an example from the Colorado Desert was discussed (see Schneider 1993). Such locations would constitute important abiotic resource patches.

A number of turquoise mines are present in the eastern Mojave Desert. The best known are in the Halloran Springs area (e.g., CA-SBR-130 and -131) (Rogers 1929; Heizer and Treganza 1944:335–336; Leonard and Drover 1980; Jenson 1985; also see

Warren 1984:421–422; Blair and Winslow 2004; Byrd et al. 2011:72). Most scholars believe that the mines were operated directly by Ancestral Puebloan people (Blair and Winslow 2004:183; also see Byrd et al. 2011:72), but it is possible that local people (e.g., Chemehuevi and/or Mojave) were the actual miners and traded the material to the east (Drover 1980; Blair and Winslow 2004:183).

Prehistoric turquoise mines are also known at Crescent Peak, at the east end of the New York Mountains (Vredenburg 1996; also see Fowler 2004; Earle 2009:105). These deposits were known to Matavi-um, a Southern Paiute consultant to Isabel Kelly, as having been available to anyone who wanted to obtain material there (Kelly 1953:21:44), essentially making it a CPR. Kelly (1953:21:41, 21:41b) further noted that turquoise was an important exchange item for the Chemehuevi, who provided it to the Mojave to be strung with shell beads.

Other important abiotic resource patches would be where salt and clay occurred. Salt was obtained at a variety of locales and was extensively traded (e.g., Davis 1961; Heizer 1978b). Two salt mines were reported in southern Nevada, one in the far eastern Mojave (Harrington 1925, 1926) and another near Danby Lake (Laird 1976:17). Salt was also obtained from dry lake beds, such as the Jean, Ivanpah, and Roach playas (Laird 1976:269). Salt sources have been reported near the Barstow-Daggett area (Kroeber 1925:762) and at Koehn Lake (Zigmond 1938:635). It is also possible to extract salt from salt grass (*Distichlis spicata*; see Hallock 2015), with no “mine” being present. No clay “mines” are known in the Mojave Desert, although some must certainly exist. Salt and clay mining sites would leave only ephemeral traces and would be extremely difficult to locate unless there were associated small camps.

Finally, ritual places are also perpetual resource patches and include some rock art sites, geoglyphs,

and other places where power emanates. However, localities specifically identified, as in the ethnographic record, as ritual places are relatively few in the Mojave Desert. Many such places must be present but simply have not been recognized or reported. One possible issue, particularly with rock art, is when researchers find a place with a camp and some rock art, it is assumed that the rock art was an adjunct to the camp. However, it may be that the intended principal focus of the place was the rock art, and the camp was the adjunct to accommodate the ritual participants (assuming the two sites/loci are contemporaneous).

Rock art is widespread across the Mojave Desert and includes both pictographs and petroglyphs. A number of large and complex rock art localities are known, including the Coso Rock Art District (Steward 1929; Grant et al. 1968; Heizer and Baumhoff 1962; Heizer and Clewlow 1973; Gilreath and Hildebrandt 2008), Black Canyon west of Barstow (Turner 1994), Halloran Springs (Turner 1991), and the Foxtrot site north of Twentynine Palms (McCarthy 1979; Hedges and Hamann 1992). Many other smaller rock art sites are known, including some 246 recorded within the Mojave National Preserve in the eastern Mojave Desert (Byrd et al. 2011:32; also see Rector 1981) and another 59 in the Granite Mountains (Christensen 2001).

Both the dating (Steward 1929; Grant et al. 1968; Heizer and Baumhoff 1962; Heizer and Clewlow 1973; Clewlow 1978; McGuire and Hall 1988; Whitley 1992, 1994, 1998; Hildebrandt and McGuire 2002; Pearson 2002; Gilreath and Hildebrandt 2008) and the function (Grant et al. 1968; Heizer and Baumhoff 1962; Wilke and Rector 1985; Whitley 1992, 1994, 1996, 1998, 2000; Keyser and Whitley 2006; Gilreath and Hildebrandt 2008) of rock art have been vigorously debated. Dates proposed range from the Late Pleistocene through the Late Prehistoric, and proposed functions range from hunting magic to costly signaling (a means of achieving prestige).

There seems to be little doubt that some rock art originated for generally secular purposes, including markers for trails (e.g., Horne and Musser-Lopez 2015), springs, and boundaries. Such secular sites would be located in a variety of settings largely influenced by physiography (e.g., at springs and in passes) and could be associated with other types of archaeological remains, such as small camps or cleared circles along trails.

Other rock art sites served ritual functions, such as to increase hunting success, to facilitate rainmaking, or as ritual management of resource patches. Rock art sites with cosmological or celestial significance (e.g., Everson 1994) are also known across the Mojave Desert, such as at Aiken Wash (Benton 1986) and Counsel Rocks (Rafter 1985, 1987) in the Providence Mountains area. This aspect of Mojave Desert cultural systems is very poorly understood.

Other ritual sites (some of which also contain rock art) may have served an initiation function for both males and females. A potential example of this is the Seep Spring site (CA-SBR-51) in the western Mojave Desert, which Wells (2014) suggested as at least partly intended for female initiation rites, among other uses (e.g., a gathering place [Walsh 2010]). Another possible ritual site is at Counsel Rocks (CA-SBR-291) in the Mojave National Preserve (Cameron and Rafter 1983; also see Christensen and Dickey 1996), which has considerable rock art and a large rock feature reminiscent of a birth canal that was modified and apparently worn down from people sliding through the opening. Cameron and Rafter (1983) suggested that this site was a “birthing” locale. Possible “vision quest” sites have been identified at Eggshell Cave in the western Mojave (CA-KER-341) (O’Donnell et al. 1997) and at the Mojave Desert Slot Canyon rock art site near Death Valley (Liwosz 2014). Such ritual sites were often located at some distance from the major base camps or villages, perhaps in an attempt to make the journey arduous, thereby increasing the importance and meaning of the ceremonies.



The Foxtrot site (CA-SBR-161), located in the south-central Mojave Desert (McCarthy 1979; Hedges and Hamann 1992), might be another example of a ritual initiation site. It is located some 60 km (36 mi) northeast of the closest portion of the eastern San Bernardino Mountains, and apparently it dates primarily after about 1,500 BP (McCarthy 1979:9). Foxtrot contains at least 490 panels of both pictographs and petroglyphs (Hedges and Hamann 1992:3), each of which might have been a “storyboard” to provide text for the rituals (e.g., Stewart et al. 2009). Multiple rock art styles and techniques have been identified at the site, suggesting influences from both the Coso area in the northwestern Mojave Desert and the Colorado Desert to the south (Hedges and Hamann 1992:8–10), perhaps indicating use by multiple cultural groups. A habitation locale (CA-SBR-9565) that dates from the Gypsum period to the Late Prehistoric period is situated along the western side of the Foxtrot site, and it may have been a camp utilized by ritual participants, probably “task groups” consisting of elders, possibly shamans, and young initiates (McGuire 1998).

Another possible example of this type of ritual locality may be at Lavic Lake/Pisgah Crater, where pavement quarries, camps, rock art, rock alignments, rock rings, cairns, cleared circles, and connecting trails were found (McDonald and McCarthy 2006). These sites generally date to Gypsum times, although some “ancestral Yuman” (Hakataya) sites were found around the lake (McDonald and McCarthy 2006:138, 140).

Geoglyphs are most likely a different type of ritual place, with many examples known across the Mojave Desert (von Werlhof 1987). A geoglyph is a large design created on the ground using elements of the landscape (usually stones) and is typically only visible in its entirety from some elevated distance. Such formations can range from simple rock alignments to complexes of “trails” connecting rock circles and cairns (e.g., Denning Spring, CA-SBR-3829) (Sutton 1987b; Byrd 1998:465–488) to complex geometric

designs (e.g., the Topock Maze) (Haenszel 1978; Musser-Lopez 2011). Johnson (1986) linked some geoglyphs along the lower Colorado River to ethnographic cosmology and noted that the Mojave viewed trails and geoglyphs as being from the same spirit creators.

A number of large complexes of cairns are known that have no obvious hunting function, such as at CA-SBR-221 in the central Mojave (Taylor et al. 1987) and at CA-SBR-10,386 in the northwestern Mojave (Walsh and Clewlow 2006). In some cases, cairns were used to cover burials (Wilke 1978).

Extensive survey work in the Granite Mountains in the eastern Mojave Desert has resulted in the recordation of more than 170 sites, including “base” camps, temporary camps, transient camps, trails, lithic scatters, caches, and 59 pictograph and petroglyph rock art localities (Christensen et al. 2001:Table 8, 44). The presence of the rock art suggested to Christensen et al. (2011:1; also see Dickey 1994; Christensen and Dickey 1996, 1998, 2001; Christensen et al. 1999a, 1999b) that the Granite Mountains constituted a center of ritual activity over the last 4,000 years.

Christensen et al. (2001:57) proposed three “chronological episodes” of rock art production in the eastern Mojave Desert. The earliest and most numerous is Western Archaic Tradition (Great Basin Abstract) art of unknown antiquity or affiliation, but believed to be pre-Numic, older than about 1,000 BP. The subsequent episode is the “Grapevine” style, forming a “small component” of the total rock art and believed to represent the Patayan (Hakataya) and ancestral Mojave (Yuman) groups. Finally, the “most recent appearing rock art, black sketched pictographs, may be Chemehuevi” (Christensen et al. 2001:57). The presence of three different styles of rock art in the Granite Mountains that have been attributed to at least two different groups (Mojave and Chemehuevi), along with the influences from both the northwestern Mojave and

the Colorado Desert as noted at Foxtrot (Hedges and Hamann 1992:8–10), support the idea of the cultural dynamics of the region.

Also of interest is the identification of a possible sheep shrine at the Rose Spring site (CA-INY-372) (Yohe and Garfinkel 2012). If its function was ritual, its presence in an established “village” appears unique. Of additional interest is the identification of specific places in the natural landscape that served as foci of ideological significance, such as Pilot Knob in the western Mojave Desert (Allen 2011). A number of such natural features have been identified ethnographically across California as traditional cultural properties (e.g., Stoffle et al. 1997).

### ***Recurring Resource Patches***

Many biotic resources are seasonally available in the same place (patch) every year; that is, they recur on an annual, predictable, and reliable basis, although with occasional failures. Such recurring resources may be abundant (e.g., pinyon and mesquite) or limited (e.g., a stand of small seeds). Other resources, such as large game, would be available within a large patch (e.g., a mountain range) on a more or less continual basis.

Some recurring patches are of abundant seasonal biotic resources. Such patches would have been available and concentrated within a relatively small geographic area in the Mojave Desert and include pinyon, mesquite, and yucca. Pinyon-juniper woodlands are present in the higher elevations of a number of mountain ranges within the Mojave Desert, mostly in the east (e.g., the Providence, New York, and Clark ranges). These pinyon stands would be relatively small, as the ecozones within the mountain ranges are small (Keeler-Wolf 2007:620). Pinyon is available in the fall, and one would expect seasonal pinyon camps, probably used by family groups, to be located at such patches, like those found in the Coso Range

along the northwestern edge of the Mojave (Hildebrandt and Ruby 1999, 2006). Of interest is the fact that the pinyon in the Mojave Desert is *Pinus monophylla*, a highly productive and predictable resource (Sutton 1984).

Mesquite pods are available in the fall (Schroth 1987), but mesquite wood and small animals that live in mesquite stands would be available all year. The two species of mesquite have a differential distribution (Keeler-Wolf 2007:623–624). Honey mesquite (*Prosopis glandulosa*) is highly dependent on permanent groundwater and can be found associated with drainages, seeps, playas, and sand dunes. The distribution of screwbean (*P. pubescence*) is more sporadic and is mostly associated with riparian habitats, such as along the Mojave and Amargosa rivers. As with pinyon, one would expect large seasonal camps used by family groups to be associated with stands of mesquite, particularly along major playas such as Rosamond and Rogers lakes (Byrd et al. 1994), Koehn Lake (Sutton 2016c), and the Cronese lakes (Drover 1979).

Various species of agave and yucca are present in the mid-elevation ecozones of the central and eastern Mojave Desert (Keeler-Wolf 2007:635). Both plants are known ethnographically as important resources (Kroeber 1925:695–696; Bean 1972, 1978:578; Bean and Shipek 1978:552; Bean and Smith 1978) and are available for food in the spring and early summer and for construction materials at any time. Archaeological data on the use of agave and yucca in the Mojave Desert are few. Krosen and Schneider (1991; also see Venner and Benton 1980; Blair 1986; Rafferty and Blair 1987) excavated several large rock ring middens at CA-SBR-798 and CA-SBR-806 in the Clark Mountain area. They found that agave (*Agave cf. utahensis*) was probably roasted in these pits. Other roasting pit features, or “ring middens,” are known across the desert and may have been constructed to process similar foods (Schneider et al. 1996).

Resources with a more limited return, but still having temporal and geographic predictability, would include stands of economically valuable plants. Such resources would include plants harvested for their seeds and/or for their greens. The seasonality of these resources would be variable, but certainly known.

Plant resources for greens and seeds would have included a large number of species (see Barrows 1900; Zigmond 1981; Ebeling 1986; Fowler 1986, 1995; Thomas et al. 1986). Greens were available in the spring but often had to be processed to remove the salts (Kroeber 1925:592). Seeds were available primarily in the summer. At least some of the same plants gathered for greens in the spring were also used for seeds in the summer; that is, a small plant patch may have been visited twice during a year. In such cases, people gathering greens in the spring would have had the opportunity to evaluate the summer seed crop potential of that same patch and may have employed that information to plan which seed patches to visit in the summer.

In addition, geophytes were important plant resources, and the roots and bulbs were used as food, medicine, and raw materials (Benedict 1924; Kroeber 1925:695–696; Strong 1929; Drucker 1937; Bean 1972, 1978:578; Bean and Smith 1978:571; Zigmond 1981). Geophytes used for food include members of the Liliaceae family, such as blue dick (*Dichelostemma capitatum*), grassnut (cf. *Brodiaea* spp.), and possibly a species of *Calochortus* lily. Other species were used for various purposes. The useful products of most of these plants became available in the late spring or early summer.

In the northwestern Mojave Desert, numerous small thermal features, often in association with milling tools, have been found in the China Lake Basin (Gilreath and Hildebrandt 1997; Gilreath and King 2003; Rosenthal and Eerkens 2003). These features are a central signature of Late Prehistoric land use in the region, suggesting a shift from geophytes to small seeds

late in time, possibly associated with changing plant densities, population pressure, social preferences, or a combination thereof (Eerkens and Rosenthal 2005:27–30). These small resource patches of geophytes, seeds, or both would have been predictatively available on a seasonal basis.

At these patches, one would expect associated small sites with thermal features, milling equipment, and/or lithic debris. If the patch required an overnight stay, relatively small seasonal camps with milling equipment and lithic debris may be present. Over time, camp overprinting might result in the formation of a much larger site. It seems possible that milling equipment would be left at the site from year to year and could be a marker of a recurrent patch. Lithic debris generated at the camp would probably not be reused and so would accumulate through time, perhaps to the point where the site would appear to be a large lithic scatter with a few milling tools, rather than a small site with some milling tools and lithics.

Large game in the Mojave Desert was limited, primarily consisting of artiodactyls (deer, bighorn sheep, and pronghorn), with perhaps an occasional bear or mountain lion. For the most part, these animals were found in large, well known patches, deer and bighorn sheep in mountain settings and pronghorn in the valleys. Hunting deer and sheep would have necessitated considerable effort by low-density intercept hunting (e.g., Thomas et al. 1986:268). Hunters would need to travel to the hunting area (patch), determine the location of the animals, and then track, kill, process, and transport them back to the base camp. It is likely that considerable ground would have been covered by relatively small groups of hunters. In some cases cairn complexes may have been used as hunting features for bighorn sheep procurement (Sutton 1987c; Sutton and Wilke 1988; Schneider et al. 2014). A number of small camps in the mountains would be expected to be present, such as at Nopah Cave (CA-INY-2535) (Sutton and Yohe 1987).

Pronghorn hunting was a communal activity, although they were sometimes hunted by individuals (Driver 1937:62; Thomas et al. 1986:267). A pronghorn hunt involved families or groups of families, including some from neighboring areas (Steward 1938:82, 1941:220, 272; Thomas et al. 1986:267). Pronghorn traps have been reported ethnographically in the Indian Wells Valley (Steward 1938:80–82), and while no archaeological examples are known in the Mojave Desert, they have been documented in other parts of the Great Basin (e.g., Arkush 1986, 1995; Lubinski 1999; Wilke 2013; Ruby 2016). Such trap facilities would also have included camps, tool rejuvenation locales, and butchering areas.

Patches containing small animals would be widespread and numerous. Such areas would have been visited repeatedly in planned actions, although opportunistic events may have occurred. Since certain small animals inhabit particular ecozones, these patches would vary depending on the prey. For example, black-tailed hares (*Lepus californicus*) reside in flat, open spaces and were hunted communally (Chamberlin 1911:336; Egan 1917:235–237; Steward 1941:220–222; Thomas et al. 1986:268; Zigmond 1986:400), while chuckwallas (*Sauromalus ater*) live in rocky areas and are hunted individually (Wallace 1978). Other small game, such as rodents, birds, and insects, had their own unique patches and required different procurement tactics.

Archaeologically, one would expect communal hunting sites to consist of localities where the animals, such as lagomorphs (e.g., CA-KER-250 and -261) (McGuire et al. 1982) or desert tortoises (*Gopherus agassizii*) (e.g., CA-KER-517) (Harvey et al. 2005; also see Schneider and Everson 1989), were processed. Such sites could contain considerable faunal material as well as processing tools and features along with tool manufacturing and/or rejuvenation debris (i.e., lithic scatters). Small trap features, such as grasshopper trenches (e.g., Drucker 1937:9; Bean 1972:61–62), might

occasionally be present (Sutton 1995). Evidence of individual hunting would be limited, perhaps confined to isolated projectile points or small lithic scatters if carcass processing occurred in the field.

Both communal and individual hunting and processing sites would be very common and typically within short commuting distance to base or seasonal camps, although evidence of some individual hunting could be present almost anywhere. Communal hunting of small animals would have been undertaken by one or more families, or even larger groups, and may have entailed a great deal of preparation.

Some plants were used for raw materials and medicine (e.g., Barrows 1900; Bean and Saubel 1972; Zigmond 1981; Ebeling 1986). Such materials would be gathered for the manufacture of basketry, sandals, rope, cordage, netting, clothing, and many other purposes. Medicinal plants included tobacco. Each target plant would likely be present in relatively small, but numerous, patches located near base camps along the fringes of the desert where they could be easily managed (e.g., tobacco pruning), monitored, and gathered by female task groups tethered to the camps. Such gathering “day spots” would be very difficult to detect archaeologically.

Lac resin was gathered and used as mastic and adhesive (Sutton 1990a; Stacey et al. 1995, 1998). This resin is found on the branches of creosote bushes, but only in some areas of the desert (few sources are currently known). Like plants gathered for raw materials, its collection would leave little archaeological evidence. However, the use of such resin can be seen on a variety of artifacts, including basketry, pottery, and even ceremonial objects, such as the “wand” from Newberry Cave (Stacy et al. 1998:65).

Another example of a biotic raw material is juniper staves for bows (e.g., Wilke 1988), which would be present where junipers grow, such as in the Coso Range (Hildebrandt and Ruby 2004). Bow stave trees require

decades of careful management and were frequently monitored (Wilke 1988). Evidence of this activity is present in the archaeological record, but probably without great time depth due to preservation factors.

As people visited and returned to specific places, it is reasonable to expect that they would cache equipment and supplies for later use. Such practices are reported ethnographically (Rogers 1936; Driver 1937; Drucker 1937; Steward 1938; Laird 1976), and there are a number of archaeological examples of such behaviors from the Mojave Desert. Cached ollas and baskets containing seeds and food have been found in various locations throughout the desert (e.g., Campbell 1931; Schneider 2000; also see Swenson 1984), and a cache of rodent trap lines (perhaps 2,000 years old) was found at Ord Shelter (CA-SBR-2846) in the central Mojave (Echlin et al. 1981). In the Death Valley area cached baskets containing foodstuffs have been found at several sites (Lathrap and Meighan 1951:19–20; Yohe and Valdez 1996).

At Mitchell Caverns (CA-SBR-117) in the eastern Mojave Desert, two cache pits were found, one containing 27 pine cones along with a variety of other materials (Pinto 1989). In the nearby Cave No. 5, a cache of winnowing trays and other materials was found (Sutton and Yohe 1988). At the adjacent Southcott Cave (CA-SBR-334) several pottery vessels thought to have contained stored foodstuffs were found, as well as a winnowing tray and other materials (Sutton et al. 1987).

Another function of caches involves funerary activities. For example, the Kawaiisu placed bodies in rock fissures (Siefkin and Sutton 1995), and the Western Shoshone placed bodies in baskets, which were then hidden in the landscape (e.g., Reed et al. 2009).

### ***Transitory Resource Patches***

Small, temporary patches of various resources would have appeared as the result of rainfall. For example,

patches of seed plants might be expected relatively soon after rain from a thunderstorm. Such places would have been noted and later reconnoitered for potential resources, much like the Hopi did to place opportunistic corn fields (Hack 1942).

Unanticipated short-term biotic resources, such as those formed by unexpected rainfall, would include a variety of small plants. Patches of such plants would have been visited and evaluated during trips for other activities, such as hunting. If these patches were deemed productive, they would be revisited at the proper time and the products (e.g., greens, seeds, nuts) collected by specialized task groups.

Other unexpected short-term resources could include insects, such as grasshoppers and crickets (Sutton 1988b). The archaeological evidence of this might be small sites with milling tools, hearths, lithic scatters, and/or occasional trap features, such as grasshopper trenches (e.g., Drucker 1937:9; Bean 1972:61–62). Faunal remains of insects (e.g., chiton from exoskeletons) are rarely considered (Sutton 1995) and consequently are rarely recovered (but see Madsen and Kirkman 1988).

Phyllo pods would have been another patchy, short-term resource (e.g., Yohe 1987; also see Henrikson et al. 1998). These small crustaceans include fairy shrimp (*Artemia* spp. and *Branchinecta mackini*) and tadpole shrimp (cf. *Triops* spp.). They commonly appear in huge numbers in many of the numerous desert playas experiencing ephemeral lake stands lasting as little as one week (e.g., Brostoff et al. 2010). Birds feeding on these animals may have also been procured.

Sites associated with obtaining and processing these resources would be relatively small and could include metates scattered along playa shorelines, hearth features, and lithic scatters. The positioning of many of these sites would vary depending on the location of

unexpected lake stands (and other factors), but sites along playas would be predictable. For example, a fairly large number of “isolated” metates have been found along and above the shoreline of Ford Lake southeast of Joshua Tree National Park (AECOM 2016). Although there is currently no direct linkage (e.g., protein residue tests) of these tools to phyllopod exploitation, the setting and artifact distribution is what one would expect for the exploitation of this resource. Features along the northwestern shoreline of Silver Lake may have also been used to procure phyllopods (Schneider et al. 2017).

The use of domesticated plant species in the Mojave Desert mostly dates to the historical period. However, Rogers (1929:8) reported the presence of Ancestral Puebloan sites and by implication agricultural activities in the Cronese Basin, although no evidence of such facilities has since been found. A few temporary horticultural plots were reportedly used by the Mojave very late in time (Jackson and Spence 1970:676). Such facilities would have been located in areas with reliable water, at least during the growing season, such as along the Mojave River or at springs. Archaeologically, these sites would manifest themselves as small, modified landscapes with associated small camps containing cultigens.

#### ***Long-Term Resource Patch Exceptions***

In exceptional cases environmental conditions resulted in the creation of long-term and highly productive, but ultimately temporary, ecozones. For example, the Mojave River is known to have experienced episodes of heavy flooding that filled a number of basins in the eastern terminus of the river, including Soda and Silver lakes, for substantial lengths of time (Wells et al. 1989, 2003; Enzel et al. 1992). Moreover, Wells et al. (1989) reported that during historic times at least eight temporary lakes (lasting from two to 18 months) formed in Silver Lake as a result of Mojave River flooding.

The Mojave River flows east out of Afton Canyon into the Mojave River Fan-Delta, and depending on the quantity of flow, the water may either filter into the water table, flow east into the Soda Lake Basin, or flow north into the Cronese Basin (Wells and Anderson 1998:202). The river is at an elevation of about 371 m as it flows out of the eastern end of Afton Canyon and into the channels of the Mojave River Fan. If the river flows into a north-sloping channel, it would flow into the Cronese Basin (326 m elevation); if not, it would flow east into the Soda Lake Basin (276 m elevation) and eventually into Silver Lake, which is lower in elevation than Soda Lake. North-flowing flood events would create lakes in the Cronese Basin, although local rainfall alone could sometimes create short-term lakes (Drover 1979:19).

Once the flood subsided, the influx of water would be cut off, and the lakes would desiccate. However, during the flood, the water would carry with it the progenitors of a variety of biotic resources, including small fish (e.g., Mohave tui chub [*Gila bicolor mohavensis*]), shellfish (*Anodonta* sp.), and pond turtles (e.g., *Actinemys marmorata*). Other animals (e.g., water birds) and plants (e.g., tules [*Scirpus* sp.], cattail [*Typha* sp.], and rushes [*Phragmites* sp.]) would have quickly colonized the lake shorelines.

Wells and Anderson (1998:Tables 23 and 35, 219; also see Schneider 1994:Note 2) identified seven major Late Holocene lake stands in the Cronese Basin (ca. 3,500, 1,700, 1,100, 700, 550, 380, and 220 BP), which is largely consistent with the record at Owens Lake (Stine 2003). These lake stands held substantial quantities of water for a decade or more, enough time for colonies of freshwater mussels (*Anodonta*) to become established (Schneider 1994:49).

A number of archaeological investigations have been undertaken in the Cronese Basin, although only a few have been published (see discussion in Drover 1979:129–134). Rogers (1929, 1945) documented

a series of sites along the margins of West Cronese Lake that included shell middens, cremations, manos, metates, and mortars. He identified several components, including Middle Holocene (albeit minor; confirmed by Drover 1979:134–135), “Puebloan” (Rogers 1929:10–11), preceramic Yuman (Rogers 1945:173–174), and Yuman (Rogers 1939:38).

Drover (1979) tested two of the sites (CA-SBR-259 and CA-SBR-260) along the shoreline of East Cronese Lake that were associated with a series of major lake stands. He thought there may have been a number of early lake stands, including ones at about 7,000, 5,500, and 3,500 BP (Drover 1979:172). The 3,500 BP lake stand (Drover 1979:171) would fall into the “Amargosa” phase of Rogers’ (1939:38) chronology, now commonly referred to as Gypsum. However, while a long-term “oasis” may have been present, there is little archaeological evidence of any Gypsum presence. It is possible that people reentering the desert at that time were not yet in a position to take advantage of the opportunity. The absence of any sites dating to the ca. 1,700 BP lake stand proposed by Wells and Anderson (1998) is a bit more perplexing since by this time people would certainly have been aware of the opportunity. It is possible that evidence of any such presence is buried in the alluvium.

Later lake stands were posited by Drover (1979:172) sometime around 1,100, 630, 450, and 240 BP, dates that are broadly consistent with the geomorphic data (Wells and Anderson 1998). Based primarily on pottery types, Drover (1979:221–222) thought that the 1,100 BP lake stand may have been associated with Ancestral Puebloan groups and that later stands were associated with Hakataya (Patayan or Yuman) groups but not “Shoshonean” people, since “[c]haracteristics typical of ‘Shoshonean archaeology’ such as described for Death Valley are *not* present in the Cronese Basin” (Drover 1979:222, emphasis in original). Drover (1979:Tables 18 and 19) found substantial quantities of *Anodonta*, as well as some remains of small fish,

pond turtles, and aquatic plants at the tested sites, attesting to human use of the lake resources.

York (1989) tested three sites (CA-SBR-128, CA-SBR-6017, and CA-SBR-6018) in the mesquite dunes on the southern side of East Cronese Lake. While these sites were not on the lakeshore, geomorphic data revealed that they were inundated at about 1,000 BP and 200 BP, indicating major lake stands (York 1989:45). Projectile point types and radiocarbon data demonstrated that each of these sites dated to post-800 BP. They were interpreted as small temporary camps (York 1989) that may have been associated with mesquite exploitation. Cisneros et al. (2016) tested several hearths at the nearby CA-SBR-4198 site, all dated to within the last 400 years.

Survey work by Byrd and Pallette (1998) along the western shoreline of West Cronese Lake identified several dozen sites, primarily lithic scatters or small camps but including a few quarries (rhyolite and chert). The sites contained numerous thermal features, pottery, ground stone, and *Anodonta* shell, and all apparently dated late (Byrd and Pallette 1998:544, Table 81).

The Cronese Lake stands and associated use by people are good examples of highly productive “pop-up” oases. Once established, people would have moved to this kind of patch to utilize its large suite of resources. These resulting habitation sites may have been “long-term” base camps, centers of subsistence for relatively large social units extending for a decade or longer. It seems likely that the 1,100 BP lake stand may have attracted Ancestral Puebloan and Hakataya people from the east.

After about 1,000 BP, however, the entire Mojave River appears to have formed a linear riparian oasis that was inhabited by the Vanyumé (Sutton and Earle 2017), people from the west or south. Thus, any pop-up lacustrine oases along the river would have been

incorporated into the existing Vanyumé settlement/subsistence system and probably outside the then reconfigured Greater Mojave CPR. Such lake stand ecozones would still have been very special places, probably used by non-Vanyumé by permission only. The idea of Vanyumé use is further supported by the presence of both pinyon and acorns at CA-SBR-260 (Drover 1979:Table 19), providing archaeological evidence of the ethnographic pattern of the Vanyumé importing these resources from the Serrano in the San Bernardino Mountains (Sutton and Earle 2017). Further, it appears that the Cronese Basin may have been within the ethnographic territory of the Vanyumé Perveatum clan (Bean et al. 1981:270–271; Earle, 2004b:34; Sutton and Earle 2017).

#### *Ancillary Places*

A variety of ancillary places (sites) could be expected to be located immediately outside or partly outside of actual resource patches. Such sites would include travel routes with associated camps and localities associated with resource monitoring.

Travel routes, or trails, are not patches per se because they usually contain no physical resources. However, depending on their placement, they can save time and energy, which can be considered resources. Trails can also be placed to facilitate monitoring various (mostly biotic) resource patches, and that information is also a resource. Sites and features associated with trails could include small camps, shrines, and cairns (e.g., Walker 1931:18). Other sites, such as geoglyphs, may have been the destination of trails. Still other sites along a trail, such as an animal kill site, may have been the result of an opportunistic event while traversing a trail. There are three general types of trails: major trade trails, trails from base camps to resource patches, and everyday trails crisscrossing the landscape. In places where everyday trails have been specifically sought out and mapped, they have been found to be ubiquitous (e.g., James 1987, 2004).

The major trail, or trail network, used primarily for trade is known as the “Old Mojave Trail” (Farmer 1935; Sample 1950; Davis 1961; Ruby 1970; Heizer 1978b; Smith and Fauvelle 2015). This trail began in northeastern Arizona, ran west to the Colorado River, then across the eastern Mojave Desert to the Mojave River sink (Soda Lake), and then followed the Mojave River to Cajon Pass into southern California. For travel to the southern San Joaquin Valley or Santa Barbara area, the trail left the Mojave River, passed through the Antelope Valley, and proceeded toward Tejon Pass. This trail was used extensively by the Mojave (Heizer 1978b:691) and later by Euroamericans, who referred to it as the Mojave Road (Casebier 2010). King and Casebier (1981:245) noted that wherever there was water available along the trail, petroglyphs were present.

Byrd et al. (2011:74, Figure 24) developed a least-cost model (following Morgan 2008) to predict the locations and routes of possible trade trails across the Mojave National Preserve in the eastern Mojave Desert. The locations of trails were predicted by linking major population centers in California, Nevada, and Arizona as proxies for prehistoric centers. This model has yet to be tested.

During travel to other resource patches or ritual places, unexpected small resource patches might have been encountered and opportunistically exploited. For example, if a group of men on a trading mission happened to encounter a bighorn sheep along a trail, they would probably try to kill it. If they were successful, a small kill site and camp would probably be present along that trail. In another example, if a task group traveling to a known patch of seed plants noticed that the agaves on the adjacent hills were unusually large, they may have diverted to that patch.

Archaeologically, one could find a variety of small, opportunistic processing localities, such as isolated hearths or roasting pits (e.g., Yohe and Sutton 1991;



Schneider et al. 1996) and small lithic scatters with expedient tools. Such sites would be difficult to categorize as to function and date.

During trips for hunting or any other purpose, the condition of particular resources along the way would be monitored to help make tactical decisions (e.g., Sutton 2000) for the next season or year (e.g., pinyon stand monitoring) (Sutton 1984). In some cases, purposeful trips to specific important patches might be made to monitor those areas. Thus, it is possible that some small camp sites in the Mojave Desert were stopovers from resource monitoring trips.

### **Archaeological Expectations of the Model**

In addition to the expectations of site types associated with resource patches discussed above, a number of general predictions can be made regarding the archaeological record of the Late Holocene Mojave Desert. First, there should be no permanent year-round base camps in the Mojave Desert proper. There could be a few mimics, such as the Cronese example, but close examination should show they were short-lived. However, after about 1,000 BP, villages would have developed along the Mojave River as the Vanyumé inhabited the length of the Mojave River year round.

Second, many of the temporary camps seen in the Mojave Desert would have been used by a variety of different cultural entities, with the probability of use by any particular group decreasing as the distance from their core areas increased (see Morgan 2008). That is, camps within a general region would contain evidence of short-term occupations by those groups bordering that region, but not groups at the other end of the desert. In addition, these occupations would vary by time as groups on the fringes of the desert passed through a dynamic prehistory. Such local use patches would include general hunting areas for small animals and general gathering areas, both of which would have been exploited by sex-based and age-based task groups.

For example, a particular site in the eastern Mojave Desert might have various Hakataya components, perhaps interspersed with Ancestral Puebloan components between 1,100 and 900 BP, and later in time, assorted and repeated use by the Serrano, Vanyumé, Mojave, and Chemehuevi. Unfortunately, it is likely that such individual occupational events would be difficult to tease out of the archaeological record.

An exception to this would be areas containing bighorn sheep. These hunting areas (e.g., the higher mountain ranges) were relatively few and scattered across the desert. These areas would have been used by many groups, even if the travel distance was great. Hunting camps in these areas across the desert should reflect use by many groups.

Third, there should be a paucity of human remains in the Mojave Desert proper, with no permanent cemeteries, except perhaps within the Vanyumé region after about 1,000 BP. It seems plausible that people who died while in the desert and had permanent homes on the edges of the desert were cremated and the remains returned home, or perhaps they were buried expeditiously, such as under rock cairns (Wilke 1978). Thus, in the primary villages on the fringes of the desert, one would expect inhumations and secondary cremations (e.g., at the Siphon site; CA-SBR-6580) (Sutton et al. 1993). Exceptions would include the long-term use of the Cronese lakes (Drover 1979; Thomas 2011:21) and the post-1,000 BP Vanyumé sites that could contain cemeteries with inhumations and even some cremations, as seen at Guapiabit (CA-SBR-1913) (Sutton and Schneider 1996:28), Turner Ranch (CA-SBR-66/182) (Gust et al. 2015), Lenwood (CA-SBR-1549) (Moffitt and Moffitt 1993), and other places along the Mojave River (e.g., Smith 1963:87, 99).

Fourth, sacred places such as rock art localities and astronomical sites would have been used by only one or two groups because each would have had a different belief system and each would have had a different

set of sacred places (some of which may have overlapped). The camps associated with these places would also reflect use by only a few groups. The Foxtrot site (CA-SBR-161) with its multiple cultural influences (Hedges and Hamann 1992:8–10) is an obvious exception.

Lastly, quarry locations would have been used by groups living relatively nearby. Most quarried stone types, such as basalt, rhyolite, and chert, are commonly found across the desert, and because transport costs were high, such materials should have been processed at or near the quarry (Shott 2015; also see Beck et al. 2002). For example, it does not seem likely that rhyolite used in the western Mojave would have been imported from the Colorado River, particularly given the presence of rhyolite quarries in the western Mojave.

An obvious exception is obsidian, because its sources are much more constricted. The major source of obsidian for much of the Mojave Desert—indeed much of southern and central California—is the Coso Volcanic Field (CVF) located along the northwestern fringe of the Mojave, in ethnographic times within the core territory of the Koso Shoshone. This material was quarried by local groups and traded down the line. Being located within the Koso core area, it would not have been a common pool resource. Other obsidian sources dispersed over a wide area of the eastern Mojave, such as Bagdad, probably were common pool.

Stand-alone lithic scatters (not lithic assemblages within other site types) are a ubiquitous site type in the Mojave Desert and range greatly in size. In some cases, the sites represent short-term reduction activities, but most such scatters should be generally associated with quarry localities. In other cases, lithic scatters would reflect the production of formed tools, such as at a hunting camp where retooling would take place or where the exploitation of a particular resource would require a specific tool type.

However, it seems likely that many lithic scatters reflect the production of expedient tools, often just flakes, to be used for the specific task at hand. If these flake tools came from bifacial cores, the debitage would appear to represent biface production or reduction rather than flake tool production. It also seems possible that such flake tools, and their resultant production debris (the lithic scatter), could have been produced by women obtaining and processing short-term biotic resources (Walsh 2000). Use-wear and protein residue analyses of the debitage might determine the function of such expedient tools (e.g., Yohe et al. 1991).

Lithic scatters may contain a variety of other signatures, such as children learning to knap or an adult male killing time while accompanying a female task group (Walsh 2011). In the former case the core “tools” and debitage would probably be of very poor craftsmanship. In the latter case, there may be biface thinning and pressure flakes present (Walsh 2011). Either signature would have little to do with the primary function of the site.

### **Rethinking the Ethnographic Mojave Desert**

The ethnographic data (e.g., Kroeber 1925) indicate that nine different ethnographic groups lived in or claimed portions of the Mojave Desert (Figure 2): the Kawaiisu, Koso Shoshone, Tübatulabal, Kitanemuk, Serrano (including the Vanyumé), Southern Paiute, Mojave, Chemehuevi, and Cahuilla. A tenth group, the Tataviam, may also have held claims to portions of the western Mojave Desert (King and Blackburn 1978:535). These groups were hunter-gatherers except the Mojave, who lived along the Colorado River and practiced horticulture. Considerable literature exists on these peoples (see various chapters in Heizer [1978], Ortiz [1983], and d’Azevedo [1986]), and a number of recent ethnographic overviews are available regarding various portions of the Mojave Desert (e.g., Bean and Vane 2002; Earle 2004b, 2009; Baksh and Hilliard 2005).

Ethnographic descriptions show “territories” assigned to each (e.g., Kroeber 1925:Plate 1), and while the borders vary from source to source (see discussion in Baksh and Hilliard 2005:49–71), they all depict “solid” borders between them with no gaps or common areas. Anthropologists certainly recognize that such boundaries are neither firm nor accurate representations of past realities, that boundaries between groups were estimated, and that boundaries varied through time. Nevertheless, aboriginal boundaries are usually neatly arranged to produce visually simple maps, leaving the reader with the impression of solid and largely differentiated territories.

Common or joint use areas are rarely acknowledged or reported. One exception was described by Knack (1981:Figure 7), who mapped a fairly large “area of intermittent joint use” to the southeast of Twentynine Palms, an area situated between the Serrano and Cahuilla on the west and the Chemehuevi and Colorado River groups to the east. Baksh and Hilliard (2005:Figure 12) depicted a kaleidoscope of overlapping tribal boundaries within the Twentynine Palms area. That map is probably reasonably accurate and serves as a testament that most of the region was actually a common use area.

The Timbisha Shoshone (Steward 1938; Wallace 1977; Fowler 1995, 1996, 2002, 2004) and Southern Paiute (Kelly 1934; Stewart 1942; Jenkins 1982; Kelly and Fowler 1986; Fowler 2002, 2004) did have their “core” areas within the Mojave Desert itself, albeit along its northern edges, although the Southern Paiute may have moved there only within the last 1,000 years or so. Jenkins (1982:Figure 11) outlined the seasonal round of a winter village in the Clark Mountains, showing seasonal trips into the lower portions of the eastern Mojave Desert. However, most of the other ethnographic groups with territory in the Mojave had their “core” areas outside the desert, either along the Colorado River in the east or in the mountain ranges along its edges, with seasonal use areas extending out into the Mojave Desert proper.

This general pattern of core areas on the periphery of the Mojave with occasional use of the desert is a common theme among the ethnographic groups of the Mojave Desert, and many examples could be offered. It is perhaps best illustrated by information available for the Kawaiisu. Zigmond (1938:Figure 3, 1981:2, 1986:Figure 1) clearly showed the Kawaiisu core area in the southern Sierra Nevada as well as the Paiute and Tehachapi mountains, but with an area where “seasonal trips” extended well out into the Mojave Desert. Zigmond (1938:635) noted that “Just how far Kawaiisu territory stretched eastward into the desert is impossible to say” and that the “desert was conceived of as an area for occasional excursions, never permanent residence.” For example, Zigmond (1938:635) reported that the Kawaiisu “went periodically to the dry lake at Saltdale for mineral salt” and to “the other side of Randsburg” [apparently either to the Lava Mountains or Red Mountain] to obtain obsidian.” Zigmond (1938:635) added that the “Kawaiisu subsistence economy is distinctly montane; desert flora and fauna assume a minor role.”

### *The “Desert” Kawaiisu*

Steward (1937, 1938:Figure 7) assigned the lower half of Panamint Valley (south of Ballarat) to the Kawaiisu, but he reported that there were few winter residents in the region. He remarked that there was no water in the valley for winter villages and was careful to add that little was known about this region (Steward 1938:84). Steward (1938:76, 92) assigned the southern Death Valley area to the Kawaiisu or to mixed groups within which the Kawaiisu predominated.

Driver’s (1937:58) Kawaiisu consultants claimed that their territory extended as far east as the Panamint Mountains. Driver (1937:58) also noted that the Chemehuevi in the Death Valley area were referred to as Kawaiisu, so there may have been some confusion regarding the tribal identity of residential “Kawaiisu” in these regions. There are several other references to Kawaiisu (or “Panumint”) being in that area (see

Earle 2004b:76, 77). It has also been reported that the Kawaiisu had a “Head Quarters” (village?) north of Saratoga Spring (Casebier 1972:41), and one of Steward’s consultants reported that a “Panamint Tom” was the chief of the Death Valley Kawaiisu (Steward 1938:85, 92–93). On the other hand, Zigmond (1938:637) denied the assertions of both Steward (1937, 1938) and Driver (1937) that the Kawaiisu lived as far east as the Panamint Mountains, although he stated that the Kawaiisu did enter the desert on trips to obtain specific resources.

Using these data, a separate “Desert Kawaiisu” group has been proposed as inhabiting the northwestern Mojave Desert (Earle 2004b; Underwood 2006; Garfinkel and Williams 2011). It has been argued that they had a separate population, a separate village (the “Head Quarters”), a separate polity (with a “chief”), and a separate subsistence system centered in the Panamint Mountains.

### *The “Desert” Mojave*

Kroeber (1959) reported the presence of a group called the “Desert Mohave, Land Mohave, or Like-Mohave,” and referred to as the Tiira’ayatawi by the Chemehuevi (also see Laird 1976:141–142; Van Valkenburg 1976:230–231; Lerch 1985b; Earle 1997, 2004, 2005:6–7, 2009). The Desert Mojave were described to ethnographers by the Chemehuevi as a group with Mojave cultural and linguistic affiliation, but who lived in the eastern Mojave Desert, dressed like the Chemehuevi, had bows like them, and hunted like them, but spoke Mojave and cremated their dead.

The Chemehuevi claimed that they had killed the Desert Mojave in a war of uncertain date, but probably before the 1770s, and took over their territory east of Soda Lake (see Earle 2004b:57–61). There is mention of some Mojave growing melons on the Mojave River (Jackson and Spence 1970:676), but a few other references noted that they were hunting

(Kroeber 1959:296–297; Stewart 1969:269). There is another account of a Desert Mojave village in Mojave oral tradition (Kroeber 1972), but most of the Mojave seen by Europeans in the central and eastern Mojave Desert were traveling (e.g., Earle 2004b:57), not surprising given their well-established trade system. Kroeber (1953, as cited in Stewart 1969:269) placed the western boundary of the Mojave along the crests of the mountains just west of the Colorado River, an area that did not include most of the Mojave Desert.

Kroeber (1948:28) hinted at another possibility found in several stories, that the “victorious attackers of the [Desert] Mohave, coming from the desert Providence mountains, are not the Chemehuevi who historically inhabited this range, but a separatist band of Mohave who are represented as having settled there, contrary to economic possibility for a farming people.” Perhaps it is imprudent to read too much into this passage, but the phrase “separatist band” suggests the possibility of political discord within the Mojave bands such that one of them left the Mojave Valley for the desert. It would have been a short-lived venture.

### *The Chemehuevi*

The Chemehuevi are a band of Southern Paiute (Kelly MS, 1934:549, 1932–1933, 1936) that diverged and moved south into the Mojave Desert within the last 200 years or so (Kroeber 1959:294). They appear to have displaced the Mojave along portions of the west bank of the Colorado River (Kelly 1934:556; Rogers 1936:38; Kroeber 1959:262; Stewart 1968:13; Van Valkenburgh 1976:2; Harrington 1986:reel 146, frame 144). Kroeber (1959:262, 294) contended that the Chemehuevi movement had initially occurred “within the desert” and only later did they occupy portions of the west bank of the Colorado River and become farmers (also see Kroeber and Kroeber 1973). Thus, it seems that the Chemehuevi were “desert” people who inhabited areas that had been used on a seasonal

basis by adjoining mountain people (the Serrano and Cahuilla) and river (the Mojave).

However, it also seems plausible that the core area of the Chemehuevi was in the Chemehuevi Valley along the west bank of the Colorado River, an area they seized from the Mojave. The Chemehuevi may have then ventured west into the eastern Mojave Desert, intermittently and opportunistically using various springs, the Mojave River (after the demise of the Vanyumé) (Sutton and Earle 2017), and traveling as far west as the Antelope Valley (Earle 2015:43). The Chemehuevi raided settlements south of Cajon Pass and interacted with the survivors of the Mountain Serrano (Bean et al. 1981:32). It does not seem likely that the central Mojave Desert was ever a core area for the Chemehuevi.

#### ***Conflict in the Greater Mojave Common Pool Resource Zone***

Hunter-gatherer violence and warfare in California and adjacent areas has been an important area of research over the past decade or so (e.g., Allen and Jones 2014). Eerkens (1999:298) had argued that an intertribal CPR system would have allowed groups to obtain resources within a mutually agreed upon set of rules, suggesting that conflict would be minimal.

Indeed, there is a paucity of evidence of conflict in the Mojave Desert in spite of the apparent overlapping and assumed interaction of so many groups in the Greater Mojave CPR. The majority of people in the ethnographic Mojave Desert were Northern Uto-Aztecan, either Numic or Takic. Sutton (1986) noted that while the Numic (and Takic?) were generally at war with their non-Numic neighbors, they rarely fought among themselves. How far back into the past this putative peaceful pattern existed is unknown.

Late in time, as the Chemehuevi moved south along the Colorado River, they came into conflict with the

Mojave, and there are suggestions of open warfare in the eastern Mojave Desert (Earle 2004b:57–61). In addition, there is evidence of people being killed along the Mojave River in ethnohistoric times, when in 1819 the Spanish explorer Nuez found about a dozen local Natives (presumably Vanyumé) killed and burned, apparently by Mojave raiders (Beattie 1955).

#### ***Discussion***

There seems to be little doubt that there were Kawaiisu and Mojave people, even families, living in portions of the Mojave Desert at contact. However, whether these people constituted separate cultural entities, or “desert” branches, is another matter. In the case of both the Kawaiisu and Mojave, the recorded data show a few small groups of people here and there, perhaps with a “chief,” a “Head Quarters,” and/or a horticultural plot. These hardly seem the descriptions of independent cultural entities but are potentially good descriptions of the occasional use of a CPR by small groups away from their core areas. Perhaps the construction of these separate “desert” branches of their respective mountain or river groups by anthropologists fills some inherent need not to have unassigned territorial “gaps” (e.g., Eerkens 1999). It is possible that the low populations of Native people in the desert was rationalized by anthropologists as reflecting a mission-related depopulation, with the implicit assumption that populations were higher in the past and that the people encountered were survivors of “desert” groups. However, Earle (personal communication 2016) reiterated his belief that the Desert Kawaiisu were a real cultural entity.

Another possibility is that these “desert” groups could reflect people moving into the desert to escape the Spanish missions (Earle 2005:17–22). This seems unlikely for Vanyumé because they lived in established villages prior to contact, or for the Kawaiisu because they had little interaction with the missions. It is a

bit more plausible for the Mojave and Chemehuevi given their contact with Europeans along the Colorado River.

For the Kawaiisu, or Desert Kawaiisu, however, there is some evidence that the people observed in the southern Panamint Valley did live there on a relatively extended basis. It is generally believed that beginning about 1,000 years ago, Numic groups expanded across the Great Basin from homelands in the northeastern Mojave Desert/southern Sierra Nevada (e.g., Madsen and Rhode 1994; Sutton 1994). The Southern Paiute/Ute are believed to have split from the Kawaiisu at about this time and moved east. It seems plausible that the presence of “Desert Kawaiisu” so far east of the Kawaiisu core area might be a vestige of that movement.

### Conclusions

The goal of this article is to examine and question the prevailing premise that people resided in the Mojave Desert on a year-round basis during the Late Holocene (after ca. 4,000 BP), and it is argued here that they did not.<sup>1</sup> As a result, a new model of Late Holocene Mojave Desert has been presented, one that posits no year-round tenancy (with the exception of the late Vanyumé), that the entire Mojave Desert was effectively a common pool resource zone in which resource patches were exploited, that Gypsum and Rose Spring were not cultural entities but simply technologies adopted by various groups across the desert (and elsewhere), and that the Late Prehistoric pattern reflects ephemeral use of the desert into ethnographic times.

This archaeological model also brings into focus some ethnographic issues. As such, it is suggested that we reevaluate the merit of the ethnographic “Desert Kawaiisu” and “Desert Mojave.” It may be that these cultural entities are real, but they should not simply be accepted by convention.

A series of archaeological expectations is offered, including suggestions about the associations of site types, components, and resource patches. Testing the model will require an open mind to some long-held assumptions, that site function be better understood, and that the identity of site inhabitants be better determined. None of this will be simple.

### Endnote

1. Of course, it remains possible that Gypsum and/or Rose Spring “base camps” will eventually be discovered in the Mojave Desert, perhaps as buried components or deflated surface assemblages. If so, this model will have to be reworked.

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