WHAT’S HAPPENING IN LATE HOLOCENE SOUTHERN CALIFORNIA,  
IS IT AGRICULTURE OR WHAT? 

STAN BERRYMAN 
NEW MEXICO STATE UNIVERSITY 

Archaeologists have proposed the Native California populations developed sufficiently stable foraging economies that agriculture did not take hold. An exception to this model is along the Southern California Bight. Within the northern San Diego County portion of that area large residential sites developed inland and along the northern San Diego coastline post AD 1300 pointing to processes of population aggregation and increasing sedentism during the latter part of the Late Holocene. It is suggested that sedentism and population aggregation may be linked to a combination of foraging and agriculture/horticulture drawing on wild foods and more formal control of land by aggregated population centers. It is possible collecting was the effective stabilizer rather than agriculture; sedentary lifestyle may have been a prerequisite for agriculture (Willey and Phillips 1955) which was developing at the time of European incursion.

Using data developed over a period of 25 years of research on Marine Corps Camp Pendleton (Camp Pendleton; Figure 1), I am proposing that within northern San Diego County there is evidence of a change in subsistence during the Late Holocene post AD 1300 (650 BP) that is comparable to the Formative Stage in the American Southwest. Specifically, a more intense use of the landscapes resulting in population aggregation into a few large villages and ancillary satellite communities resulted in a more sedentary lifestyle. This is reflective of the climatic landscape changing from the times of stress during the Medieval Climatic Anomaly and prolonged droughts to a more stable, wetter climate (Grissino-Mayer et al. 1997; Larson n.d.). The prehistoric people in the study area were organizing (Figures 2 and 3) and using the physical landscape through more intensive collecting and agriculture based on the use of fire.

DISCUSSION

Bettinger (2015) proposed the Native California populations developed sufficiently stable foraging economies that agriculture did not take hold. For example, Bettinger (2015:137–138 argued that “setting aside the district organizations of Colorado River agriculturalists (Yuma and Mohave) and possible the Nisenan, the patrilineal triblet was arguably as coherently hierarchal form of sociopolitical organization as would ever evolve in aboriginal California outside the California Bight...”—the coast from Point Conception to San Diego. Residential bases would be made up of one or two clans (Bettinger 2015) and would be practicing intensive foraging. If the California Bight area is an exception, what was the economic and social structure employed by people in this area?

It is posited in this paper that within the ancestral Luiseno/Juaneno territory of southern California, an economy based on foraging coupled with plant husbandry developed in the later part of the Late Holocene, (Berryman 2014). This strategy coincided with climate stability. Much of the Late Holocene is marked by climate instability and periods of prolonged drought. According to Larson (n.d.) rainfall totals in the Late Holocene were highly variable (Table 1). Stine (1994), using tree data derived from relic tree stumps found in four sites close to and within the central Sierra Nevada Mountains in central California, determined that a period of climate known as the Medieval Climatic Anomaly was a world-wide phenomenon. Stine (1994:549) offered that “The mediaeval [sic] period in California was thus marked not only by severe and prolonged drought, but by abrupt and extreme hydroclimatic shifts—from inordinate dryness, to inordinate wetness, and back again.” According to Stine (1994) the first medieval drought lasted for over 220 years (AD 892 to AD 1115), the second lasted for a period of approximately 140 years AD 1209 to AD 1350). A period of wetness separated the droughts for less than 100 years, from approximately AD 1112 to AD 1209. This period of wet weather was marked by precipitation that exceeds modern levels.
Figure 1. Camp Pendleton Area of Southern California.
Table 1. Climatic Conditions in the American West and Southwest.

<table>
<thead>
<tr>
<th><strong>STINE (1994)</strong></th>
<th><strong>LARSON (n.d.)</strong></th>
<th><strong>GRISSINO-MAYER (1997)</strong></th>
<th><strong>CLIMATIC CONDITION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>AD 500–650 (1450–1300 BP)</td>
<td>-</td>
<td>Drought</td>
</tr>
<tr>
<td>-</td>
<td>AD 650–800 (1300–1100 BP)</td>
<td>-</td>
<td>Low Rainfall</td>
</tr>
<tr>
<td>-</td>
<td>AD 700–750 (1250–1200 BP)</td>
<td>-</td>
<td>Extreme Drought</td>
</tr>
<tr>
<td>-</td>
<td>AD 800–1000 (1100–950 BP)</td>
<td>-</td>
<td>Wet</td>
</tr>
<tr>
<td>AD 892–1112 (1058–838 BP)</td>
<td>AD 980–1015 (970–935 BP)</td>
<td>AD 940–1040 (1010–910 BP)</td>
<td>Severe Drought</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>AD 980s (970 BP)</td>
<td>Short wet interval in drought</td>
</tr>
<tr>
<td>-</td>
<td>AD 1015–1030 (935–920 BP)</td>
<td>-</td>
<td>Moderately Dry</td>
</tr>
<tr>
<td>-</td>
<td>AD 1030–1100 (920–850 BP)</td>
<td>AD 1040–1125 (910–825 BP)</td>
<td>Very Wet</td>
</tr>
<tr>
<td>-</td>
<td>AD 1100–1250 (850–700 BP)</td>
<td>AD 1125–1140 (825–810 BP)</td>
<td>Drought</td>
</tr>
<tr>
<td>-</td>
<td>AD 1120–1150 (830–800 BP)</td>
<td>-</td>
<td>Extremely Harsh</td>
</tr>
<tr>
<td>AD 1112–1209 (838–741 BP)</td>
<td>-</td>
<td>AD 1140–1210 (810–740 BP)</td>
<td>Very Wet</td>
</tr>
<tr>
<td>-</td>
<td>AD 1250–1300 (700–650 BP)</td>
<td>-</td>
<td>Improving</td>
</tr>
<tr>
<td>AD 1209–1350 (741–600 BP)</td>
<td>-</td>
<td>AD 1210–1305 (740–645 BP)</td>
<td>Drought</td>
</tr>
</tbody>
</table>

Larson (n.d.) studied variations in rainfall and surface sea temperatures (SST) for central coastal California covering the period AD 400 to AD 1800. He coupled these with tree-ring samples from big cone spruce found in the Transverse Range of central Santa Barbara County. According to Larson (n.d) rainfall totals in the Late Holocene were highly variable. There was a 50-year period from AD 500 to AD 650 when rainfall was moderate, followed by a 150-year period of low amounts of precipitation ending approximately AD 700. This was followed by a 20-year period of drought to AD 720. The third event, AD 980 to 1000, followed a very favorable 200-year interval and included abrupt shifts in environmental conditions. During this 20-year interval mean precipitation rates fell rapidly. The fourth event began at AD 1120 and ended at AD 1200. Stine (1994) showed a severe drought in the eastern Sierra Nevada from AD 892 to AD 1112. Grissino-Mayer et al. (1997) reconstructed annual precipitation for the Southern Rio Grande Basin. During this period of drought, he identified a wet interval during the AD 980’s. He also described a very wet period during AD 1040–1125 which corresponds with Larson’s (n.d.) wet period of AD 1030–1100 for central coastal California. This was followed by a drought beginning in AD 1125 and ending AD 1140. Both Stine and Grissino-Mayer et al. (1997) saw a wet cycle occurring during the early to middle AD 1100s and ending in the early AD 1200s. Grissino-Mayer et al. (1997) identified a nearly 100-year drought that corresponds to the 140-year mega-drought defined by Stine (1994). After AD 1300 wet/dry cycles become less severe and the climate generally becomes more benign interspersed with several short-term drought or wet periods. “The MCA [Medieval Climatic Anomaly] period stands out...
clearly this way as an extended period of elevated aridity over the West that has not been matched since AD 1300" (Cook et al. 2009:38). The long-term variations in temperature and precipitation diminished in frequency and severity post AD 1300 during the Little Ice Age.

It was at the end of the last prolonged drought which lasted between 100 and 140 years that we begin to see a change in the cultural landscapes within Camp Pendleton. New residential bases are being settled inland, (Berryman 2014). The human population is growing, and the physical and cultural landscapes are being heavily used. It is in this Late Holocene period from about AD 1300 to European incursion that there is a shift in the economic base of the Luiseno/Juaneno ancestors. As considered in this paper, agriculture is broken down into the following:

a. Agriculture is the cultivation and breeding of animals, plants and fungi for food, fiber, biofuel, medicinal plants and other products used to sustain and enhance human life (definitions.net, 9/25/2018). Agriculture generally implies growing domesticated plants.

b. Swidden agriculture – a temporary agricultural plot formed by cutting back and burning off vegetative cover (Merriam-Webster.com, 2/18/2018)

c. Garden plot – a plot of ground where herbs, fruits, flowers, or vegetables are cultivated

d. Horticulture – is the activity of growing garden plants, The USDA defines horticulture as, “that branch of agriculture concerned with growing plants that are used by people for food, for medicinal purposes…” (nifa.usda.gov 9/25/2018)

To show an economy in Southern California based on horticulture we would need:

a. Evidence of manipulation of the land to better propagate desired plants and a consistent use of those plants;

b. Evidence of use of pottery and tools associated with agricultural societies; and

c. Evidence of population expansion and aggregation into large, stable villages occupied by multiple clans;

Population aggregation into large stable villages with multiple clans is in evidence on Camp Pendleton. Post AD 1300 existing villages such as CA-SDI-812 (Red Beach) aka Huisme were undergoing population expansion. New villages were being established in the inland areas such as in Las Pulgas drainage including the extensive single component ethnohistoric village of Chacape or SDI-14665/14666, 18990, 18991, 18992, and 19392. There is an expansion of the territory being used by an increasingly dense human population. By AD 1550 (400 BP) there are at least 15 dated late post 1300 AD, Late Holocene residential sites on Camp Pendleton and by the time of European intrusion there are seven named villages with multiple outliers. These are focused not just along the coast and on major rivers but are found inland along streams and springs.

As for land manipulation to better propagate specific plants, the record is a bit cloudier (Lightfoot and Parish 2009). There is evidence that fire was used to modify and manipulate the physical landscapes. The use of fire by Southern California Indians is quite remarkable (Blackburn and Anderson 1993). Shipek proposed one of the purposes for controlled fires was in manipulating the physical landscape by preparing the land for planting of desired plants such as grasses that produce seed heads (Shipek 1977). Heitzmann (2009) has noted that burning affects plant species composition, favoring grasses over forbs. Burning also enhances the available nitrogen. He also indicated that burning can affect phosphorus, potassium and calcium levels in soil. Shrub and scrub lands would be type converted to herbaceous and grass associations. Keeley (2002:310) showed post-fire species diversity increased in scrub and shrub lands from two dozen per 0.1 hectare primarily woody pre-fire, to as many as 80 species. Dodge (1975) hypothesized that the mix of grassland and shrubland was maintained by the Indians in San Diego County by consistently burning. Keeley (2002) concluded that grasslands occupied at least 25% of the indigenous landscape and was the result of type conversion of the shrub lands through anthropogenic fire.

Many of these plants do best in a more open environment such as a mixed grassland/shrubland. It is interesting that two of the most frequently plants recovered in archaeological contexts on Camp Pendleton
are Goosefoot (*Chenopodium berlandieri* ssp.) and Little or Wild Barley (*Hordeum pusillum*), which were domesticated in the eastern North America around 1800 BC (Smith 2011; Graham et al. 2017). Another plant cultivated in the eastern US (Mueller 2018) but apparently not domesticated was Maygrass (*Phalaris* sp.). Maygrass is also found in many sites on Camp Pendleton.

Of interest is that acorns did not come into use in Northern San Diego until very late, “an extensive acorn economy does not take hold until around AD 1700…” (Hale 2009:14). It is possible that use of acorns may have acted as maize in northeast America which according to Mueller (2018) pushed out local domesticates as *Hordeum pusillum* (little barley) and Chenopodium (*Berlandieria* ssp.; herbaceous goosefoot) among others. Shipek (1977) indicates the native grass species mentioned in a 1789 account by a Father Palou have been extirpated by invasive plants. “The savages subsist on seeds of the Zacate (wild grass) which they harvest in the season. From these they make sheaves as is the custom to do with wheat.” (Father Francisco Palou in Pourade 1969 II, 17)

Evidence of certain plants is found more frequently, and Table 2 presents the plants in order of highest frequency to least. According to Reddy (1997) plant remains found archaeologically in Camp Pendleton coastal sites show a preference for grasses, legumes, and small edible seeds which has been termed the Grass-Legume-Small Seed Complex as defined by Miksicek (1991). This is similar to plant assemblages found in early agricultural cultures in the American Southwest and eastern North America. For example, the Mesilla Phase of the Jornada Mogollon is represented by the development of residential complexes that are part of a culture that was still mobile, and used pottery, agriculture, hunting and collecting. The stability of their lifestyle was generally based on substantial collecting. In addition to the cultigens of maize, *Cucurbita* (squash/pumpkin/gourd), and *Marantaceae* (arrowroot), the Mesilla Phase people collected a significant variety of wild plants. As has been demonstrated by Renn and Church (2010) these plants included; *Amaranthus* sp. (pigweed), *Acnatherum* sp. (rice grass), *Allium* sp. (wild onion), *Thalia dealbata* (alligator flag), *Asteraceae* sp. (sunflower family), *Helianthus* sp. (sunflower), *Xanthium* sp. (cocklebur), *Nicotiana* sp. (tobacco), and *Quercus* sp. (oak-acorn), *Yucca* sp., *Opuntia* sp. (prickly pear cactus), *Agave* sp., *Chenopodium* sp. (goosefoot), and *Cylindropuntia* sp. (cholla cactus).

Tizon Brownware ceramics are found throughout the Luiseno/Juaneno territory. For example, at SDI-14631 a late site on Las Pulgas Creek and the possible location of the ethnohistoric village of Pomameye, pottery was found throughout the site (Figure 3). The carbonized soot on two potsherds dated 2-sigma AD 1510–AD 1600 and AD 1520–AD 1840. A 2-sigma shell date from this site was AD 1420–AD 1530. Ceramics are found exclusively in late, Late Holocene context after approximately AD 1300. Among the other 15 ceramic bearing sites on Camp Pendleton are coastal multi-component residential bases with Late Holocene 2-sigma dates: Topomai (SDI-101561/12399H) dating AD 1285–AD 1420 to AD 1670–AD 1780. The recovery of macrobotanical data was limited with *Chenopodium* sp., *Hordeum vulgare*, *Zea mays*; (York et al. 2002); Huisme: (SDI-812H) AD 960–AD 1160 to AD 1560–AD 1845, *Chenopodium* sp., *Erodium* sp., *Galium* sp., *Hemizoma* sp., *Hordeum* sp., *Phalaris* sp., *Salvia* sp., *Sambucus* sp. *Carex* sp. (Martin and Popper 1998; Reddy 2006); Chacape (SDI-14665/14666,-18990,-18991,-18992, and -19392), AD 1560–AD 1840 to AD 1490–AD 1680. *Chenopodium* sp. Goosefoot, *Erodium* sp. *Hemizoma* sp. Tarweed, *Hordeum* sp. Wild Barley, *Lepidium* sp. Peppergrass, *phalaris* sp. Maygrass (Popper 2003). Non-residential sites that exhibit ceramics, although in low densities include: SDI-10705, AD 1645–0, *Poaceae*, *Chenopodium* sp., *Hemizoma* sp., *Fabaceae*, *Sambucus* sp. (Reddy 1999); SDI-5138 and SDI-5139 AD 1310–AD 1445, *Chenopodium* sp., *Hemizoma* sp., *Hordeum* sp. *Trifolium* sp. (Reddy 1997).
Table 2. Plants by Frequency of Occurrence.

<table>
<thead>
<tr>
<th>PLANT SPECIES FROM MACROBOTANICAL STUDIES</th>
<th>COMMON NAME</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chenopodium ssp.</td>
<td>Goosefoot</td>
<td>Shoots, leaves, seeds</td>
</tr>
<tr>
<td>Hemizonia sp.</td>
<td>Tarweed</td>
<td>Seeds, roots</td>
</tr>
<tr>
<td>Hordeum pusillum</td>
<td>Little Barley</td>
<td>Seeds</td>
</tr>
<tr>
<td>Sambucus sp.</td>
<td>Elderberry</td>
<td>Fruit, leaves, blossoms,</td>
</tr>
<tr>
<td>Rhus laurina</td>
<td>Laurel sumac</td>
<td>Berries</td>
</tr>
<tr>
<td>Quercus spp.</td>
<td>Oak</td>
<td>Acorns</td>
</tr>
<tr>
<td>Cyperus sp.</td>
<td>Nutsedge</td>
<td>-</td>
</tr>
<tr>
<td>Salvia sp.</td>
<td>Sage</td>
<td>Seeds</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Legumes</td>
<td>Seeds, leaves</td>
</tr>
<tr>
<td>Solanum sp.</td>
<td>Nightshade</td>
<td>Seeds, leaves, fruit, tubers</td>
</tr>
<tr>
<td>Cucurbita foetidissima</td>
<td>Melon</td>
<td>Seeds</td>
</tr>
<tr>
<td>Heteromeles sp.</td>
<td>Toyon</td>
<td>Berries</td>
</tr>
<tr>
<td>Lens sp.</td>
<td>Legume</td>
<td>Seeds</td>
</tr>
</tbody>
</table>

PLANTS IDENTIFIED IN PROTEIN RESIDUE SAMPLES GATHERED FROM MORTARS

| Cactaceae sp.                           | Cactus      | Fruit, seeds         |
| Asteraceae sp.                          | Sunflower   | Seed                 |
| Juglandaceae sp.                        | Calif. Walnut| Seed                 |


Few tools related to cultivation are found on Camp Pendleton. This may be an identification issue during archaeological survey and excavation or the result of native people not needing tools since manipulation and preparation of the landscape for planting was done by controlled burning and harvesting was accomplished by basket seed beaters. Harvesting grass and shrub seeds involved non-destructive techniques. For example, seed gathering was conducted in much the same manner by many tribes. In 1846 Edwin Bryant reported California Indian women harvesting grass seeds. This process is performed with two baskets (Figure 4), one shaped like a round shield and the other having a basin and handle. With the shield the top of the grass is brushed, and the seeds by the motion are thrown into the deep basket held in the other hand (Bryant 2007:56).

According to Willey and Phillips (1955:756) agriculture is a primary criterion for considering when a culture has passed into a Formative stage of development. The Formative stage is very limited in California, in fact it may be more accurate to posit that southern California cultures were moving into what maybe more accurately described as Pre-formative, much like the Mesilla Phase of the Jornada Mogollon As Wiley and Phillips state, the role of agriculture in an Early Formative culture is a significant determinate of when that culture has moved from Archaic, hunting and collecting are still followed, with, almost certainly, the greatest emphasis on the second. It is even theoretically possible that collecting, rather than agriculture, was the effective stabilizer; sedentary life may have been a prerequisite for agriculture rather than the other way around” (Willey and Phillips 1955:756). Layton et al. in 1991 proposed an approach to the transition from foraging to agriculture that shows hunting, gathering, herding, and cultivation as alternative strategies of subsistence that may be taken up individually or in various, combinations, depending on the social and ecological circumstances. There is evidence that increasing sedentism at Camp
Figure 2. Late Holocene Sites that Occur Early in the Holocene Sequence on Camp Pendleton.
Figure 3. Late Holocene Sites that Occur Late in the Holocene Sequence on Camp Pendleton.
Pendleton occurred only in the relatively recent past in the Late Holocene, and more particularly post AD 1300. In this period, the number of residential bases grew, and they were no longer solely focused along the coastal streams and major rivers and the coast to more inland locations. The use of locations for resource harvesting, camping and processing resources expands to the inland from the coast and river basins during this time.

CONCLUSIONS

Archaeologically the later part of the Late Holocene witnesses significant changes in economic, social organization, and complexity exemplified in the sites of northern San Diego County (Berryman 2014). By recognizing that significant changes were going on, we recognize that the cultures in northern San Diego County were neither static nor fixed into an easily definable pre-existing culture history. We are able to see a more complex organization of their physical landscape. As the climate landscape changed and generally became more stable, generally wetter and milder their population expanded requiring new ways of organizing the landscape away from the coast and major river valleys. It appears that they used fixed resource procurement limited activity areas as the population grew and the large residential bases formed. Beals and Hester (1974), for example, suggested that only five percent of the ethnohistoric Luiseno territory was not used. White (1963) indicated the typical Luiseno village intensively used 85 square kilometers.

Using the ethnographic record has provided some clues to the use of landscapes and has assisted in creating the interpretations of the archaeological record offered here. The ethnographies can be used to inform about the archaeology and provide clues on use of landscapes. White (1963:63) stated:

…each Rancheria [ethnohistoric village] is composed of several definite topographical units, arranged so that all necessary types of terrain are included within these boundaries, for example, oak groves, chaparral-covered slopes, river bottoms, springs, and so forth. None is so large that a man could not reach any part of it on foot in about half a day, starting from the major dwelling site or village; each included all features necessary for maximum efficiency in the harvesting of food and other resources according to daily need, seasonal availability accessibility, and defensibility.

To better understand White’s description of a typical Luiseno village and what is present archaeologically at Camp Pendleton post AD 1300. We need to look to Sparkman, a shopkeeper and neighbor of the Luiseno who described movements of Luiseno people across the physical landscape. [The Luiseno] formerly occupied not only the river valley, but also Palomar Mountain [in the mountains east of Camp Pendleton], and there is a tradition among them that they formerly went to the coast in winter. It must not be supposed that they wandered at will over the territory; on the contrary, each band had its allotted district, in which it alone had the right to gather food and hunt…Each band seems to have guarded its allotted territory with the greatest jealousy, and more quarrels are said to have arisen over trespassing than from all other causes combined (1908:190).

Using White’s estimated 85 square kilometers of intensely used land for each Luiseno village the seven ethnohistoric villages and outliers on Camp Pendleton would need approximately 59,000 hectares. Such an amount is larger than the 50,580 hectares or 124,985 acres of land within Camp Pendleton area, suggesting that prehistorically there would have been no territory within the study area that was not being either intensely used or controlled. Such a figure would then suggest that these populations might have ranged over the whole area but within their allotted district.

Bettinger (2015) argued that the California forager residential areas were generally small and consisted of only one or two clans. Gifford (1918) and Strong (1929) identified 90 Luiseno clan names, research by Johnson et al. for Camp Pendleton (1998) point to 13 identified Luiseno patrilineal clans associated with the Camp Pendleton area. Clans appear to have been primarily affiliated with specific rancherias or ethnohistoric villages. Importantly they note that smaller villages were composed of a single clan, while larger towns were multi-clan communities.” Topomai (SDI-10156) is located along the
Figure 4. Seed Beater Basket in Use (Edward S. Curtis Collection/Library of Congress, Washington, DC., neg. no. LC-USZ62-116525).
Santa Margarita River in the southcentral portion of Camp Pendleton. Five documented clans resided at the village which according to Johnson and O’Neill is comparable to the most populous Barbareno Chumash towns, which are generally regarded as having the largest populations in Southern California at the time European contact. Based on mission records Topomai may have had at least one satellite community called Pomameye. Figure 5 shows the locations of the known ethnohistoric villages (rancherias) from the late 1800s. The studies by True (1966), True et al. (1974) point to a similar density of sites within the traditional Luiseno territory. White’s estimate also supports the need for aggregated residential bases from which most resources can be reached by a short walk.

The very Late Holocene people of northern San Diego County were at least semi-sedentary, practicing some level of possible cultivation or horticulture coupled with gathering and hunting: New tools in the form of ceramic vessels became essential and entered into regular use in the area post AD 1300. They were manipulating the plants and landscape by use of fire and likely planting and harvesting wild plants that had domesticated varieties in eastern North America (Chenopodium ssp., Hemiziona sp., Hordeum pusillum, Sambucus sp.). Their villages became the centerpieces and focus of their daily lives. It seems the idea that the entire or at least large part of a village getting up and moving seasonally (True and Waugh 1982) is counter to the idea that the village clans controlled their territory (White 1963). It is evident that as the residential bases aggregated, became larger and more complex, control over their resources became more important. Whalen pointed out that;

The greater southwest participated in a familiar evolutionary sequence in which, small mobile, preceramic hunter-gatherer groups were replaced by larger societies or ceramic-using farmers whose residential mobility was either absent or significantly diminished. Nevertheless, it is clear that this was not a simple, universal progression that affected all of the Southwest to the same degree or at the same time (Whalen 1994:622).

Resource intensification along the coast undergoes a significant change from post AD 1300, perhaps resulting from stress reduction due to the end of persistent droughts discussed by Larson and Michelson (n.d). and Grissino-Mayer et al. (1997). The reduction in environmental stress may have facilitated an expansion in population, seen archaeologically in the rapid appearance and expansion of large inland residential bases and ancillary sites. The growth in the residential bases provided the opportunity to expand into and manipulate a variety of different areas from the coast, to the rivers and streams, to the uplands. The planting and foraging of wild plants began during this period.

There was a significant aggregation of Late Holocene people in northern San Diego County. At the time of Spanish contact there were at least seven named villages in the Camp Pendleton boundaries. These residential bases held territory that as White said was made up of several definite topographical units. These were organized in such a way that the terrain with vegetation types needed to support the villages were to be found close by. This included oak groves, chaparral-covered slopes, river bottoms, springs, and (while not explicitly stated) grass-covered slopes and valleys. This aggregation into more centralized residential bases happened over a 200 to 300-year period starting around AD 1300 and continuing through AD 1550. During this time the population also expanded, coming together in sedentary residential bases, and began to exhibit significant social ordering. It may be suggested that at this time roles developed for individuals to be responsible for such things as when to burn the grass fields that were later harvested for their seeds, and specialists in growing and maintaining oak groves, as noted by Shipek (1977) She proposed that the Late Holocene residents of San Diego County ancestors of the Kumeyaay, who live just south of the Luiseno and whose sites based on personal experience are indistinguishable from their northern neighbors, managed the landscape to promote the growth of seed-bearing grasses as well as other plants as shown in Table 2. They would “cultivate” the land first by burning and then by broadcasting the seed. Hale (2009) has shown that collection and processing of acorns came late to San Diego County. Again, this occurs in the later part of the Late Holocene at a time of aggregation into large residential sites, controlled territory, social controls being developed, cultivation of plants in “garden” plots of cereal grasses, oak trees and other edible plants. As Reddy pointed out, “…plant resources reflect a narrowing of taxonomic diversity in food items, with collecting increasingly focused on species of grasses such as Hordeum sp., Phalaris sp., and Bromus/Aena...
sp. during the late Holocene…” (2004). The Late Holocene inhabitants of northern San Diego County, post AD 1550., were transitioning from forager to a forager/farming lifeway. They had accepted elements of farming including items such as pottery, sedentary life, and plants that if not fully domesticated were, on their way to domestication. We can only speculate if they would have accepted maize cultigens from farmers living to the east along the Colorado River. These Late Period people do demonstrate that the transition to early food production in western North America was an ongoing process throughout the entirety of the Holocene and was not the result mass migration but was driven by the force of climate and cultural factors.

**BIBLIOGRAPHY**

Beals, R. L., and L. A. Hester  
1974 *California Indians: Indian Land Use and Occupancy in California.*

Becker, M., and M. Hale  

Berryman, S. R.  
Bettinger, R. L.  

Blackburn, T. C., and K. Anderson  

Bryant, E.  

Byrd, B.  

Cook, E. R., R. Seager, R. R. Heim Jr, R. S. Vose, C. Herweijer, and C. Woodhouse  

Dodge, J. M.  
1975  *Vegetational Changes Associated with Land Use and Fire History in San Diego County.* Ph.D. Dissertation, University of California, Riverside, CA.

Gifford, E. W.  

Graham, Anna F., Karen R. Adams, Susan J. Smith, and Terence M. Murphy  

Grissino-Mayer, H., C. Baisan, and T. Swetnam  

Hale, M. J.  

Heitzmann, R. J.  
2009  *Hunter-gatherer Settlement and Land Use in the Central Canadian Rockies, AD 800–1800.* University of Leicester.

Johnson, J. R., D. J. Crawford, and S. O’Neil  

Johnson, J. R., and S. O’Neil  
2001  *Descendants of Native Communities in the Vicinity of Marine Corps Base Camp Pendleton.* Prepared for Marine Corps Base Camp Pendleton.

Keeley, Jon E.  

Larson, D.  
Lightfoot, K. G., and O. Parrish  

Martin, S. L., and V. S. Popper  
1998 Paleobotanical Analysis. In *3,000 Years of Prehistory at the Red Beach Site CA-SDI-811 Marine Corps, Camp Pendleton*, by K. Rasmussen and C. Woodman, SAIC.

Miksicek, C. H.  

Mueller, N. G.  

Popper, V. S.,  
2003 Macrobotanical Analysis of Soil Samples from CA-SDI-14665 and 14666 San Diego County, California. In *Archaeological Investigations at CA-SDI-14,665/14,666 And CA-SDI-14,688 Marine Corps Base Camp Pendleton* by York et al. EDAW.

Pourade, R.  

Reddy, S. N.  


Renn, C. and T. Church,  

Shipek, F.  

Smith, B. D.  
Sparkman, P. S.

Stine, S.

Strong, W. D.

True D. L.

True, D. L., and G. Waugh

True, D. L., C. W. Meighan, and H. Crew

Whalen, M. E.

White, R.

Willey, G., and P. Phillips

York, A. L., A. Kirkish, and S. L. Harvey