Trade Routes and Contradictory Spheres of Influence: Movement of Rhyolite Through the Heart of the Western Mojave Desert

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Abstract A geochemical study of seven discrete areas within two rhyolitic formations in the Antelope Valley, California, has demonstrated that rhyolite artifacts could be sourced in the western Mojave Desert (Scharlotta 2010a). Provenance analysis of obsidian and rhyolite artifacts from four Late Prehistoric sites located on the northern and southern edges of the western Mojave Desert suggest direct procurement practices and the presence of a trade network through the Antelope Valley. Less clear is whether evidence for the movement of materials can effectively be used to infer particular cultural territories or specific cultural interactions. Ethnographic work in the Antelope Valley suggests that the areas surrounding each rhyolitic formation, as well as the archaeological sites, may have each been controlled by a different group. The boundaries described by ethnographers may not have accurately reflected the prehistoric territories of groups in the area, as mission contact likely altered regional populations prior to recording. Notes from early missionaries and explorers provide conflicting information regarding the location of villages, native groups, and associated territories within the Antelope Valley. Furthermore, reports suggest that enmity/amity relationships varied between regional groups over time, and that open conflict was occurring near Santa Clarita, California, during the 1770s, circumstances that likely inhibited trade networks between the western Mojave and coastal Chumash populations. The movement of lithic artifacts is examined in light of the different lines of evidence to infer modification of previous trade networks and territorial boundaries in the Antelope Valley.

Resumen Un estudio geoquímico de siete zonas diferenciadas dentro de dos formaciones riolíticas en el Antelope Valley, California, demostró que se pueden identificar los fuentes de los artefactos de riolita en el oeste del desierto de Mojave (Scharlotta 2010a). El análisis de la procedencia de los artefactos de

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obsidiana y riolita de cuatro sitios prehistóricos tardíos que se encuentran en los bordes norte y sur del desierto de Mojave occidental sugiere la costumbre de obtenerlos directamente y la presencia de una red de comercio a través de Antelope Valley. Menos claro es si se puede utilizar la evidencia para el movimiento de materiales efectivamente para deducir determinados territorios culturales o interacciones culturales específicas. El trabajo etnográfico en Antelope Valley sugiere que las áreas que rodean a cada formación riolítica, así como los sitios arqueológicos, pueden ser controladas cada uno por un grupo diferente. Los límites definidos por los etnógrafos pueden no reflejar con exactitud los territorios de los grupos prehistóricos de la zona, ya que el contacto misional probablemente alteró las poblaciones regionales antes de su registro. Las notas de los primeros misioneros y exploradores proporcionan información contradictoria con respecto a la ubicación de las aldeas, los grupos indígenas y sus territorios asociados en Antelope Valley. Además, los informes sugieren que las relaciones de enemistad/amistad variaron entre los grupos regionales a través del tiempo, y que ocurría el conflicto abierto cerca de Santa Clarita, California, durante la década de 1770. Esas circunstancias probablemente inhibían las redes comerciales entre el Mojave occidental y las poblaciones de los Chumash de la costa. Se examina el movimiento de los artefactos líticos a la luz de las diferentes líneas de evidencia para inferir la modificación de las redes de comercio anteriores y los límites territoriales en Antelope Valley.

The examination of cultural interaction in archaeology is necessarily biased by observations of the movement of material goods and ideas. In cases where distinctive patterns of artifact production can be attributed to a single geographic region or cultural group, the discussion changes from the abstract movement and interactions of goods and peoples to the nature of relationships. In complex societies, this process of interaction can often be used to infer state–hinterland relationships or the interactions between different political factions. For hunter-gatherers groups such as the Vanyumé, Serrano, Kitanemuk, and Tataviam in southern California, the movement of goods can be verified archaeologically, although the nature of the relationships between different cultural groups is largely speculative.

Long-distance exchange can be inferred from the presence of artifacts that are exotic to the area, materials such as obsidian in the western Mojave Desert. Determining how exotic objects were introduced into local Californian archaeological contexts is difficult; however, certain objects are traceable across geographic space through chemical composition analysis. Provenance

analysis can be used to determine origins of raw material sources. This information can be used to interpret the direction of movement and the mechanisms of exchange through spatial analysis of specific materials in archaeological assemblages.

In studies of California archaeology, obsidian has been demonstrated as a valuable raw material, often found at long distances from the geologic source. Studies in central and southern California have suggested that obsidian from particular sources, such as the Coso Volcanic Field, was traded far beyond local areas (e.g., Baugh and Ericson 1994; Hughes 2012). Non-glassy rhyolitic materials, however, have not shown similar patterns of use or movement in prehistory. This phenomenon is perplexing because although rhyolitic materials can vary greatly in terms of workability, the relative abundance of workable rhyolites is high when compared with high-quality obsidian (Figure 1).

There are two major rhyolite-bearing geological formations in the Antelope Valley (AV) that contain material of suitable quality to make refined lithic

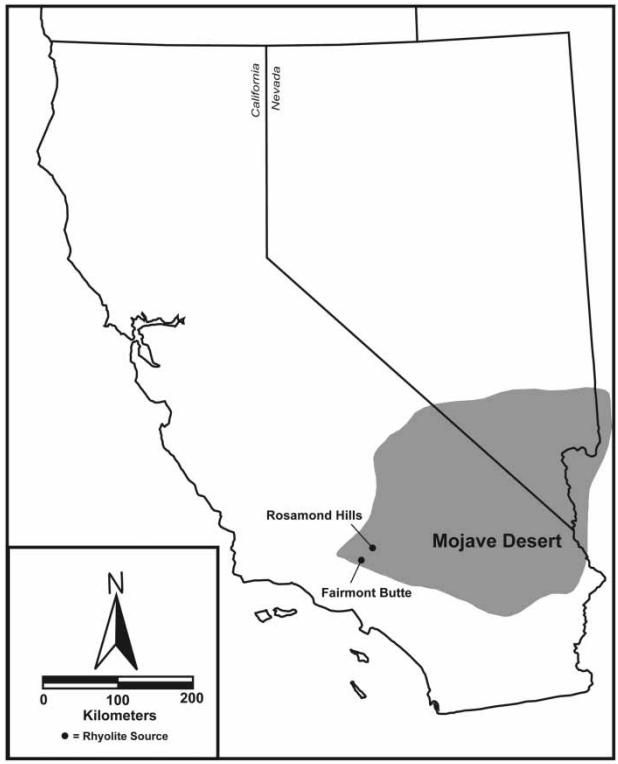

Figure 1. Map showing general study area and identifying relevant rhyolite formations. Geographic coverage of Mojave Desert follows cultural zones described by Sutton (1996).

artifacts: Fairmont Butte and the Rosamond Hills. Rhyolite was once thought to represent a temporal-typological attribute of sites in the western Mojave Desert, indicating Pinto-aged (9,000–5,000 B.P.) assemblages (e.g., Glennan 1971; Sutton 1982). The chronologies of these early sites have since been revised to suggest Late Prehistoric origins (900 B.P. to historic contact) (Sutton et al. 2007).

A recent study of Late Prehistoric non-glassy rhyolites from the western Mojave Desert region demonstrates that archaeological rhyolites can be effectively sourced using chemical analysis (Scharlotta 2010a). While rhyolite is a material resource that is not expected to travel on the same scale as obsidian, the procurement and exchange of rhyolite may illuminate new information about the movement of obsidian and other cultural interactions in this region.

Reconstruction of past interactions are complicated and complex for several reasons. Where the archaeological, historical, linguistic, and ethnographic records appear to overlap, these multiple lines of evidence can be cross-referenced to clarify and observe the extent of correspondence. In regions with strong ethnographic records, the problems are largely limited to discerning the directionality of movement and patterns of change through time that link prehistoric material culture to living populations. However, in cases where the ethnographic record is not as complete, the limited records can often present a puzzling mix of gaps in knowledge and apparent contradictions.

In the western Mojave Desert during the Late Prehistoric and early historic periods, it is difficult to determine the dynamic territorial boundaries and networks of interaction that operated between different groups known to have occupied the region in prehistory and into the ethnohistoric period, such as the Vanyumé, Serrano, Kitanemuk, and Tataviam. Studies examining the patterns of burials, genetic relationships between interred individuals and modern populations, chemical analyses of rhyolite and obsidian artifacts, as well as linguistic, ethnographic, and historical records, all contribute different layers towards understanding prehistoric interactions. Discussing the implications of scientific analyses of lithic materials in the context of various lines of evidence (discussed below) helps to determine the directionality of movement and to better interpret the mechanisms of procurement, exchange, and/or interaction.

Rhyolite Sourcing

Identifying the provenance of rhyolite artifacts has proven difficult in both the regional history of the western Mojave Desert and in lithic sourcing using

geochemical analysis techniques. There are numerous sources of rhyolite in the western Mojave Desert, both within the AV and smaller formations in the foothills and mountains surrounding the region (Figure 2), although its quality as a potential prehistoric lithic resource varies greatly. There are two main problems that have hampered rhyolite provenance research in the AV. First, previous research in the western Mojave Desert has postulated that most rhyolite artifacts originated from quarries located on the Fairmont Butte formation (Glennan 1971; Sutton 1982, 1988), with no clear alternative quarry sites. Second, rhyolite has a heterogeneous structure with considerable complexity in composition, rendering both visual and geochemical identification of materials problematic.

Glennan (1971) hypothesized an "Early Rhyolite Tradition" for the western Mojave based largely on his work at two quarry locations (CA-LAN-298 and CA-KER-302) (Figure 2). Excavations at these sites produced a lithic assemblage almost entirely composed of rhyolite, including projectile points diagnostic of the Pinto Period (4,000–7,000 B.P.) (also see Sutton 1982, 1996). The proposed early cultural complex, dating 7,000–5,000 years B.P., was characterized by the almost exclusive use of rhyolite over locally available and technically superior cryptocrystalline materials (Glennan 1970:7). This chronological claim was based on the similarity of a Pinto-like obsidian projectile point recovered

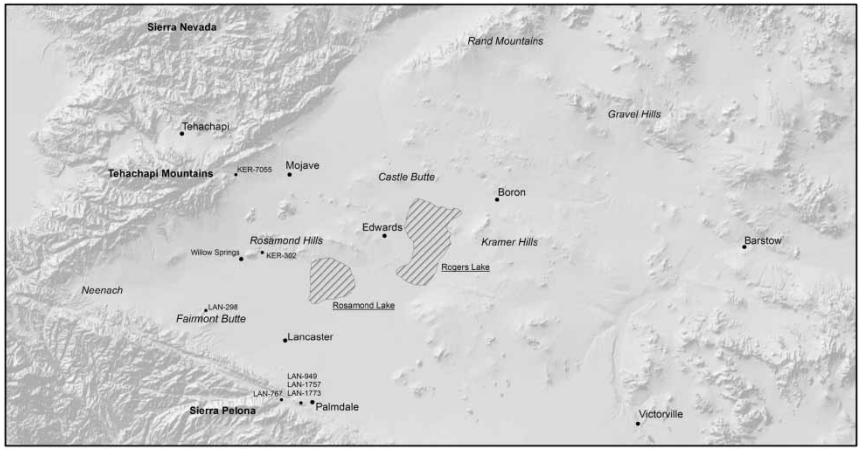

Figure 2. Map of the western Mojave Desert: ● denotes cities; • denotes the approximate location of archaeological sites; geologic formations containing rhyolite are shown in italics; mountains are shown in bold, and dry lakes are underlined. See Dibblee (1967) for additional geologic reference maps.

from CA-KER-302 to points reported from the Stahl site (Harrington 1957) and an obsidian hydration measurement (10.5 microns) that was also similar to readings from the Stahl site (Glennan 1971). The dominance of rhyolite in the lithic assemblages was also noted at several other sites in the AV that contained Pinto-like points, including CA-KER-505, CA-LAN-714, and CA-LAN-787 (Sutton and Robinson 1977).

This is in contrast with the work at CA-KER-303, a site with an upper component dated to the Late Prehistoric where rhyolite comprised only 39 percent of the debitage assemblage. Work at the Fairmont Butte site (CA-LAN-298) produced similar results to those reported for CA-KER-302, with most of the non-rhyolite materials observed in the upper layers and associated with Late Prehistoric diagnostic artifacts (e.g., Cottonwood projectile points and shell beads) (Sutton 1982). These data are supportive of Glennan's (1971) hypothesized complex, but other obsidian hydration readings from CA-KER-302 were not consistent with this temporal assignment (Meighan et al. 1974). A re-examination of the original data showed that the artifacts thought by Glennan to be finished tools were actually quarry blanks, and he suggested that the sites were from the Late Prehistoric Period.

The validity of the "Early Rhyolite Tradition" aside, the predominance of rhyolite artifacts has been used to tentatively date sites in the region to the Pinto Period (Sutton 1993). Revised chronologies have not attempted to attribute collections to a specific time period based solely on the presence or absence of rhyolite artifacts (e.g., Sutton et al. 2007). The temporal aspect of the "Early Rhyolite Tradition" has been refuted, yet the importance of the Fairmont Butte as the source location has received little additional discussion prior to recent geochemical provenance work in the AV.

A recent study by Scharlotta (2010a) demonstrated an effective method for compositional analysis by microsampling the groundmass of rhyolite using laser ablation–time of flight–inductively coupled plasma–mass spectrometry (LA-TOF-ICP-MS). Through the testing of geological samples and archaeological artifacts, this method indicates that provenance analysis is possible using rhyolite artifacts, as well as suggesting that the prevalence of Fairmont Butte rhyolites may not be accurate for all parts of the western Mojave Desert. Analytical results are now available for 51 artifacts from three Late Prehistoric sites near the western edge of Palmdale, California (CA-LAN-949, CA-LAN-1757, and CA-LAN-1773), as well as for 31artifacts from one additional site (CA-KER-7055) on the northern edge of the AV, between Mojave and Tehachapi, California (Figure 2, Table 1) (Scharlotta 2010a, 2010b).

Table 1. Provenance and Number of Rhyolite Artifacts in the Study Area.

Site	Rosamond Hills	Fairmont Butte	Unknown	Totals
CA-LAN-949	15	3	2	20
CA-LAN-1757	3	1	1	5
CA-LAN-1773	19	5	2	26
CA-KER-7055	30	0	1	31
Totals	**67**	**9**	**6**	**82**

The results highlight the importance of the Rosamond Hills as a raw material source for lithic artifacts and raise additional questions. Foremost is that the location of the first three sites lies significantly closer to one source than to the other, over relatively flat and unimpeded terrain (Figure 2). Linear distance from CA-LAN-949 to Fairmont Butte is approximately 28 km to the northwest directly across the valley floor, although only 10 km from Lake Elizabeth, the recorded location of a Tataviam village (King and Blackburn 1978). The difference in distance across the valley floor could be important depending on the season of travel. The Rosamond Hills are located 35 km to the north, across the valley floor. Thus, for the southern AV, there is a clear preference for rhyolite from the Rosamond Hills over Fairmont Butte, requiring greater travel across the valley floor.

In the northern AV, CA-KER-7055 is located near the junction of Tehachapi Willow Springs Road and Oak Creek Road, 17 km from the Rosamond Hills and 34 km from Fairmont Butte. The inhabitants of CA-KER-7055 used nearly all material from the Rosamond Hills, not surprising given their proximity, although clearly not in line with early hypotheses for rhyolite procurement. The predominance of Rosamond Hills rhyolite at these sites is clear. It is possible that groups from the southern and northern edges of the AV came into contact with one another while utilizing the same raw material source.

This idea prompts a number of questions. Was there a settlement in proximity to the Rosamond Hills that could have control over access? Was there systematic trade as part of an established network running through the middle of the AV using the Rosamond Hills as a meeting point or way station, or were materials periodically collected by small groups? Why did groups near Palmdale travel significantly farther, both in total distance and in potential minimal distance across the valley floor, for use of the Rosamond Hills? Does the differential movement of raw material indicate the type of procurement, direct or down-the-line exchange? Was lithic procurement embedded in mobility patterns

governed by seasons, subsistence activities, settlement patterns, or other cultural activities? Why were the Rosamond Hills not specifically noted in ethnographic accounts, or in earlier archaeological reconstructions of trade networks (e.g., Farmer 1935:Map 1; Sutton 1988:Figure 28)?

Several large sites have been excavated in proximity to the Rosamond Hills but it is not clear if these are settlement sites, seasonal aggregations, or intensive single-use or specific purpose sites. Areas adjacent to Willow Springs (e.g., Clevenger and Crawford 1997; Glennan 1971; Sutton 1980, 1988, 1993; Sutton et al. 2007), are the most likely candidates for a permanent settlement location due to perennial access to water, although temporary or seasonal sites could have included many locations. Father Garcés visited Willow Springs while following the old Horse Thief Trail (later known as Joe Walker Trail, see below) (Warren and Roske 1981). Willow Springs was also a stopping point on historic wagon trails, serving as a watering spot for numerous traveling parties and as a stage coach station. Garcés did not make any specific note of a village located at Willow Springs, but the importance and reliability of the springs as a water source is clear. Adequate water supported a continuous population near the Rosamond Hills, but this alone does not provide evidence of the presence of a single group controlling the area.

Willow Springs was identified as a California Historic Landmark by the Office of Historic Preservation in 1934 (Marker No. 130), denoting the stopping of the Garcés party at the location while following the Horse Thief Trail, although this may have been the result of confusion of party members. As noted above, portions of the Horse Thief Trail, sometimes referred to as the Old Spanish Trail, were also termed Walker's Trail, after Ute Chief Walker or Wakara, the renowned horse thief. The major extent of the Horse Thief Trail that connected Los Angeles and southern California with northern New Mexico did not traverse the Antelope Valley, following a course from the Cajon Pass and along the Mojave River to the east (Hafen 1948; Warren and Roske 1981; Wiseman 2013).

Alternatively, the travels of Joseph R. Walker included linkages between Salt Lake City and California, passing through the Sierra Nevada to the Owens Valley and later expeditions through the territory of the Mojave and into Arizona (Miller 2003, 2004; O'Meara 1915). Trails that would become the Owens River Road later connected to Fort Mojave, Willow Springs, and Lake Elizabeth through the AV (Warren and Roske 1981). It is possible that multiple trails were used by horse thieves, or that the details of multiple trails and historical expeditions were incorrectly related to specific individuals.

One aspect of Garcés's expeditions was to establish mapped trails, or travel routes, through explored regions that could potentially lead to trade in material goods, the movement of military equipment and/or personnel, and the proselytizing efforts of missionaries. The presence of established trails through the heart of the AV prior to the arrival of Garcés and other European expeditions is highlighted by examples such as the Horse Thief Trail. The moniker for this specific trail was largely due to events in the 1840s when Ute horse thieves would take horses from California across the Mojave to sell in New Mexico (TEC 2007). The native guides that Garcés and other expedition leaders relied upon followed locally known trade and information routes linking settlements and water sources in desert regions. Systematic trade between the southern California coast and the Great Basin is well documented (e.g., Chartkoff 1989; Howard and Raab 1993; Hughes 1994, 2012; Sutton 1989; Sutton and Koerper 2009) and it is very likely that some of this trade passed through the AV area.

With other sources of rhyolite located throughout the western Mojave Desert (Dibblee 1967), it is unlikely that any one group would have had reason to try to limit control over access. Furthermore, with rhyolite prevalent in lithic assemblages throughout the AV, consumption patterns suggesting a local resource without great trade value, and rhyolite formations occurring in areas outside of the AV (e.g., the Chocolate Mountains [Jennings 1967]), it is doubtful that rhyolite would have been traded over long distances, barring significant differences in material quality.

Experimental knapping of numerous cobbles from both Fairmont Butte and the Rosamond Hills has not produced any clear difference in workability of tool stone (Fraser-Shapiro 2007). Reduction efforts were limited to exploring the possibility of inter- versus intra-formation differences in material quality and did not aim to produce highly refined artifacts. It remains possible that differences were present in terms of cobble size and quality for particular purposes, although none were observed in previous studies. Thus, control over the Rosamond Hills may have been physically possible, but the benefits are not clear and any evidence to support such control was gone by the time Garcés visited the area in 1776.

Travel across the open valley floor would have been difficult during some portions of the year due to the intense heat, wind, and lack of cover; however, prior to historic agricultural impacts, the water table was significantly closer to the surface and a number of artesian springs and seasonal creeks along the valley floor may have been accessible for water in prehistory (Johnson 1911). As such, travel across the valley is hypothesized to have been difficult

and kept to a minimum except during times of the year when water was predictable. This would support the concept of the desert as a marginal zone of little use or interest to groups such as the Tataviam or Kitanemuk—who lived primarily in the hills and mountains surrounding AV—with only seasonal presence within the valley (e.g., Beals and Hester 1971) and trade networks that largely followed its perimeter, avoiding the valley floor and open desert areas when possible (Sutton 1988).

Following this assumption, people would likely travel first to Elizabeth Lake in order to interact with the villagers there, to trade for raw materials, and/or to rest before making a much shorter trek into the desert for rhyolite. The total distance to Lake Elizabeth and then to Fairmont Butte is approximately 30 km, which is shorter than the linear distance to the Rosamond Hills. The season of travel and rhyolite procurement is not known, although it would have been more arduous during either the peak of summer or winter.

One difference between the destinations is the location and proximity of predictable water sources. Willow Springs represents a perennial spring on the western end of the Rosamond Hills and Rosamond Lake may have been seasonally filled to the south and east (see Figure 2). Amargosa Creek, exiting from Leona Valley very near CA-LAN-949 (between Lancaster and Palmdale), once flowed across the valley into Rosamond Lake. This creek could have provided a sporadic or seasonal water source for travelers trekking between Palmdale and Rosamond, or simply supplied a pathway with some cover from the elements when it was dry. From Rosamond Lake, the Rosamond Hills are between 6 and 10 km away, depending on what portion of the formation was used as a destination, with a total travel distance of over 40 km. Pathway or not, the total travel distance is 10 or more additional kilometers, a difference in distance and effort likely not lost on any traders or foragers returning with rhyolite cobbles.

The existence of settlements in proximity to Lake Elizabeth, Willow Springs, and other remnant lakes east of the Rosamond Hills suggests the possibility of a local population capable of either limiting access to rhyolite resources or encouraging down-the-line trade by producing tool blanks or partially reduced cobbles for trade. The presence of primary and secondary debitage at CA-LAN-949 indicates that primary cobble reduction was occurring at the site, rather than secondary processing or refinement of prepared cobbles or cores (Fraser-Shapiro 2007). If primary reduction was taking place near Palmdale, cobbles of rhyolite were being transported, intact, from the Rosamond Hills or Fairmont Butte, characteristic of direct procurement as opposed to traded goods.

If primary procurement was the norm, then why were additional transportation costs being incurred by prehistoric populations? One likely reason is that rhyolite was not the only resource accessible at Rosamond Hills. If rhyolite was procured in tandem with another resource traveling along a trade route, then additional transport costs would be reduced—limited to procurement and carrying efforts without requiring an additional trip. Two of the best known resources funneled through the AV by way of bi-directional trade are obsidian from Coso and shell beads from the Santa Barbara coast. Coso obsidian likely moved along with embedded procurement strategies; that is, both rhyolite and obsidian were being accessed at Rosamond Hills, whereas rhyolite could be directly accessed only at Fairmont Butte.

The most direct and least cost travel route, in terms of terrain, from the Coso Range to coastal southern California is to go through the heart of the AV and follow the corridor through the mountains that is now the path of Highway 14. Evidence to support the use of the Rosamond Hills as a way station along that network suggests that the valley floor was not a hindrance to travel or exchange, and that any potential risks or hardships associated with the journey were outweighed by the reduced overall length of the pathway.

The more difficult question of why the Rosamond Hills were not noted in ethnographic accounts, or highlighted in previously hypothesized trade networks, is largely speculative. The lack of an ethnographic note may have been a simple omission, or may be evidence that the Rosamond Hills were not viewed as a significant territory or as containing important resources that may have been owned by any of the groups encountered by either Garcés or ethnographers during the early twentieth century. Archaeological reconstructions of prehistoric networks rely on ethnohistoric information about village locations and interactions or relationships mentioned by informants. If early explorers made no mention of a location being important to local inhabitants, then it is possible that the area was not of specific importance, at least at the time of contact.

Ethnographers were working many decades after initial contact with Spanish missionaries and explorers, as well as subsequent miners, ranchers, and settlers. Territorial boundaries and networks of trade or cultural interaction may have significantly changed during this period of time, with specific resources or networks no longer considered significant within the living memories of informants. As such, archaeological evidence is the only means by which information on prehistoric networks of interaction can be reconstructed.

Obsidian Sourcing

Geochemical analysis of 29 obsidian artifacts from CA-KER-7055 indicated the use of only one obsidian source, the West Sugarloaf subsource in the Coso Volcanic Field, approximately 120 km north-northeast of the site (Skinner and Thatcher 2010). Not all obsidian artifacts recovered during excavations at CA-KER-7055 were analyzed, so it cannot be unequivocally stated that site occupants were trading or consuming only West Sugarloaf obsidian.

In order to investigate the chronology of the obsidian artifacts and the possibility that materials representing a single source were the result of a short-term event in trade or procurement, hydration rinds were also analyzed for the same artifacts. Results indicate that a long-term pattern of procurement and/or trade existed between the northern AV and the Owens Valley, in proximity to the Coso Volcanic Field. Twenty-six of the artifacts yielded hydrations rinds from 3.3 to 5.6 microns, corresponding with the later Newberry, Haiwee, and Marana periods in the Owens Valley (Eerkens and Rosenthal 2004), or the late Gypsum, early Rose Spring, and Late Prehistoric complexes in the Mojave Desert (Sutton et al. 2007). The remaining three artifacts have hydration rinds between 7.4 and 9.1 microns and likely date to the middle Holocene, although samples with large micron values may reflect the reuse of older artifacts. The hydration rind indicates only how long the surface has been exposed to the atmosphere and not specifically when it was procured or traded.

Eerkens and Rosenthal (2004) examined the different geochemical subsources of Coso obsidian and determined that West Sugarloaf was the preferred source for trade and the production of projectile points. This may be partly related to the nature of the formation, which is accessible as a bench formation from which large pieces can be obtained as opposed to harvesting individual nodules. Obsidian from Coso in general, and West Sugarloaf in particular, has been identified throughout mainland Chumash territory, as well as on the Channel Islands and in Gabrielino territory to a lesser extent (Hughes 2012; Rick et al. 2001). The movement of obsidian from Coso, through the Mojave Desert and to coastal groups, and the ages of obsidian artifacts being recovered provide evidence of the far-reaching and ancient trade networks and/or interaction spheres linking the Great Basin and the southern California coast.

The analysis of both rhyolite and obsidian artifacts from CA-KER-7055 shows the movement of West Sugarloaf obsidian from the Coso Volcanic Field to the northern AV, very likely into the hands of the same people traveling to the Rosamond Hills to procure rhyolite for more functional and less valued tools. Strictly speaking, the co-occurrence of materials at the same

archaeological site does not demonstrate that the same group was responsible for all parts of the deposit, but it is very likely that both materials were present at the same point in prehistory while the site was in use. The Rosamond Hills are also a point of contact with groups on the southern edge of the AV, who traveled to Rosamond Hills to procure rhyolite. Both Coso obsidian and rhyolite from Rosamond Hills are found at archaeological sites located in the southern AV, near a natural corridor linking the western Mojave Desert to the coastal areas of southern California. Obsidian is common at low densities throughout sites in the AV, including CA-LAN-949, although sourcing studies have not been conducted to verify whether these materials came from West Sugarloaf or another source (Archaeological Associates 1991).

Burials

Genetic and osteological morphological analyses have been conducted on human remains from two archaeological sites (CA-LAN-767 and CA-LAN-949) recorded during the City Ranch Project that are informative for determining territorial boundaries and cultural interactions in the southern AV (Archaeological Associates 1991). CA-LAN-767 (also known as the Lazy T Cemetery site), located at the mouth of the Leona Valley west of Palmdale, is dated within the last 400 years and yielded 11 burials (Sutton et al. 2010). Numerous beads were recovered in association with the interments, but very few other artifacts were observed, leading Sutton et al. (2010) to interpret the site as a cemetery. No associated habitation sites have been recorded in the immediate area, although a number of potential candidates lie within approximately 2 km of the site. Osteological investigation of the individuals at CA-LAN-767 focused on metric analysis of morphological characteristics, where possible. The results indicated that the individuals were likely members of the Western Mono physical type, as opposed to the Californian type noted throughout desert groups such as the Serrano and Mojave (Sutton et al. 2010:75–76; also see Gifford 1926a, 1926b).

The physical differences suggest that the interred individuals were different from the inhabitants of the AV. Serrano and Vanyumé groups that potentially occupied much of the western Mojave Desert were said to have practiced cremation, yet burials attributed to the Vanyumé have been identified, so burial customs may have varied throughout the region (Moffitt and Moffitt 1993; Sutton and Ritter 1984). Comparing burial traditions between different areas in the western Mojave Desert, including areas thought to specifically relate to groups such as the Kitanemuk and Tataviam, Sutton et al. (2010) concluded

that the combination of physical traits and lack of associated habitation sites indicated that the cemetery had belonged to the Tataviam.

The second site, CA-LAN-949, is located approximately 3 km east of CA-LAN-767 and has been investigated multiple times over the years (e.g., Archaeological Associates 1991; Kemp et al. 2005; Popper 2005). Two burials were recovered during the 1991 City Ranch Project, at which time the site was determined to be a Late Prehistoric habitation locale rather than a cemetery (Archaeological Associates 1991). No osteological analyses were conducted to determine the morphological type of the interred individuals, although the placement of burials within, or in association to, a habitation site is characteristic of the Kitanemuk in the northern and western AV (see Sutton et al. 2010).

Mitochondrial DNA analysis of teeth from two of the burials at CA-LAN-949 indicated connections with the matrilineal line of a woman who was baptized at Mission San Fernando, but who was born in 1750 in the village of Topipabit, located along the Mojave River and associated Mojave Trail, near the Victorville Narrows (Johnson and Lorenz 2006:51; Pumphrey et al. 2010; TEC 2007). This area has been documented as Vanyumé territory (Johnson and Lorenz 2006; Kemp et al. 2005). The exact boundaries between Vanyumé and other Serrano groups is not clear but may have placed the Vanyumé in the corridor of the Mojave River and the Serrano in open areas of the western Mojave Desert and regions around the San Bernardino Mountains (Earle 2005; Kroeber 1925).

The mitochondrial DNA demonstrates only the matrilineal line of descent, meaning that while the exact matrilineal line was found at both CA-LAN-949 and Topipabit some 80 km to the east, only a single female ancestor directly links these groups. That is, a single female ancestor links both individuals analyzed from CA-LAN-949 and the woman baptized at Mission San Fernando. A genetic link may also evidence older processes. Sutton (2009) suggested that Kitanemuk diverged around 1,000 B.P., with one group remaining near their homeland around the Tehachapi Mountains, while the other was adopted by Yuman groups to the east, who became the Vanyumé and Serrano. That these individuals were interred rather than cremated suggests that the group inhabiting CA-LAN-949 was, in fact, not Serrano. Marriage relationships were common between Serrano groups and the Kitanemuk, among others in southern California, making it quite likely for related lineages to be found in areas inhabited by different groups. More likely, the single matrilineal line indicates a sole matriarch for a family group (or earlier generations) that occupied CA-LAN-949.

The presence of burials rather than cremations suggests that Serrano groups did not occupy CA-LAN-949. Moreover, the placement of burials within a

habitation site suggests that the Tataviam were also not present, despite occupying a roughly contemporaneous site a short distance to the west. Early explorers and ethnographers in the AV noted that the Tataviam were not on friendly terms with the Kitanemuk or the Vanyumé. In 1776, when Garcés was traveling through the AV, there appears to have been a war going on between the Kitanemuk and Tataviam (Alliklik), as Garcés mentioned that the Kitanemuk had killed a chief on the Santa Clara River and the group did not conduct him into Kitanemuk territory (Coues 1900; Kroeber 1925:613). Groups with enmity relationships, or in open conflict, are unlikely to have stable marriage and exchange relationships. Thus, mitochondrial DNA evidence suggests that the occupants were most likely Kitanemuk or a closely related group, with a matrilineal line demonstrating ancestral relationships with or marriages to Vanyumé groups to the east. These patterns may have been flexible, shifting over time.

Historical Accounts

Franciscan missionary explorer Father Francisco Garcés traveled through the AV in 1776 during one of many reconnaissance expeditions throughout southern California and Arizona, providing a picture of the native political geography at that time for the Mojave Desert and the Colorado River regions (Coues 1900; Earle 1990, 2005; Garcés 1965). Translations of his notes suggest that Garcés referred to all people living along the Mojave River, within the San Gabriel and San Fernando valleys, in the upper reaches of the Santa Clara River, and in the Elizabeth Lake region as Beñeme, grouping the Tataviam and other neighbors speaking a Takic language under a generic name (King and Blackburn 1978). There is debate, however, as to whether the term Beñeme refers only to the Vanyumé along the Mojave River, or if it can be extended to other desert-dwelling groups of apparent Serrano people living further west in the southern AV region (Earle 1990).

Earle (2005) compared Garcés diary, upon which most of the preceding discussion is based, against J. P. Harrington's unpublished notes, and determined that the Beñeme of whom Garcés wrote were Vanyumé proper, not a generic name assigned by the Mojave to all local Indians. Such misinterpretations of Garcés' comments and place names resulted in the potentially erroneous assignment of the southwestern AV to the Tataviam or Kitanemuk rather than the Vanyumé (Earle 1990; Johnson and Earle 1990).

Mission Records

Researchers working with baptism, marriage, burial, confirmation, and census (*padrón*) registers have translated and compiled much of the information into an accessible database and discussed some of the limitations of the data therein (e.g., Johnson 1988, 1997, 1999, 2006). Problems with translation and recording of the names, locations, and affiliations of villages present difficulties, but do not overshadow the great value of these data for reconstructing territorial boundaries. For example, Garcés recorded the term "Beñeme" as referring to desert groups, but did not clearly differentiate whether this was following the Mojave informant's views of other desert groups or an ethnic or linguistically relevant term to denote only a single group of desert inhabitants (e.g., Earle 2005). The Tataviam were incorporated into Missions San Fernando and San Buenaventura fairly early in the mission period, and by 1810 virtually all Tataviam had been baptized (Johnson 2006; Johnson and Earle 1990; King and Blackburn 1978).

Another interesting note is that in 1811 a great number of Vanyumé or Serrano natives were incorporated, possibly by force, and baptized at Mission San Fernando (Earle 2005; Johnson 1997, 2006). Even if incorrect tribal affiliations were listed on the baptism records, the presence of Vanyumé and/or Serrano individuals after 1810—by which date most Tataviam are suggested to have been baptized—indicates that missionaries were recruiting people from areas beyond territories controlled by the Tataviam.

Locations of *rancherías* or villages from which individuals had been recruited to Mission San Fernando suggest at least two locations within the AV (Earle 2005; Johnson 1997, 2006). A military foray to identify possible inland mission locations, commanded by Gabriel Moraga and accompanied by Father José María de Zalvidea, passed through the AV in 1805 (Cook 1960). Two years later, José Palomares led two military forays from Mission San Fernando in pursuit of runaway neophytes being harbored by gentile chiefs in the southern AV and on the upper Mojave River to the east (Earle 2005). Failure of negotiations, the conduct of the military forays, and brutal treatment of neophyte runaways led to increased tensions and an uprising of Serrano and Gabrieliño groups at Mission San Gabriel in 1810. Retribution for attacks and fears of a wider conspiracy led to additional military forays into the Mojave Desert (Earle 2005).

It is likely that the bulk of Serrano or Vanyumé listed on mission registers did indeed come from the corridor of the Mojave River and the San Bernardino Mountains, but the listing of baptisms associated with forays through the

southern AV or listing village names identified within Kitanemuk areas indicates the inclusion of individuals within the study area (Johnson 2006; King 2004). The lack of distinction between different desert groups—despite named villages clearly placed in parts of the western Mojave Desert attributed to different groups by informants working with Garcés in 1776 and Harrington in the early twentieth century—adds an element of confusion. Although individuals recruited from the AV are listed as being affiliated with the Vanyumé, this term clearly applied to the Vanyumé in their full territorial extent, as well as to some Serrano and Kitanemuk areas. Some villages were occupied by members of more than one tribal group and the Vanyumé occupied far larger and more diverse territory than has been suggested by various researchers, such as Bean and Smith (1978), Blackburn and Bean (1978), King and Blackburn (1978), and Kroeber (1925).

Ethnographic Notes

Ethnographic notes collected by J. P. Harrington from his Kitanemuk, Chumash, Gabrielino, and San Bernardino Mountains Serrano informants provided information on their respective groups, as well as on the Tataviam (Harrington 1913, 1916, 1917). As noted above, virtually all of the Tataviam had been baptized at Mission San Fernando by 1810, their descendants intermarried with other groups at the mission or in the Tejon region, and the last native Tataviam speaker died in 1916, making the collection of firsthand information impossible (King and Blackburn 1978:536–537). The territories that Harrington could determine based on informants from neighboring tribes indicated that Tataviam territory ended within the Sierra Pelona, at the edges of the AV.

Similar to the Tataviam, very few Kitanemuk informants retained their lifestyles through the mission period or could not be located in 1916–1917 when Harrington was working in the AV. Those few who were located resided at Tejon Ranch (Blackburn and Bean 1978:564). Harrington's notes (Harrington 1916, 1917) are the primary ethnographic resources for the Kitanemuk, although additional details are found in accounts of neighboring tribes (Harrington 1942; Kroeber 1907, 1925; Strong 1929; Sutton 1980).

Kitanemuk territory appeared to be centered on the Tehachapi Mountains but extended across the northern half of the AV that included the Rosamond Hills and Rosamond Lake, although it is not clear if this reflected an ancestral homeland or a later development in reaction to European intrusion into the AV. Harrington (1917) suggested that considerable interactions took place

among Kitanemuk villages, as well as between the Kitanemuk and groups such as the Chumash, Tubatulabal, and possibly the Kawaiisu. According to Blackburn and Bean (1978:564), "Their relationship with the Yokuts and Tataviam was one of enmity, while an amity relationship seems to have linked the Kitanemuk with the Chumash and Tubatulabal in a complex trading and ritual alliance."

Garcés (1965) noted the presence of Mojave traders while in the southern AV as well as within the Tehachapi Mountains. This suggests friendly trading and potential marriage interactions between the Kitanemuk and the Mojave.

Ethnolinguistic Reconstruction

Based on historical records and ethnographic notes for the western Mojave Desert, Kroeber (1925) determined that the Tehachapi Mountains and northern portions of the AV were affiliated with the Kitanemuk, the Sierra Pelona and possibly the southern edge of the valley floor with the Tataviam, and the AV floor with the Vanyumé (Bean and Smith 1978; Blackburn and Bean 1978; King and Blackburn 1978). The distribution of different languages suggests that by the early twentieth century, the groups had diverged from the parent Takic (or proto-Takic) family and were distinct languages, although there are few explanations for any relationships and how this distribution came into being (Sutton 2009).

Based on linguistic maps and strong similarities in the archaeological assemblages of Late Prehistoric sites in the AV and surrounding areas, researchers have concluded that nearly all of the AV was affiliated with the Kitanemuk (Beeler and Klar 1977; Sutton 1980). With additional work in the area, the territories of the Tataviam were expanded to include the southern portions of the AV (Sutton 1988, 1989). The Vanyumé or Serrano have been consistently placed along the eastern margins of the AV and throughout the remainder of the western Mojave Desert, although it is not clear what impacts European contact and the mission period may have had on these boundaries.

Discussion

Different lines of evidence suggest that a number of possibilities exist, many contradictory, in terms of territorial boundaries and cultural interaction networks, or spheres, throughout the AV. Chemical analysis of lithic artifacts provides two important pieces of information. First, Late Prehistoric archaeological sites along both the northern and southern edges of the AV show a preference for the use of rhyolite from Rosamond Hills in spite of differential procurement

costs and potential alternative raw material sources. Second, obsidian from the West Sugarloaf subsource of the Coso Volcanic Field was also used in the northern AV and demonstrates a stable pattern of reoccupation for 1,700 years. The use of the same geological formation by groups at opposite ends of the valley suggests that the area was also a likely point of contact for trade or other cultural interaction. The presence of Coso obsidian at contemporaneous sites in the northern, middle, and southern AV could indicate that access to trade for this resource was partially responsible for the apparently costly procurement strategies of inhabitants of the southern AV, as part of an embedded procurement pattern within larger regional trade networks and spheres of interaction.

Sutton (1980) postulated that while proto-Kitanemuk were likely in the AV, around 300 B.P. they shifted their major territorial and economic base to the Tehachapi Mountains. The obsidian hydration results from CA-KER-7055 suggest a long-term presence in the hills. A possible abandonment of the site by 300–500 B.P. is suggested by the lack of hydration rinds smaller than 3.3 microns. The dates support a major regional shift, as Sutton (1980) suggested, or abandonment of the site due to other factors. The occupation span for CA-KER-7055 (approximately 1,500 years) demonstrates that the use of the hills leading into the Tehachapi Mountains, the procurement of rhyolite from the Rosamond Hills, and likely the travel corridor to Tehachapi adjacent to the site were not late developments, although there may have been disruptions by European contact in southern California.

The direct and indirect effects of missionary and military forays into the Mojave Desert, as elsewhere in California, are well documented in the archaeological and ethnographic literature. One detail that was likely to have impacted regional trade networks and the nature of cultural interactions between groups was the spread of European disease. These diseases often spread ahead of physical contacts, making it likely that disruptions and possible population declines within the spheres of interaction connecting southern California to the Great Basin had already begun by the time Garcés traveled through the AV in 1776 (Bronk Ramsey 2013; Erlandson et al. 2001; Lightfoot and Simmons 1998; Reimer et al. 2013; Shackley 2005; Shackley et al. 1996). Garcés noted in his diary that there was a violent conflict, or open war, between the Tataviam and the Kitanemuk and that a Tataviam chief had recently been killed along the Santa Clara River. This note is intriguing for several reasons. First, the Santa Clara River is located in the western portion of Tataviam (or possibly Chumash) territory, over 50 km from that attributed to the Kitanemuk. It is possible that the killing was related to a trading party interacting near the

border between the Ventureño Chumash (*Camulus*) and Tataviam (*Piru*) and was completely unrelated to regional events (Johnson 1997).

A second possibility is that King's (2004:21) revised map for cultural areas—showing Serrano control of regions south of the Sierra Pelona and within 20 km of Chumash territory—is correct, thereby implicating this group for involvement, as occupants in relative proximity would likely have great interest in events along the Santa Clara River. King denoted the area as Serrano, but multiple sources have indicated likely confusion in the use of the terms Serrano and Vanyumé as general designations for desert tribes, or more specifically, Takic desert groups, including the Kitanemuk. Tataviam informants working with Garcés may not have seen important differences between Serrano groups along their eastern borders and the inhabitants of the AV, reported to be the Kitanemuk.

A third possibility is that the Tataviam informants were correctly in identifying the Kitanemuk as inhabitants of the AV, or more specifically the northern AV, and as being responsible for the death of their chief, and that this action was related to the spread of diseases. Villages in the western Tataviam areas would have had closer ties with Chumash groups and also earlier contact with the Spanish, bearing the consequences of that contact. If goods or information passing through the AV trade routes were accompanied by disease, then Kitanemuk suffering from disease may have tracked the source back to the western Tataviam or a particular chief involved in trade. Shamanism and witchcraft were closely associated with disease as well as with political power, and the killing of a shaman believed to be responsible for witchcraft or having failed to cure an illness is well documented in the ethnographic literature of the region (e.g., Blackburn and Bean 1978; Harrington 1917, 1942; Hudson 1979; King and Blackburn 1978; Kroeber 1925; Strong 1929). A selective attack far outside Kitanemuk territory upon a suspected shaman could explain the distance involved, in contrast to events leading to conflict lying closer to the AV.

Evidence from burials at CA-LAN-767 and ethnographic evidence from Earle (1990) suggests that the Tataviam were in control of the southern AV. Genetic evidence from CA-LAN-949 indicates a direct link between the site and the Mojave River corridor near Victorville, supporting historical and ethnographic reconstructions designating Vanyumé or Takic relatives (the Serrano and Kitanemuk) that the AV was affiliated with desert groups as opposed to the Tataviam. Sutton (2009) suggested that both Vanyumé and Serrano groups originated from Kitanemuk or proto-Kitanemuk populations and later incorporated Yuman influences from contact with other desert groups.

Johnson and Lorenz (2006) reported that the matrilineal connection between Palmdale and Victorville was an identical match, not a closely related haplotype. If Sutton (2009) is correct in postulating separations and territorial expansions in the Mojave Desert beginning 1,000 years ago, then it is very unlikely to have a single exact matrilineal pattern shared by such diverse groups. The exact match indicates a more recent connection between the Vanyumé and Kitanemuk, or whatever group was occupying CA-LAN-949. In this case, the question may not be which account is correct as the different lines of evidence are not inherently contradictory. CA-LAN-767 and CA-LAN-949 are located close to one another (approximately 2 km apart), but assuming that tribal affiliations were correctly assigned, may have been occupied at different times during the Late Prehistoric, suggesting changing boundaries and land use patterns, or may have been contemporaneous and represented the border zone between Tataviam and desert groups.

The latter option seems likely in this case as there are differences in both burial style and the exchange of goods. It is possible that CA-LAN-767 represents a special case, where deaths from disease were handled differently than other members of society, but this may contradict other lines of evidence. Despite hypothesized trade networks linking Palmdale to Lake Elizabeth, only about 18 percent of rhyolite artifacts used at CA-LAN-949, CA-LAN-1757, and CA-LAN-1773 came from Fairmont Butte, located only 10 km from Lake Elizabeth. If both CA-LAN-949 and Lake Elizabeth were controlled by the same cultural group, suggested as being the Tataviam, then the disparity in rhyolite usage is surprising.

Rhyolite is a utilitarian raw material, so it is not expected to be associated with unusually high procurement costs. The use of the Rosamond Hills cannot be explained on technological grounds and is likely the result of trade interactions associated with networks moving Coso obsidian and shell beads, as an embedded procurement strategy. No additional travel costs (e.g., from a separate trip) would be incurred by traders traveling to the Rosamond Hills to trade shell beads and/or obsidian, as the rhyolite would be accessible at the point of contact. The rhyolite would still require some effort to exploit and transport as a raw material, but as part of the overall cost of a multi-purpose trip. Thus, the costs for travel and transport would actually be comparable in terms of weight and effort, but not additional distance as compared with traveling to Fairmont Butte solely for rhyolite.

While the use of Rosamond Hills can be explained, the disparity in use is not sufficiently clear. Embedded procurement would account for its presence, but not the amount, unless the majority of economic activities hinged on this

trade as opposed to more generalized subsistence or high mobility. This is possible, as elevated population densities and social complexity in the Mojave Desert have been noted (e.g., Bettinger 1978; Sutton et al. 2007). The proximity and comparative ease of travel to Lake Elizabeth for cultural interaction still appears to have been less preferred, a fact that seems odd unless the two areas were affiliated with different groups that were not closely linked through language, culture, or marriage. If the border between the Vanyumé/Kitanemuk and the Tataviam lay between Palmdale and Elizabeth Lake, for example at Leona Valley, then interaction between these regions was likely possible but would probably have been more difficult than interactions within or between affiliated desert groups.

Harrington (1916, 1917) and Kroeber (1925) both noted that while the Kitanemuk and Tataviam interred their dead, Serrano and related desert groups followed the Yuman pattern of cremation. Having burials rather than cremations at CA-LAN-949 lends credence to the occupants having been Kitanemuk rather than Vanyumé or Serrano, although there have been a few burials attributed to the Vanyumé (e.g., Moffitt and Moffitt 1993; Sutton and Ritter 1984), further complicating the issue. Additional burials with customs that appear different from the Kitanemuk are reported east of Rosamond Lake and may have been Vanyumé (Sutton 1980). The relative influence of Yuman cremation practices on Takic groups in the western Mojave Desert was likely dynamic, exhibiting regional and possibly temporal diversity, assuming that Sutton's (2009) hypothesis of divergence of Vanyumé and Serrano groups from the Kitanemuk around 1,000 B.P. is correct.

Conclusion

Determining the potential cultural affiliation and patterns of interactions throughout the Antelope Valley requires examination of multiple lines of evidence. Linguistic and ethnographic evidence for the western Mojave Desert suggests that the southern Antelope Valley was affiliated with either the Tataviam or the Vanyumé. Genetic evidence supports connections between the occupants of CA-LAN-949 and the Vanyumé near Victorville. Chemical compositional analyses of rhyolite and obsidian artifacts suggest stable populations and trade networks for more than 1,500 years, with possible disruptions during the Late Prehistoric Period around 300 B.P. Cultural interaction appears to have occurred directly between groups at the northern and southern ends of the Antelope Valley at the Rosamond Hills. The antiquity of territorial control and trade networks preceded hypothesized divergence of the Kitanemuk into

other groups such as the Vanyumé and Serrano that absorbed cultural and linguistic influences from Yuman groups to the east.

As such, the most likely explanation for the different lines of evidence is that the area around Palmdale was occupied by the Vanyumé or a similar Takic group that was closely associated with the Kitanemuk. It is not clear if significant linguistic or cultural divisions existed between the Kitanemuk and the Vanyumé/Kitanemuk during the Late Prehistoric, or if significant changes occurred later, following Spanish intrusions. Groups closely connected culturally 500 to 300 years ago may have changed a great deal following the arrival of diseases via trade networks, prior to initial contact and the impacts of the mission period.

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