Spatial and Temporal Distributions of Archaeological Heated-Rock Cooking Structures in the Transverse Mountain Ranges: Proposed Markers of Land-Use Shifts Since The Early Holocene

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Temporal and spatial distributions of archaeological heated-rock cooking structures found in the mid-Transverse Mountain Ranges potentially serve as useful measures of land-use shifts since the early Holocene. In this paper, the term "heated rock" designates stone heating elements found embedded within food cooking facilities, including "earth ovens," "grills" and "burnt-rock middens." Radiocarbon data compiled by the Angeles and San Bernardino National Forests indicate that heated-rock cooking of foods was initiated at desert-facing margins of the Transverse Ranges by at least 7600 cal BP, and this technology gradually became more commonplace during subsequent millennia. Archaic populations at upland areas used earthen firing-pit ovens to cook plant foods that included roots/tubers, oak acorns, manzanita berries, and juniper berries. By 2300 cal BP, more sedentary logistical systems of land use involved significant intensification of heated-rock cooking, which appears to have focused on yucca and piñon nuts. After approximately 2000 cal BP, more fuel-efficient rock-lined ovens largely replaced the use of earthen pit ovens at the Cajon Pass and eastern San Gabriel Mountains. Heated-stone cooking may have decreased in the mid-Transverse Ranges after roughly 400 cal BP.

Temporal and spatial distributions of heated-rock structures found in the mid-Transverse Ranges of southern California are applied in this paper to a working model of food cooking since the early Holocene. We use the term "heated rock" interchangeably with "burnt-rock" and "cook stone" to recognize stone heating elements embedded within a variety of food cooking facilities used by prehistoric Californians, including "earth ovens," "grills," and "burnt-rock middens." Adapted from Thoms (2003), this model considers evolutionary changes in cooking techniques over millennia as reflective of land-use shifts in the Transverse Ranges, and presumes that period-by-period distributions of heated rocks across the regional landscape are indicative of a long-term trend towards resource intensification.[1]

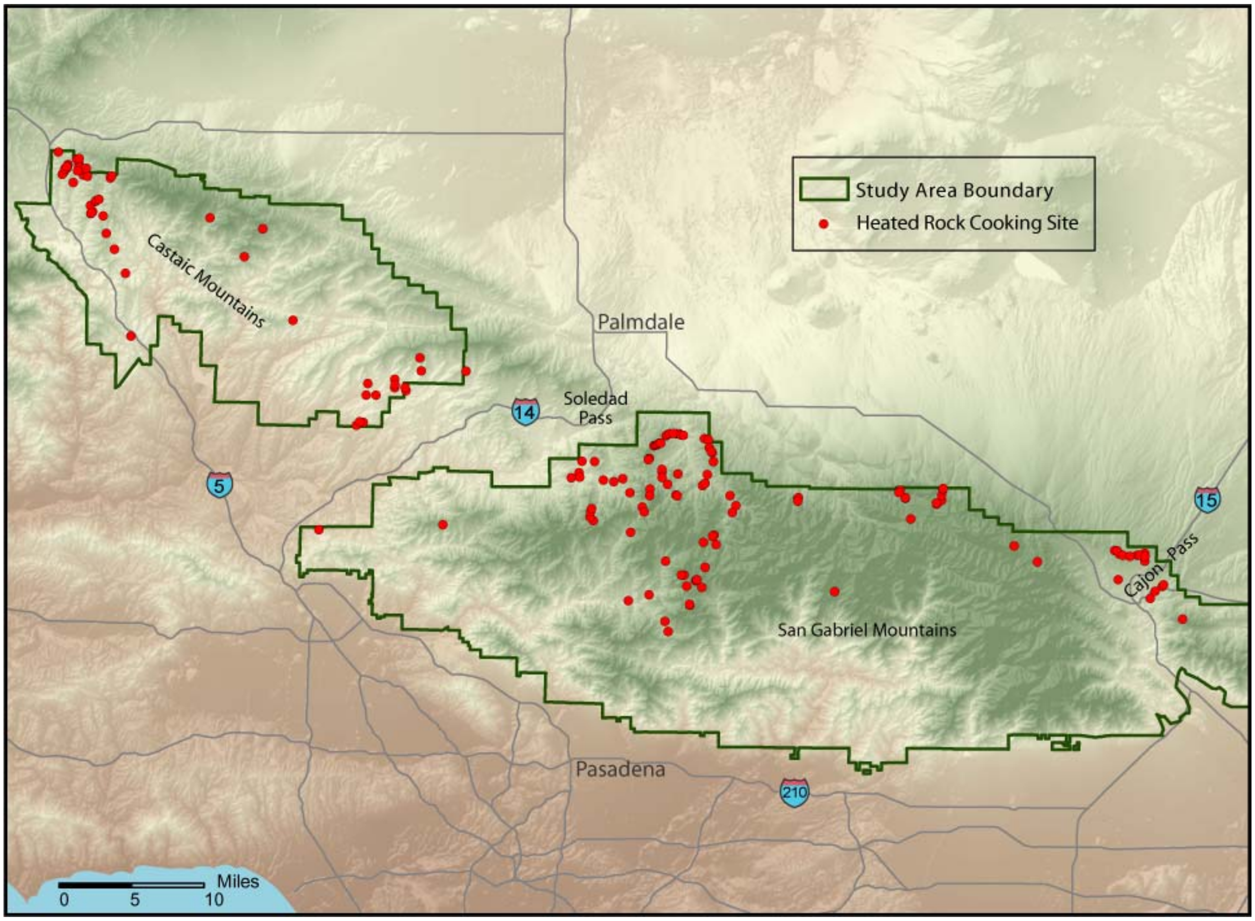

Figure 1. Distributions of cook stone facilities in the central Transverse Mountain Ranges.

THE STUDY AREA

The study area selected for this paper encompasses segments of the central Transverse Mountain Ranges situated within administrative boundaries of the Angeles and San Bernardino National Forests, including most of the Castaic Mountains (Sierra Pelonas, Sawmill Mountain, and the Liebre Mountains), the San Gabriel Mountains, and Baldy Mesa Ridge/Cajon Divide (Figure 1).[2] Extending approximately 160 km between Piru Creek on the west to the Old Cajon Pass on the east, the mid-Transverse Ranges comprise a significant topographic barrier between coastal-facing areas of southern California and the western Mojave Desert.

One hundred sixty locations containing cook stone structures are recorded within the mid-Transverse Ranges study area, including 92 sites in the San Gabriel Mountains, 52 sites in the Castaic Mountains, and 16 sites at the Baldy Mesa/Cajon Pass (Figure 1). Heated-rock structures are most densely concentrated in desert-facing and lower montane landscapes at middle elevations between 915 m and 1,525 m. Clusters of heated-rock locations are found near Liebre Mountain, Soledad Canyon, and Upper Big Tujunga Creek, and along desert slopes between Little Rock Canyon and Cajon Pass. So far, only one heated-rock location has been identified below 915 m in elevation (about 457 m in Placerita Canyon), and only six are reported above 1,525 m in elevation (with the highest along Piñon Ridge at about 1,890 m).

Landforms containing cook stone structures include alluvial creek terraces on valley floors, suspended (stream-abandoned) terraces at lower slopes, and saddles, benches, and knobs on ridgelines. Commonly shared landform attributes include relatively level surfaces, soil matrices with sufficient depth and horizontal extent to contain firing pits, proximity to desirable plant foods and sources of fuel wood, and availability of suitable stone for structural and/or heating elements (cf. King et al. 1974:16-17). With varying degrees of density, yucca (*Yucca whipplei*) is a plant constant at virtually all heated-rock locations in the study area. At desert-facing locations, past or present distributions of piñon (*Pinus monophylla*), juniper (*Juniperus californica*), manzanita (*Arctostaphylos* sp.), and scrub oak (*Quercus* sp.) are also vegetation constants (Milburn 2004:102).

HEATED-ROCK FACILITIES

Abundant heated-rock terminology found in Transverse Mountain Ranges archaeological reports include "earth oven," "pit oven," "stone-lined oven," "slab-lined oven," "grill," "hearth," "central hearth," "rock hearth," "lined hearth," "rock lined pit," "fire pit," "roasting pit," "roasting platform," "roasting processing station," "processing station," "yucca oven," "yucca roasting oven," "piñon oven," and "burned rock midden" (see, as examples, Basgall and True 1985; Berryman et al. 2001; Broeker and Padon 1993; de Barros 1997; Ericson 1972; King et al. 1974; Milburn 2004; Singer et al. 1995; Strudwick and Sturm 1996; Wessel 1990; Wessel and McIntyre 1986). The catchall terms "earth oven," "hearth," and "roasting pit" are most widely employed by regional researchers as undefined and largely interchangeable designations. Berryman et al. (2001:2.13) point out that the abundance of heated-rock terminology makes it difficult to compare the various kinds of cooking structures reported in regional archaeological literature.

In this paper, basic categories of heated-rock structures found in the mid-Transverse Mountain Ranges are referenced as "earth ovens," "grills," and "burnt-rock middens" (Milburn 2006a, cf. 1998, 2004:105-106). Although we also recognize "roasting pits" and "slab-lined baking ovens" as heated-rock categories, unequivocal archaeological evidence of these structures has never been found, or at least adequately described, in the mid-Transverse Ranges. We specifically do not use the term "hearth" as a heated-rock feature designation.[3]

Earth Ovens

As used in this paper, the term "earth oven" refers to heated-rock facilities that indirectly bake foods placed on rock "cooking platforms" constructed above fires in subsurface pits. Earth-oven structures share attributes of oxygen-reduced burning of fuel wood in firing pits, transfer of dry heat from the fires upward through overlying rock layer(s), and placement of earthen mounds over the cooking platforms to contain generated heat. Primary earth-oven subcategories found in the Transverse Mountain Ranges are described as "earthen pit ovens" and "stone-lined ovens" (Milburn 1998, 2004, 2005, 2006a).

Earthen Firing Pit Ovens

Earthen firing pit ovens are circular or oval-shaped structures with unlined lenticular firing pit sides and floors dug into native soil (Figure 2). Complexity of stone cooking platforms found in earthen pit ovens ranges from a few dozen stones arranged in a single layer to several hundred stones placed in multiple courses above two or more firing zones. The concavities of earthen pit structures typically range from about 1.5 m to 3.0 m in diameter and from 30 to 100 cm in depth (Milburn 2004:105). Ethnographic examples of earthen pit cooking facilities include yucca ovens that were described to J. P. Harrington by Eugenia Mendez (Kitanemuk) and Juan de Jesus Justo (Ventureño Chumash) (Hudson and Blackburn 1983:214).

Stone-lined Firing Pit Ovens

Stone-lined ovens examined in the study area are typically characterized by firing pits lined with granitic cobbles, slabs, or small boulders, single-course cooking platforms, and firing concavities that range between 1.0 m and 1.5 m in diameter and about 30 to 50 cm in depth (Figure 3). Formal variations of the firing pits include unpatterned cobble linings, double-walled stone linings, concave basins ground

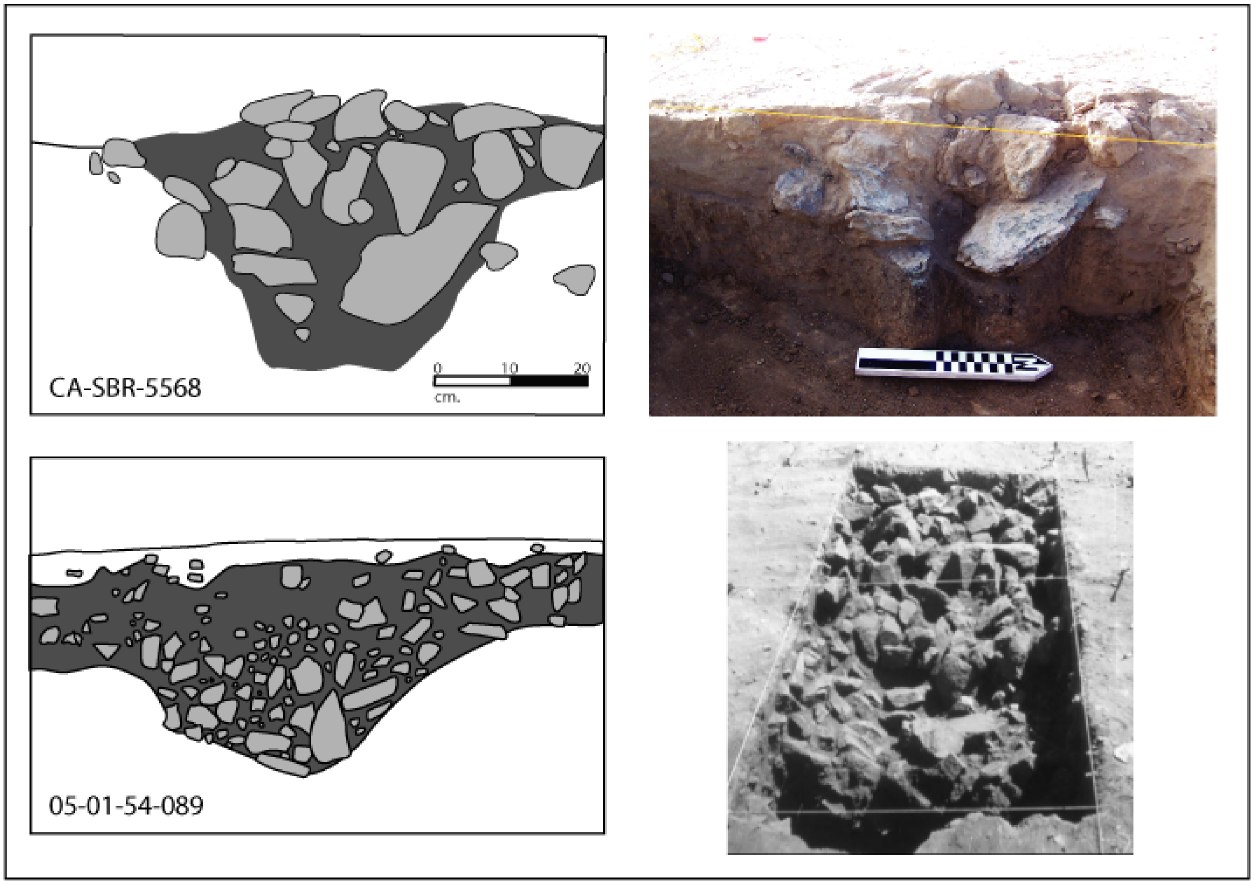

Figure 2. Archaic earthen pit ovens at CA-SBR-5568 and FS-050154089.

into solid bedrock, and relatively elaborate structures that exhibit percussion-shaped single flat stone floors and angled slab sidewalls (Milburn 1998, 2004, 2006a).[4] Historic descriptions of stone-lined cooking structures include those used by the Cahuilla to cook agave (*Agave* sp.) and by the Kawaiisu to process yucca (Bean and Saubel 1972:31-34; Dozier 1996; Schneider et al. 1996:31-32; Zigmond 1981).

Grills

Grill cooking structures examined in the Transverse Ranges are structurally similar to earthen pit ovens; however, grills contain mostly single-course stone cooking platforms and relatively shallow unlined firing depressions, and apparently lack earthen mound baking enclosures (Milburn 2006a). Grill structures typically range in diameter from 0.5 m to 3 m and contain firing zones that are less than 40 cm in depth (Figure 4). Due to their relatively shallow firing depressions, amounts of heat generated by grill facilities are considerably less than the heat produced in earth-oven structures (Milburn 2006a).

Roasting Pits

We use the term "roasting pit," similar to most regional archaeologists, to designate earthen or stone-lined cooking facilities where foods, usually wrapped in greenery, are cooked amongst hot rocks and coals within firing pits covered with a layer of dirt (see, as example, Berryman et al. 2001:2.11-2.12). In contrast to earth ovens, roasting pits do not contain overlying stone cooking platforms and require digging into firing zones in order to retrieve the cooked foods. Despite the frequent reporting of "roasting

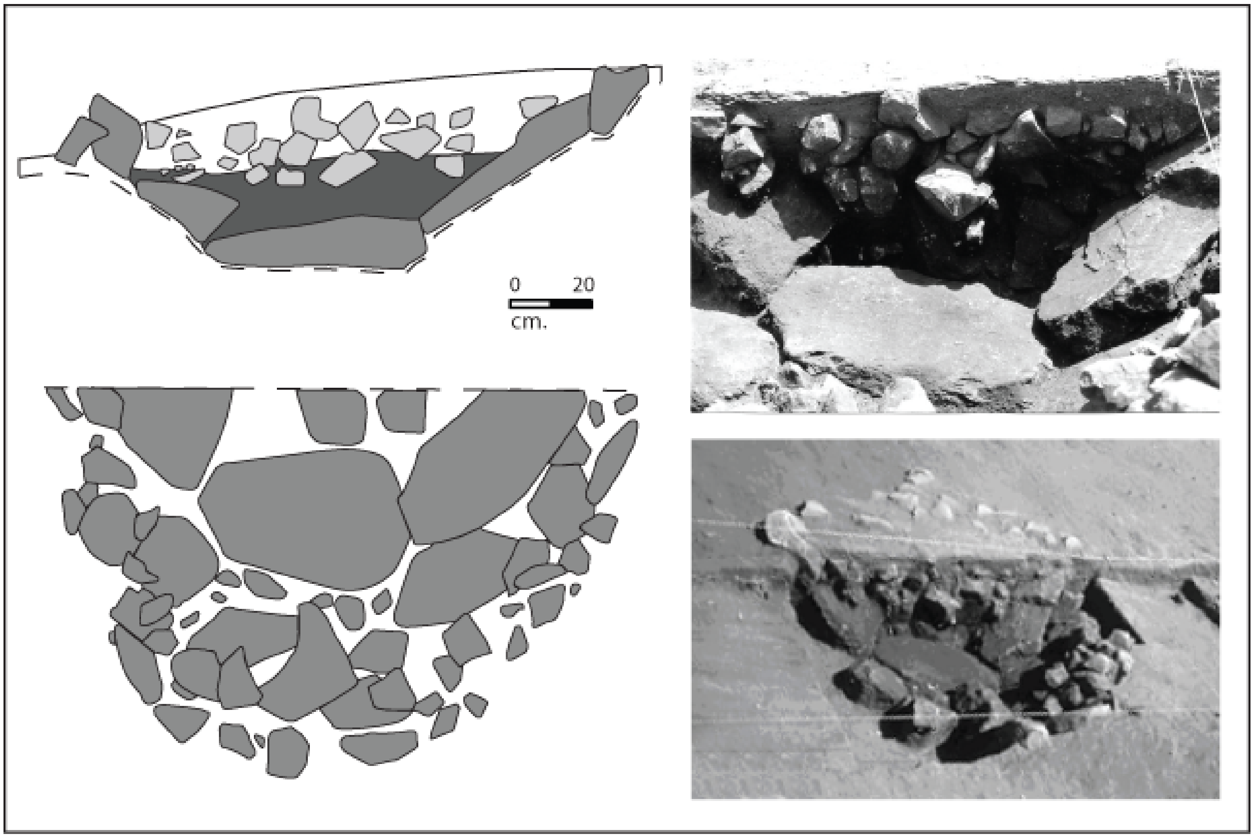

Figure 3. Post-archaic stone-lined oven at CA-LAN-2129.


Figure 4. Post-archaic grill structure at CA-LAN-2328.

pits" in regional archaeological literature, roasting pits have never actually been found, or at least adequately described, in the mid-Transverse Mountain Ranges (Milburn 2006a). Historical references to roasting pits elsewhere in southwestern California include an account of an early 1900s agave cooking facility that was constructed by Antonio Cuevas in the Santa Rosa Mountains (Sanders 1923:184-186).

Slab-lined Cooking Ovens

"Slab-lined cooking oven" is a term that is used to describe a category of highly specialized heated-rock structures found at many Santa Barbara Channel-area village sites (Gamble 1983; King 1993). These cooking facilities contain parabolic pits lined with sandstone slabs or cobbles and are similar to some stone-lined ovens found in the mid-Transverse Ranges; however, lack of evidence of high heating on the slab linings indicates that the cook stones were preheated in external fires prior to placement into pits with food (Gamble 1983:109-110,117; King 1993:283-284). External preheating of cook stones has not yet been reported for any heated-rock structure in the mid-Transverse Mountain Ranges.

Burnt-Rock Middens

Burnt-rock middens are cumulative features comprised of burnt rocks and darkened organic residues resulting from construction, firing, maintenance, and expansion of intersecting cook stone facilities over periods of time. Formed by use and re-use of heated stones, the relative sizes of the burnt-rock deposits may be indicative of the durations and/or intensities of food cooking activities at specific locales. Burnt-rock middens may contain one or more embedded cooking facilities; however, centralized cooking features are often not discernible (Figure 5). The burnt-rock middens examined so far in the Transverse Mountain Ranges appear similar in structure and size to Archaic "domed burnt-rock middens" found in central Texas but do not resemble the distinctive later period annular "ring middens" found in the eastern Mojave Desert and across much of the Southwest (Milburn 2004:105-106)

THE DATA

For purposes of this paper, ^{14}C ages and other cook stone data from the mid-Transverse Ranges are organized within broad temporal divisions reflecting cultural developments at desert and coastal areas. These sequences, which do not have hard edges, are referred to as Paleo-archaic <10,500 to 8000 cal BP), Early Archaic (8000 to 4000 cal BP), Late Archaic (4000 to 2300 cal BP), Post-archaic (2300 to 800 cal BP) and Proto-historic (800 to 200 cal BP). The period-by-period patterning of radiocarbon ages (Figure 6) and other heated-rock data is likely biased by greater visibility and accessibility of later-period deposits relative to earlier deposits (cf. Fitzgerald 2007)

Paleo-archaic Period (<10,500 to 8000 cal BP)

There are indications of human habitation at desert-facing flanks of the Transverse Mountain Ranges during the Paleo-archic Period;[5] however, there is as yet no evidence of heated-rock cooking during this period. Near the terminus of the Paleo-archaic Period, evidence of open-air cooking is provided by a partially burnt mule deer (*Odocoileus hemionus*) talus bone (2σ median calibrated ^{14}C age of 8020 cal BP) from LAN-1974 along Santiago Creek in the northern San Gabriel Mountains (Milburn 2004:109). As far as we are aware, this represents the earliest ^{14}C date, or is certainly among the earliest radiometric dates, retrieved so far from the Transverse Mountain Ranges.

Early Archaic (8000 to 4000 cal BP)

Six heated-rock stone locations in the San Gabriel Mountains and Baldy Mesa/Cajon Pass have yielded radiocarbon dates indicative of the Early Archaic Period (Table 1). While no Archaic heated rocks have been found at upland areas of the Castaic Mountains, an approximate ^{14}C age of 4110 cal BP from LAN-2058 could be associated with a nearby earth oven feature (Berryman et al. 2001:5.24-5.25) and a

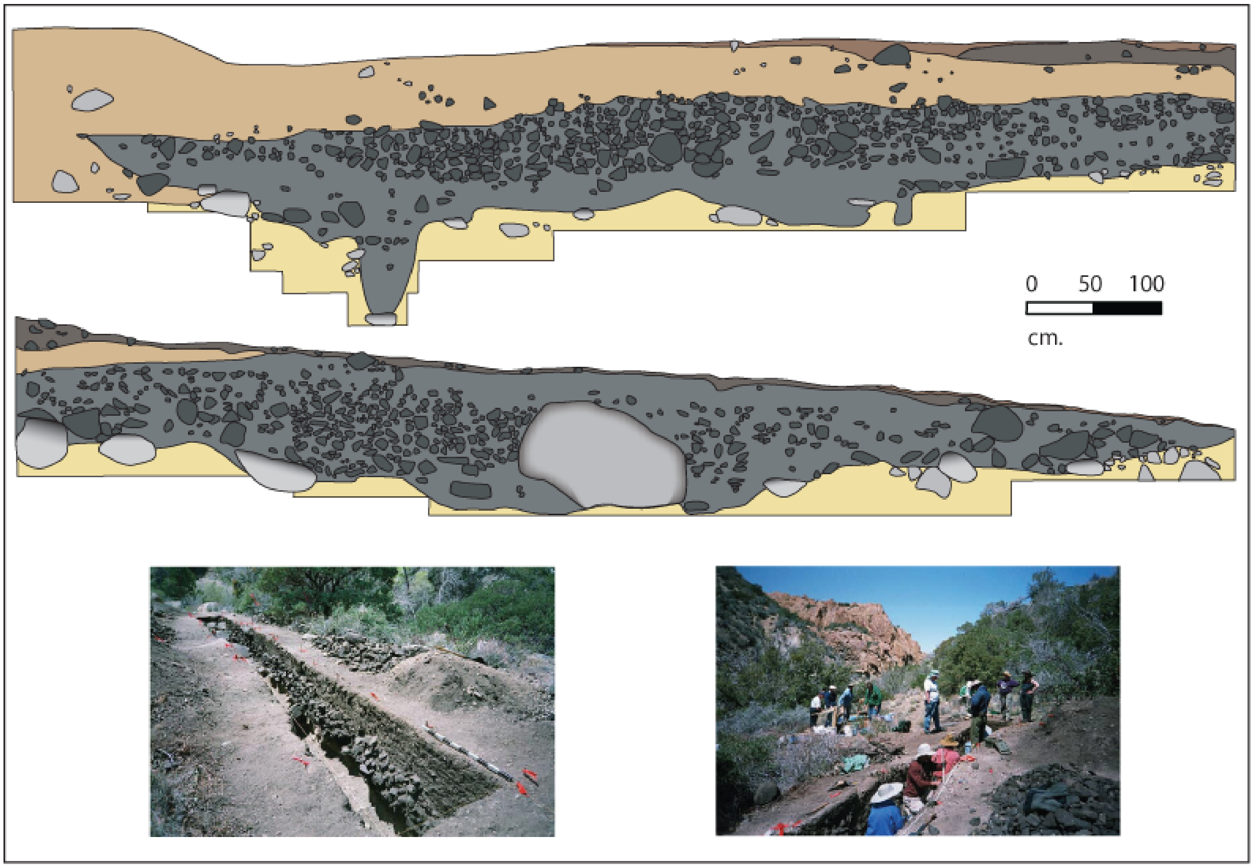

Figure 5. Burnt rock midden at CA-LAN-3013.

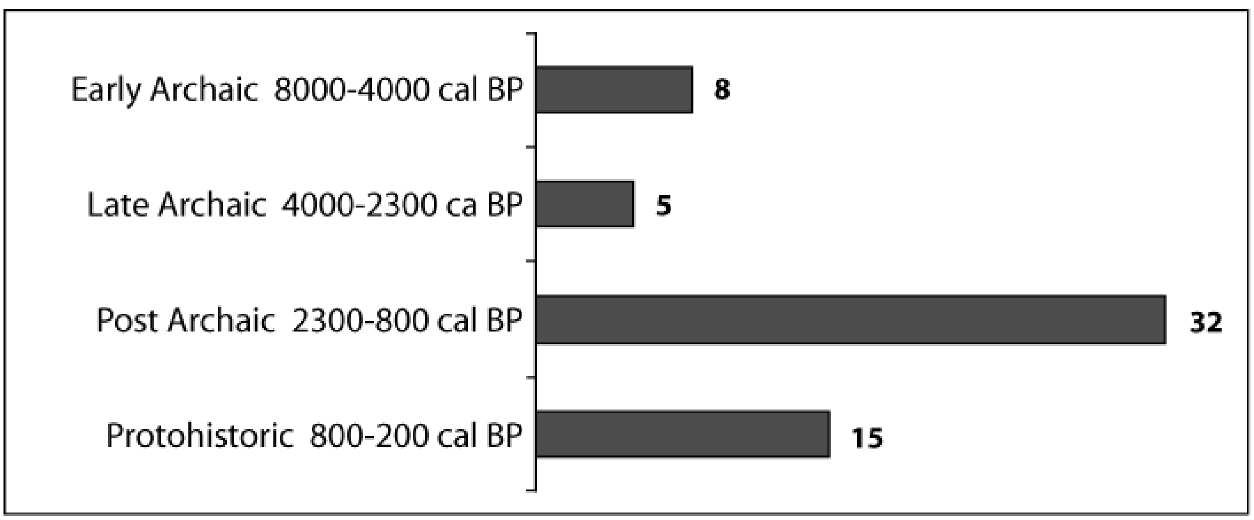

Figure 6. Distributions of ^{14}C dates retrieved from cook stone structures.

Table 1. ^{14}C Dates from Archaic Cook Stone Structures.

Site No. and Location[a]	Heated Rock Structure[b]	Lab Number	Material/ ^{14}C Dating Method	^{13}C o/oo[c]	Conventional Radiocarbon Age (1Σ)	2σ Calibration (cal BP)[d]	Median Prob. (cal BP)[e]	Calibration	Source[f]
LAN-3013 SGM	BRM	Beta-180869	Charcoal/ AMS	-24.3	6850 ± 40	7740 to 7610	7675	INTCAL98; (Stuiver et al. 1998)	1
LAN-3013 SGM	BRM	Beta-180868	Vitreous Resin/ AMS	-18.2	6750 ± 80	7710 to 7465	7600	INTCAL98; (Stuiver et al. 1998)	1
LAN-3013 SGM	BRM	Beta-155557	Bulk Sediment/ AMS	-22.3	5870 ± 60	6790 to 6530	6660	INTCAL98; (Stuiver et al. 1998)	1
LAN-3013 SGM	BRM	Beta-155556	Bulk Sediment/ AMS	-22.4	5590 ± 50	6460 to 6290	6375	INTCAL98; (Stuiver et al. 1998)	1
SBR-5568 BM/CP	EPO	PRI-07-20-5568. 2006.01	Charcoal/ AMS	-22.4	6305 ±25	7280 to 7160	7220	INTCAL05 on Oxcal v.3.10 (Bronk 1995; Reimer et al. 2004)	2
SBR-10075 BM/CP	EPO	Beta-226639	Charcoal/ AMS	-21.2	4840 ±40	5640 to 5580	5610	INTCAL04; (Reimer et al. 2004; Talma and Vogel 1993)	2
FS - 050154216 SGM	EPO	Beta-204972	Charcoal/ AMS	-22.0	4170 ±40	4840 to 4560	4700	INTCAL98; Stuiver et al. 1998;	3
FS - 050154089 SGM	EPO	Beta-94023	Charcoal/ AMS	-24.4	3720 ±50	4220 to 3905	4060	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993.	4
SBR-10073 BM/CP	EPO	Beta-226385	Charcoal/ AMS	-23.7	3570 ±40	3970 to 3730	3850	INTCAL04; (Reimer et al. 2004; Talma and Vogel 1993)	2
SBR12464 BM/CP	EPO	Beta-226383	Charcoal/ AMS	-21.6	3520 ±40	3900 to 3690	3795	INTCAL04; (Reimer et al. 2004; Talma and Vogel 1993)	2
LAN-2987	EPO	Beta-199325	Charcoal/ AMS	-24.4	3350 ±110	3860 to 3360	3610	INTCAL98 Stuiver et al. 1998	5
SBR113 BM/CP	EPO	Beta-41039	Charcoal/ Standard	(-25.0)	3060 ±100	3300 to 3200	3250	---	6
SBR10067 BM/CP	EPO	Beta-226384	Charcoal/ AMS	-22.9	2460 ±40	2720 to 2360	2540	INTCAL04; (Reimer et al. 2004; Talma and Vogel 1993)	2

[a] Location: Baldy Mesa/Cajon Pass = BM/CP; CM = Castaic Mountains; San Gabriel Mountains =SGM.
[b] Heated Rock Structure: Earthen Pit Oven = EPO; Stone-lined Oven =SLO; Grill = G; Burnt Rock Midden = BRM.
[c] Measured values (assumed values are in parentheses).
[d] Reported in calendar years before 1950. Multiple calibration ranges have been combined.
[e] Rounded to nearest five years.
[f] Source: (1) Milburn 2002, 2004; (2) Milburn and Doan 2008; (3) Milburn 2006b; (4) Milburn 2006a; (5) Milburn 2000, Romani et al. 2002; (6) de Barros 1997.

series of cook stone-associated radiocarbon ages ranging between 4610 and 3140 cal BP are reported for the Anaverde Valley (Padon and Padon 2008).

The earliest known evidence of heated-rock cooking in the Transverse Mountain Ranges is found at CA-LAN-3013, which is a burnt-rock midden site situated at about 1400m in elevation along Cruthers Creek in the northern San Gabriel Mountains (refer to Figure 5). Two charcoal clasts from the lowest levels of the approximately 18-m-diameter burnt-rock deposit yielded radiocarbon ages of 7675 cal BP (2σ calibration range of 7740 to 7610 cal BP) and 7590 cal BP (2σ calibration range of 7710 to 7465 cal BP). Additional radiocarbon dates from LAN-3013 indicate that heated-rock cooking activities occurred, at least periodically, for thousands of years.[6] The focus of heated-rock cooking appears to have been canyon live oak acorns (*Quercus chrysolepis*) and manzanita (*Arctostaphylos* sp.) berries; however, other plant foods, small mammals, and occasional freshwater shelled invertebrates were also processed (Milburn 2004).

Another Early Archaic cook stone structure was found at SBR-5568, which is situated at 1,365 m I elevation along Baldy Mesa Ridge. During the fall of 2006, an ill-advised archaeological excavation of the cooking structure retrieved virtually no useable data. During December 2006, Milburn and Doan (2008) reopened the 1-x-1-m excavation unit at SBR-5568 and documented in situ remnants of an earthen pit oven structure (see Figure 2). Sediment samples were collected and forwarded to Paleo Research Institute, Golden, Colorado for Fourier Transform Infrared Spectrometry (FTIR), macrobotanical, and radiocarbon dating analyses.[7] FTIR found the presence of starchy, processed edible tissue (PET) that may represent the remains of deteriorated starchy foods or seeds from local plants. Flotation yielded hardwood charcoal clasts that were too small for macrobotanical identification but probably represent manzanita and/or oak. Of particular significance, one of these specimens yielded a radiocarbon age of 6305 ±25 with 2σ calibrated age range of 7280 to 7160 cal BP (Puseman and Cummings 2007).

An earthen pit oven structure at SBR-10075, which is situated at 1,390 m in elevation along the Baldy Mesa rim, yielded a charcoal clast with radiocarbon age of 4840 ±40, calibrated 2σ between 5640 and 5580 cal B.P (Milburn and Doan 2008). The oven, which is situated in a dirt roadbed about one meter below the current surface, overlies older cultural deposits containing lithic flakes. The charcoal record from SBR-10075 is predominantly manzanita but also includes small fragments of buckbrush (*Rhamnus* sp.) and California laurel (*Umbellularia californica*). Recovery of a charred juniper seed fragment, possible epidermis from a succulent leaf, and small fragments of charred vitrified tissue may be indicative of foods cooked in the oven (Puseman and Cummings 2007).

Site FS 050154216 is a unique, clay-capped earthen pit oven site situated at 1,463 m in elevation near desert-draining Grandview Canyon in the northern San Gabriel Mountains (Milburn 2006b). This cooking structure is exposed in a road cut approximately 4 m below the current surface. The lower firing zone of the oven, which is about 80 cm in diameter and 50 cm in vertical extent, is overlain by a deliberately packed layer of clay. This clay stratum, which has sagged somewhat into the lower firing zone, is overlain by an approximately 7-m-diameter upper firing zone, which is in turn partially capped by yet another constructed layer of clay. AMS dating of charcoal from the lower firing zone yielded a radiocarbon age of 4170 ±40, with a 2σ calibrated age range of 4840 to 4560 cal BP.

At Site FS 050154089, an approximately 2-m-diameter earthen pit structure is situtated at about 1,426 m in elevation on the eastern flank of Little Rock Canyon (Milburn 1998, 2006b). The oven feature contains a relatively deep (80 cm) firing pit filled with many hundreds of densely compacted fire-affected rocks, darkened sediments, and exceedingly sparse carbonized plant remains. Charcoal flecks extracted from the lowest level of the structure yielded a ^{14}C date of 3720 ±50, with a 2σ calibrated range of 4220 to 3805 cal BP.

Late Archaic (4000-2300 cal BP)

Late Archaic radiocarbon dates, which range from about 3850 to 2540 cal BP, have been retrieved from earthen pit oven structures at LAN-2987, SBR-113, SBR-10067, SBR-10073, and SBR-

12464 (de Barros 1997; Milburn 2008a; Milburn and Doan 2008). The San Bernardino County sites are situated at Baldy Mesa/Cajon Pass, and LAN-2987 is located in the northwestern San Gabriel Mountains. Macrobotanical remains were reported for SBR-113 and SBR-12464.

A heated-rock structure at SBR-113, which yielded a radiocarbon age of 3250 cal BP, was found to contain predominantly charred juniper seeds and a few burnt yucca stalk fragments (de Barros 1997:5.29.-5.32). Juniper berries might well have been the focus of the heated-rock cooking activity; however, de Barros (1997:5.29.-5.32) interprets the structure as indicative of yucca cooking. If de Barros (1997) is correct, SBR-113 contains the earliest evidence of yucca cooking yet reported for the mid-Transverse Ranges.[8]

An earthen firing pit cooking structure at SBR-12464 yielded a 2σ median calibrated radiometric age of 3795 cal BP (Milburn and Doan 2008). A darkened sediment sample extracted from the feature contained manzanita, oak, and conifer charcoal, two parenchyma fragments that suggest roots or tubers, and charred vitrified tissue fragments that appear to represent a fleshy fruit, berry, or succulent plant part (Puseman and Cummings 2007:13).

Post-Archaic (2300-800 cal B P.)

Sixteen heated-rock sites in the San Gabriel Mountains have yielded Post-archaic radiocarbon dates ranging from about 2250 to 810 cal BP (Table 2). These include stone-lined ovens at LAN-902, -1254, -1359, -1974, -2128, -2129, and -2327 and earthen pit ovens and grills at LAN-2137, -2328, -2987, -2990, -3013, -3031, -3418, and SBR-12196 (Milburn 1995a, 1995b, 1997, 2004, 2005a, 2006a; Singer et al. 1995).

Six radiocarbon dates ranging between approximately 2130 and 960 cal BP have been obtained from earthen pit oven sites in the Castaic Mountains (Table 2), including LAN-1165, -2058, -2116, -2119, and -2373 (Berryman et al 2001; Broeker and Padon 1993; Strudwick and Sturm 1996; Wessel and McIntyre 1986). Also, a 2σ median calibrated ^{14}C age of 1510 cal BP was retrieved from a stone-lined earth oven at LAN-2464. That cooking structure represents the only unequivocal stone-lined facility reported so far in the Castaic Mountains (Vance 2008).

Seven conventional radiometric dates have been retrieved from five heated-rock structures at Baldy Mesa/Cajon Canyon sites SBR-421D, -713, -10074, -10078, and FS-051253134 (Basgall and True 1985; Doan et al. 2008; Milburn 1995b; Milburn and Doan 2008). The dates range between 2280 ±100 and 1050 ±60 BP (Table 2).

Protohistoric (800 to 200 cal BP)

Fifteen radiocarbon dates indicative of the Protohistoric Period have been retrieved from 12 heated-rock sites in the mid-Transverse Ranges (Table 2). Seven radiocarbon dates are reported in the San Gabriel Mountains at LAN-1977, -2128, -2327, -2990, -3013, and -3031). Five radiocarbon dates have been retrieved from cook stone structures in the Castaic Mountains at LAN-2480, -1235, -1834/H, and -2119. In the Cajon Pass, three radiometric ages have been yielded from ovens at SBR-113 and -3773. It may be significant to note that only four ^{14}C dates from the study area are later than 400 cal BP, and one of these, from LAN-2128, is almost certainly reflective of intrusive wildfire charcoal (Milburn 2006a).

BIOLOGICAL REMAINS FROM LATER-PERIOD HEATED ROCK FEATURES

Carbonized biological remains have been recovered from five cook stone structures in the San Gabriel Mountains that date to later periods: LAN-1359, -1977, -2129, -2328, and -3418. Macrobotanical analyses indicate that oak, juniper, manzanita, pine wood, and pine cones were frequently used as earth oven fuelwood (Milburn 1995, 2005, 2006a). Carbonized fragments of yucca stem and a yucca leaf base retrieved from stone-lined ovens at LAN-1977 in Santiago Canyon and LAN-2129 on Alimony Ridge, respectively, are interpreted as evidence of yucca processing (Milburn 1995a, 1998, 2006a; Klug and

Table 2. ^{14}C Dates from Post-archaic and Protohistoric Cook Stone Structures.

Site No. and Location[a]	Heated Rock Structure[b]	Lab Number	Material/ ^{14}C Dating Method	^{13}C o/oo[c]	Conventional Radiocarbon Age (1Σ)	2σ Calibration (cal BP)[d]	Median Prob. (cal BP)[e]	Calibration	Source[f]
LAN2137 SGM	EPO	Beta-94022	Charcoal/ AMS	-22.7	2290 ±50	2355 to 2150	2250	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	1
SBR421D BM/CP	"fire pit"	Beta-8541	Charcoal/ Standard	(-25.0)	2280 ±100	---	---	---	2
LAN2058 CM	EPO	Beta-106709	Charcoal/ Standard	-22.5	2120 ±50	2300 to 1955	2130	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	3
LAN2327 SGM	SLO	Beta-182595	Vitreous resin/ AMS	-22.3	2030 ±40	2105 to 1890	2000	INTCAL98; (Stuiver et al. 1998)	1
SBR10078 BM/CP	EPO	Beta-226638	Charcoal/ AMS	-24.0	2010 ±40	2050 to 1880	1965	INTCAL04; (Reimer et al. 2004; Talma and Vogel 1993)	4
FS-051253134 BM/CP	SLO	Beta-227262	Charcoal/ AMS	-25.7	2010 ±40	2050 to 1880	1965	INTCAL04; (Reimer et al. 2004; Talma and Vogel 1993)	5
LAN1254 SGM	EPO	Beta-73642	Charcoal/ Standard	-21.9	1970 ±70	2060 to 1730	1895	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	6
LAN2119 CM	EPO	Beta-106711	Charcoal/ Standard	-26.7	1950 ±60	2000 to 1730	1865	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	3
LAN2987 SGM	EPO	Beta-146417	Charcoal/ AMS	-21.7	1900 ±40	1920 to 1730	1825	INTCAL98; (Stuiver et al. 1998)	7
LAN2373 CM	EPO	Beta-106712	Charcoal/ Standard	-25.1	1870 ±50	1895 to 1700	1798	Stuiver et al. 1993	3
LAN2116 CM	EPO	Beta-58101	Charcoal/ Standard	-21.1	1780 ±60	1840 to 1720	1780	---	8
LAN2990 SGM	EPO	Beta-175802	Charcoal/ Standard	-23.4	1830 ±60	1890 to 1600	1745	INTCAL98; (Stuiver et al. 1998)	9
LAN3013 SGM	BRM	Beta-155555	Charcoal/ AMS	-22.7	1820 ±50	1870 to 1610	1740	INTCAL98; (Stuiver et al. 1998)	10
LAN2328 SGM	G	Beta-113902	Charcoal/ AMS	-24.5	1750 ±50	1790 to 1535	1665	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	1
SBR12196	EPO	Beta-206585	Charcoal/ AMS	-21.2	1730 ±40	1720 to 1540	1630	INTCAL98; (Stuiver et al. 1998	11
LAN2464 CM	SLO	Beta-223043	Charcoal/ AMS	-24.9	1630 ±40	1600 to 1420	1510	INTCAL98; (Stuiver et al. 1998)	12
SBR10074 BM/CP	SLO	Beta-226386	Charcoal/ AMS	-24.6	1430 ±40	1390 to 1290	1340	INTCAL04; (Reimer et al. 2004; Talma and Vogel 1993)	4

Site No. and Location[a]	Heated Rock Structure [b]	Lab Number	Material/ ^{14}C Dating Method	^{13}C o/oo[c]	Conventional Radiocarbon Age (1Σ)	2σ Calibration (cal BP)[d]	Median Prob. (cal BP)[e]	Calibration	Source[f]
LAN2128 SGM	SLO	Beta-94021	Charcoal/ Standard	-23.4	1360 ±50	1330 to 1175	1255	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	1
LAN2129 SGM	SLO	Beta-74588	Charcoal/ Standard	-23.9	1300 ±60	1310 to 1070	1190	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	1
LAN2129 SGM	SLO	Beta-74589	Charcoal/ Standard	-23.2	1240 ±50	1280 to 1050	1165	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	1
LAN1359 SGM	SLO	Beta-81519	Charcoal/ Standard	-25.5	1170 ±40	1170 TO 970	1070	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	13
LAN1359 SGM	SLO	Beta-81518	Charcoal/ Standard	-24.2	950 ±50	950 TO 735	840	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	13
LAN1974 SGM	SLO	Beta-146418	Charcoal/ AMS	-24.6	1150 ±40	1170 to 960	1065	INTCAL98; (Stuiver et al. 1998)	14
SBR0713 BM/CP	"rock rubble"	unknown	Charcoal/ Standard	(-25.0)	1960 ±50	---	---	---	2
SBR0713 BM/CP	"FAR cluster"	Beta-8544	Charcoal/ Standard	(-25.0)	1620 ±70	---	---	---	2
SBR0713 BM/CP	"rock cluster"	UCLA-1789A	Charcoal/ Standard	(-25.0)	1440 ±50	---	---	---	2
SBR0713 BM/CP	"fire pit"	Beta-8543	Charcoal/ Standard	(-25.0)	1050 ±60	---	---	--	2
LAN1165 BM/CP	EPO	UCR-2102	Charcoal/ Standard	-25.0	960 ±50	1010 to 910	960	---	15
LAN3418 SGM	EPO	Beta-204372	Charcoal/ AMS	-24.0	1000 ±40	970 to 800	885	INTCAL98; (Stuiver et al. 1998)	16
LAN3418 SGM	G	Beta-204373	Charcoal/ AMS	-23.4	940 ±40	940 to 760	850	INTCAL98; (Stuiver et al. 1998)	17
LAN3031 SGM	EPO	Beta-130854	Charcoal/ AMS	-21.9	980 ±40	935 to 745	840	INTCAL98; (Stuiver et al. 1998)	17
LAN3031 SGM	SLO	Beta-130853	Charcoal/ AMS	-22.7	860 ±40	790 to 675	735	INTCAL98; (Stuiver et al. 1998)	17
LAN902 SGM	SLO	Beta-196260	Charcoal/ AMS	-22.6	880 ±40	920 to 700	810	INTCAL98; (Stuiver et al. 1998)	9
LAN1977 SGM	SLO	Beta-76020	Charcoal/ Standard	-22.4	840 ±60	915 to 665	790	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	14
LAN1977 SGM	SLO	Beta-94808	Charcoal/ Standard	-23.7	850 ±60	915 to 665	790	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	14

Site No. and Location[a]	Heated Rock Structure[b]	Lab Number	Material/ ^{14}C Dating Method	^{13}C o/oo[c]	Conventional Radiocarbon Age (1Σ)	2σ Calibration (cal BP)[d]	Median Prob. (cal BP)[e]	Calibration	Source[f]
LAN2480 CM	EPO	Beta-108286	Charcoal/ Standard	-24.6	820 ±50	885 to 665	775	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	3
LAN2990 SGM	G	Beta-175801	Charcoal/ AMS	-24.6	740 ±40	720 to 650	685	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	9
SBR113 BM/CP	'hearth"	Beta-41038	Charcoal/ Standard	-25.0	740 ±80	800 to 550	675	-	18
LAN2119 CM	EPO	Beta-79554	Charcoal/ Standard	-25.0	660 ±50	675 to 540	610	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	19
LAN2119 CM	EPO	Beta-79553	Charcoal/ Standard	-25.0	600 ±50	660 to 525	595	Same as above	19
LAN3013 SGM	BRM	Beta-155554	Charcoal/ AMS	-23.9	580 ±40	650 to 530	590	INTCAL98; (Stuiver et al. 1998)	10
LAN1235 CM	EPO	UCR-2103	Mule deer antler/ Standard	-25.0	530 ±80	610 to 450	530	---	20
LAN2327 SGM	SLO	Beta-74588	Charcoal/ Standard	-22.3	390 ±60	525 to 300	415	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	1
SBR3773 BM/CP	SLO	Beta-41040	Charcoal/ Standard	-25.0	260 ±50	440 to 140	290	---	18
SBR3773 BM/CP	SLO	Beta-41041	Burnt log/ Standard	-25.0	70 ±60	after 200	---	---	18
LAN1834 CM	"fire circle"	Beta-58100	Charcoal/ Standard	-25.5	240 ±50	290 to 190	240	---	8
LAN2128 CM	SLO	Beta-113901	Charcoal/ AMS	-19.9	160 ±50	after 300	150	Stuiver et al. 1993; Talma and Vogel 1993; Vogel et al. 1993	1

[a] Location: Baldy Mesa/Cajon Pass = BM/CP; CM = Castaic Mountains; San Gabriel Mountains =SGM.
[b] Heated Rock Structure: Earthen Pit Oven = EPO; Stone-lined Oven =SLO; Grill = G; Burnt Rock Midden = BRM.
[c] Measured values (assumed values are in parentheses).
[d] Reported in calendar years before 1950. Multiple calibration ranges have been combined.
[e] Rounded to nearest five years.
[f] Source: (1) Milburn 2006a; (2) Basgall and True 1985; (3) Berryman et al 2001; (4) Milburn and Doan 2008; (5) Doan et al. 2008; (6) Singer et al. 1995; (7) Milburn 2000; Romani et al. 2002; (8) Broeker and Padon 1993; (9) Milburn 2008a; (10) Milburn 2002, 2004; (11) Milburn 2005b; (12) Vance 2008; (13) Milburn 1995; (14) Milburn 1997; (15) Wessel and McIntyre 1986; (16) Milburn 2005; (17) Milburn 2008b; (18) de Barros 1997; (19) Strudwick and Sturm 1995; (20) Wessel and Wessel 1985.

Popper 1994, 1996). Carbonized manzanita and juniper berries found at LAN-1359 and LAN-3418 indicate that these plant fruits were cooked in earth ovens (Milburn 1995b; Puseman and Dexter 2005). Amorphous carbonized material retrieved from a grill structure at LAN-2328 (see Figure 4), which may be the remains of pine nut meat, suggests piñon nut processing (Milburn 2006a; Klug and Popper 1996). The recovery of burnt and unburnt bone fragments at LAN-1359 and LAN-3418 probably indicates that small animals were also sometimes cooked with heated rocks (Milburn 1995b, 2005; Puseman and Dexter 2005).

In the Castaic Mountains, charcoal specimens from LAN-2119, -2058, and -2373 include oak, juniper, manzanita, toyon (*Heteromeles arbutifolia*), buckthorn, and chamise (*Adenostoma* sp.) (Berryman et al. 2001; Strudwick and Sturm 1996). A basal fragment of a carbonized yucca spine from an earthen pit oven at LAN-2119 is interpreted as evidence of yucca cooking (Strudwick and Sturm 1996:46). Carbonized sap found at LAN-2119, -2058, and -2373 may represent sugary remains from yucca reduction (Berryman et al. 2001:8.7). Bone fragments from LAN-2119 indicate that mule deer was cooked with heated rocks, along with plant foods (Strudwick and Sturm 1996:41, 55).

At Baldy Mesa and Cajon Pass, biotic remains have been retrieved from cook stone structures at SBR-421, -713, -773, -10074, and -10078. Charred juniper seeds and animal bones were identified at SBR-421 and -713 (Basgall and True 1985); however, the results of the analyses are considered inconclusive (de Barros 1997:2.46-2.47). Abundant yucca stalk, heart, and leaf materials from two stone-lined ovens at SBR-3773 strongly indicate very late proto-historic or early historic-period yucca cooking (de Barros 1997:5.205-5.206). Charcoal from SBR-10074 is predominantly manzanita and oak, though a charred juniper seed, two unidentified seed fragments, and charred vitrified PET fruity tissue suggest that juniper berries, seeds, and possibly a succulent plant were cooked as food. At SBR-10078, apparent plant carbohydrate and waxes were found associated with the cook stones (Puseman and Dexter 2005).

WORKING MODEL OF HEATED-ROCK COOKING

Following the Pleistocene in the Great Basin, there was a lengthy transition from earlier Paleo-Indian lifeways to subsequent Archaic adaptations. Small, widely dispersed Paleo-archaic populations utilized an economy that focused on a few high-quality plant foods and small game extracted from very large hunting-gathering areas on valley floors (e.g., Jones et al. 2003:6-8, 30-31). These foods were probably cooked almost exclusively in open-air hearths, a technique that is not well preserved in the archaeological record.

Although hearths continued to be used during all subsequent periods, a series of more labor-intensive cooking techniques became increasingly commonplace over time. Along northern and southern margins of the western Mojave Desert, earthen pit cooking facilities appeared by approximately 8000 cal BP at KER-3939 in the Fremont Valley (Gardner et al. 2006) and a few centuries later, about 7600 cal BP, at LAN-3013 in the San Gabriel Mountains (Milburn 2002, 2004). As modeled herein, these heated-rock structures marked a gradual shift in land-use from desert valley floors towards a broader-spectrum Archaic economy, which included penetration of upland montane landscapes and development of new technologies to process new sources of food, including complex carbohydrate plants requiring longer cooking times.

During Archaic periods, heated-rock food cooking gradually expanded into a greater diversity of landscape settings in the Transverse Ranges. The plant foods cooked in Archaic earthen pit ovens probably included oak acorn, juniper berries, manzanita berries, and roots/tubers, such as Brodiaea (*Dichelostemma pulchellum*), Mariposa lily (*Calochortus* sp.), and biscuit root (*Lomatium triternatum*).[9] Admittedly, juniper fruits, manzanita berries, and biscuit root do not require long cooking times; however, elsewhere in North America, foods not requiring lengthy cooking are found in earth ovens with heated-rock elements (Thoms 2003:92). One possible explanation is that heated rocks provide fuel-saving capacities in fuel-poor arid environments.

By the beginning of the Post-archaic Period, roughly 2300 cal BP, there was a significant increase in the use of cook stones in the mid-Transverse Ranges, including an expansion of this technology into higher elevations of the San Gabriel Mountains and upland zones of the Castaic Mountains. Post-archaic heated-rock activity appears to have been related to more logistical land-use systems that included intensified utilization of food resources by greater numbers of people.[10] While land use remained broad-spectrum, populations at desert margins of the Transverse Ranges tended to focus on a few staple food resources, including piñon nuts, juniper berries, manzanita berries, oak acorns, and yucca (Earle et al. 1995:2.14-2.23). Much of the heated-rock cooking during later periods appears to have been centered on yucca heart, which can be placed in storage for a year or more after cooking (Zigmond 1981), and also on the extraction of nuts from green piñon cones.

Distinctive stone-lined ovens appear to have been introduced into the Transverse Ranges by at least 2000 cal BP (Milburn 1998, 2004). Suggested as a hallmark for Uto-Aztecan groups during later periods, this new food cooking technology largely replaced the use of earthen pit structures in the eastern San Gabriel Mountains and at the Cajon Pass (Milburn 1998, 2006a). Stone-lined oven structures are arguably more labor-costly to construct than earthen pit ovens but require considerably less fuel to achieve desired cooking temperatures. The conservation of fuelwood may have been an important consideration for intensified food cooking with heated rocks at some locales (King 1993; King et al. 1974:17).

Scarcity of heated-rock-associated radiocarbon dates after about 400 cal BP suggests that the intensity of food cooking in these kinds of features may have decreased prior to the arrival of Europeans. This could relate to the encorporation of alternative cooking technologies during the Protohistoric Period, such as "boiling stones," stone bowls, and pottery vessels (see Thoms 2003); however, it might also relate to less resource utilization due to a reduction in native populations.

SUMMARY

The appearance of heated-rock cooking structures in the archeological record of the Transverse Mountain Ranges, which occurred by at least 7600 cal BP, is indicative of a land-use shift from Paleo-archaic adaptations on valley floors towards broader-spectrum Archaic lifeways. During Archaic periods, upland foods cooked with heated rocks included acorn, juniper, manzanita, and roots/tubers. A significant expansion of heated-rock cooking occurred by approximately 2300 years ago, which is reflective of increased populations and more sedentary patterns of resource intensification. During later periods, heated-rock cooking appears to have focused on a few primary foods, including yucca and piñon nuts. By about 2000 cal BP, more fuel-efficient stone-lined ovens began to replace earthen pit ovens at the Cajon Pass and easterly portions of the San Gabriel Mountains. Heated-rock cooking activity may have decreased in the Transverse Ranges after about 400 cal BP.

NOTES

[1] Following Thoms (2003:87), we use the term "land use" to reference the "patterned exploitation of resources by human groups, the manner in which they used places on the landscape, the technologies they employed in the process, and the effects of that exploitation on the ecosystem." The term "resource intensification" is used interchangeably with "land-use intensification" to describe "a trend through millennia toward expenditure of more energy per unit area to recover more food from the same landscape to feed more people" (Thoms 2003:87; cf. Hildebrandt 1995).

[2] Baldy Mesa, also referred to as the Cajon Divide, is an approximately 16-km-long ridgeline that connects the San Gabriel Mountains to the San Bernardino Mountains. Baldy Mesa, which ranges in maximum elevation from about 1280 on the east to 1525 m on the west, forms the northern flank of the three-pronged Cajon Pass corridor (West Cajon Valley, Central Cajon Basin, and Crowder Canyon). To the west of Cajon Pass, the steep and rugged San Gabriel Mountains extend approximately 100 km to San Fernando Pass, with a maximum width of about 40 km. Elevations in the San Gabriels average 1,220 m to 1,525 m; however, many eastern peaks exceed 2,100 m and the tallest, Mt. San Antonio (Old Baldy), reaches 3,068 m. Northwest of the San Gabriels, the topographically rugged but relatively low-elevation Castaic Mountains extend about 55 km between Soledad Pass and Piru Creek, with a maximum width of approximately 30 km. The highest point in the Castaic Mountains is approximately 1,765 m, at Burnt Peak.

Broad-scale vegetation zones recognizable in the mid-Transverse Ranges are largely transitional from coastal-facing landscapes to interior desert areas. These include chaparral-covered foothills (below

915 m), lower montane chaparral-dominated landscapes with patches of conifers/live oaks (915 to 1,525 m), upper montane pine and fir forests (1,525 to 2,590 m), subalpine/alpine communities on the highest peaks (above 2,590 m), and north-facing desert montane landscapes (915 to 2,135 m) comprised of piñon-juniper woodlands at mid-elevations and desert chaparral/scrub communities along the dry desert margins (cf. Stephenson and Calcarone 1999:17-22).

[3] We use the term "hearth" to designate open-air, mostly non-rock, thermal structures used to cook foods held above flames, placed on coals, or contained in ceramic or stone vessels. While hearths may contain a few fire-containment rocks, prop stones, or pot rests, these structures do not utilize cook stones to heat foods (Milburn 2006a).

[4] Descriptions of "stone-lined" firing pits found in regional archaeological reports should be viewed with some degree of caution (Milburn 1998, 2006a). In situ cobble cooking platforms found in earthen pit ovens, which simply sagged into firing zones as the underlying fuelwood was consumed, are sometimes misinterpreted by researchers as representing floor and sidewall stone linings (see, as few examples, Ericson 1972:44; Strudwick and Sturm 1996:29-47); Wessel 1990:4-5; Wessel and McIntyre 1986:38-40).

[5] The geographical foraging territory of a Paleo-archaic population in the southern Mojave Desert may be delimited by occurrences of obsidian from the Coso Volcanic Field (Jones et al. 2003:30-31). Although Wohlgemuth (1995) rightly urges caution, obsidian pieces recovered from lowest levels of site LAN-1304 along Little Rock Creek, which yielded hydration rim measurements that included 11.2/12.1, 14.5, and 15.1/16.2 microns, potentially indicate Paloe-archaic habitation of the mid-Transverse Ranges.

[6] Other radiocarbon data from LAN-3013 include calibrated median ages of 6660 and 6375 cal BP that were retrieved from bulk fine-grained organic sediment samples. These dates are not absolute but, rather, represent the mean residence times for decomposed organic carbon retained in the bulk samples. Due to potential dilution by downward transportation of younger organic matter, these ages represent the minimum for the deposits from which they were retrieved. Other median calibrated ^{14}C ages of charcoal retrieved from upper levels of the burnt-rock midden at LAN-31013 are 1740 cal BP and 590 cal BP (Milburn 2004:107-108)

[7] Darkened sediments from six cook stone features at Baldy Mesa were recently subjected to Fourier Transform Infrared Spectrometry (FTIR) analysis, which is considered to be a powerful tool for identifying organic substances in archaeological deposits (Puseman and Cummings 2007). The FTIR process for the Baldy Mesa materials included placement of the samples in the path of a specially encoded infrared beam that passed through the sample and produced an inferogram signal. A computer then read the inferogram and used Fourier transformation to decode the intensity information for each frequency (wave numbers) and presented a spectrum. Each spectrum collected from the organic samples serves as a chemical fingerprint of materials, including carbohydrates, lipids, and proteins, which are associated with specific wave number bands. Comparison of this spectrum with a set of standard spectra and other references provided critical information to identify the unknown materials (Puseman and Cummings 2007).

[8] Because the yucca stalk materials from SBR-113 appear to have been burnt as fuel in earth oven firing zones, the interpretation of a yucca cooking is not unequivocal. In contrast to roasting pits, carbonized plant remains below rock cooking platforms in earth ovens comprise the materials that were burnt as fuel and thus do not provide direct evidence of cooked foods (cf. Berryman et al. 2001:2.11). However, it is not unreasonable to assume that some food plant parts may have been discarded amongst the oven fuel during processing, which allows for indirect inferences about cooked foods to sometimes be drawn from plant remains in firing zones (Milburn 2006a).

[9] Baking of oak acorns with heated rocks in the Transverse Mountain Ranges may represent an Archaic tradition that may have been largely discontinued after later-period mortar/pestle and leaching technologies were adopted (Milburn 2002). There is considerable evidence for heated-rock cooking of oak acorns elsewhere in North America. In the Southwest, Gambel's oak (*Quercus gambelii*) and shrub

oak (*Q. turbinella*) in the Southwest were pit-roasted, shelled, ground into meal, and stone-boiled into mush (Puseman and Dexter 2005). In northern California, Shasta groups sometimes roasted whole canyon live oak (*Q. chrysolepis*) acorns in ashes without preliminary leaching, and the Pomo buried acorns in shells, retrieved them when moldy, and baked them in underground stone-lined ovens about two feet deep (Barrett 1952:61, 76-77; Kroeber 1925:293).

[10] Intensification patterns evident during later periods may simply have evolved in-place among indigenous groups due to long-term population increases; alternatively, it is suggested that these patterns may relate to the migrations of Shoshoneans (Uto-Aztecans) into southwestern California with distinct land-use adaptations (Hildebrandt 1996). Shoshonean land-use systems included less mobility, intensive use of lower-quality resources, and resource exploitation in a wider range of environmental habitats, which may have allowed them to support larger populations and to out-compete less populous predecessor groups. Long-term implications of land-use intensification include a greater degree of sedentism, more localized land-use, ecological niche saturation, and increased stress on resources (Hildebrandt 1996:5).

REFERENCES CITED

Basgall, Mark E., and D. L. True
1985 *Crowder Canyon Archaeological Investigations, San Bernardino County, Volumes 1 and 2, CA-SBR-421 and CA-SBR-713.* Far West Anthropological Research Group, Davis, California.

Barrett, S.A.
1952 *Material Aspects of Pomo Culture, Part One.* Bulletin of the Public Museum of the City of Milwaukee No. 20, Milwaukee.

Bean, Lowell J. and Katherine Siva Saubel
1972 *Temalpakh, Cahuilla Indian Knowledge and Usage of Plants.* Malki Museum Press, Banning, California.

Berryman, Judy, Sean Hess, Karen Rasmussen, Steve Martin, and Virginia Popper.
2001 *Archaeology Along the Pacific Pipeline: Upland Roasting Pits in the Liebre Mountains, California.* Science Applications International Corporation, Santa Barbara, California.

Bronk, Ramsey C.
1995 Radiocarbon Calibration and Analysis of Stratigraphy: the OxCal Program. *Proceedings of the 15th International Radiocarbon Conference, Glasgow.*

Broeker, Gale and Beth Padon
1993 *Cultural Resource Monitoring Report, Mobil Oil Corporation, M-70 Project.* Report by LSA Associates, Irvine, California.

de Barros, Philip L.
1997 *Results of Archaeological Test Excavations and a Request for Determination of Eligibility for Nine Sites in Crowder Canyon – Route 138 Improvement Project 08-SBd-138 PM 16.3/19.7*. Professional Archaeological Services, San Diego.

Doan, U. K., Julie Scrivner, and James McPherson
2008 *Archaeological Investigation for the 2006 Ramp Fire Incident in the Cajon Pass, San Bernardino National Forest, San Bernardino County, California*. USDA - Forest Service, San Bernardino National Forest, San Bernardino, California.

Dozier, Deborah L.
1996 *Conversations with the Elders: A View of the Cahuilla World*. Heyday Press, Berkeley.

Earle, David D., Judy McKeehan, and Roger D. Mason
1995 *Cultural Resources Overview of the Little Rock Watershed, Angeles National Forest, California*. Chambers Group, Irvine California.

Ericson, Jonathon E.
1972 *GeoScience at the Castaic Site (LAn-234)*. University of California Los Angeles, Institute of Geophysics and Planetary Physics.

Fitzgerald, Richard
2007 Radiocarbon Dating in the California State Parks. *Society for California Archaeology Newsletter* 41(4):31-33.

Gamble, Lynne H.
1983 The Organization of Artifacts, Features and Activities at Pitas Point: A Coastal Chumash Village. *Journal of California and Great Basin Anthropology* 5:103-129.

Gardner, Jill, Sally F. McGill, and Mark Q. Sutton.
2006 Early and Middle Holocene Hearth Features Along the Garlock Fault, Western Fremont Valley, California. *Pacific Coast Archaeological Society Quarterly* 38(4):45-59.

Hildebrandt, William R.
1996 *Ecosystem and Cultural Resources: A View From Littlerock Canyon, Angeles National Forest*. Far Western Anthropological Research Group, Davis, California.

Hudson, Travis and Thomas C. Blackburn
1983 *The Material Culture of the Chumash Interaction Sphere, Vol. II: Food Preparation and Shelter*. Ballena Press Anthropological Papers No. 27, Menlo Park, California.

Jones, George T., Charlotte Beck, Eric E. Jones, and Richard E. Hughes
2003 Lithic Source Use and Paleoarchaic Foraging Territories in the Great Basin. *American Antiquity* 68:5-38.

King Chester D.
1993 Fuel Use and Resource Management: Implications for the Study of Land Management in Prehistoric California and Recommendations for a Research Program. In *Before the Wilderness: Environmental Management by Native Californians*, edited by Thomas C. Blackburn and Kat Anderson, pp. 293-298. Ballena Press, Menlo Park, California.

King, Chester D., Charles Smith, and Thomas F. King
1974 *Archaeological Report Related to the Interpretation of Archaeological Resources Present at Vasquez Rocks County Park*. Los Angeles County Department of Parks and Recreation, Los Angeles.

Klug, Lisa, and Virginia S. Popper
1994 *Macrobotanical Analysis of One Soil Sample from Earth Oven Feature A, CA-LAN-2129, Los Angeles County, California*. University of California Los Angeles, Paleoethnobotanical Laboratory.
1996 *Macrobotanical Analysis of Soil and Charcoal Samples from Seven Sites from the San Gabriel Mountains, Los Angeles County, California*. University of California Los Angeles, Paleoethnobotanical Laboratory.

Kroeber, Alfred L.
1925 *Handbook of the Indians of California*. Bureau of America Ethnology Bulletin No. 78, Washington D.C.

Milburn, Douglas H.

1995a *Archaeological Assessment: Alimony Earth Oven Site No. 2 (CA-LAN-2129), Northern San Gabriel Mountains, Los Angeles County, California*. USDA- Forest Service, Angeles National Forest, Arcadia, California.

1995b *Archaeological Investigation at CA-LAN-1359, Upper Big Tujunga Canyon, San Gabriel Mountains, Los Angeles County, California*. USDA- Forest Service, Angeles National Forest, Arcadia, California.

1997 *Archaeological Data Recovery Related to Wildfire Suppression Damage at CA-LAN-1977, Santiago No. 4, Northern San Gabriel Mountains, Los Angeles County, California*. USDA-Forest Service, Angeles National Forest, Arcadia, California.

1998 Prehistoric Stone-lined Roasting Ovens from Littlerock Canyon: Proposed Archaeological Markers of Ethnic Replacement and Territorial Extent in the Northern San Gabriel Mountains, California. Paper presented at the 32nd Annual Meeting of the Society for California Archaeology, San Diego.

2000 Archaeological Site Record Form: CA-LAN-2987. Form on file USDA-Forest Service, Angeles National Forest, Heritage Resources Section, Arcadia, California.

2002 *Archaeological Investigation at CA-LAN-3012 and -3013 Located Near Cruthers Creek, Northern San Gabriel Mountains, Los Angeles County, California*. USDA-Forest Service, Angeles National Forest, Heritage Resources Section, Arcadia, California.

2004 14C Ages of Carbonized Organics From CA-LAN-3013 Indicating Approximate 7600 CYBP Firing of Earth Ovens Near Mojave Desert Verge of the San Gabriel Mountains, California. In *Ever Westward: Papers in Honor of Elizabeth Kelley*, edited by Regge Wiseman, Thomas C. O'Laughlin, and Cordelia T. Snow, pp 101-114. The Archaeological Society of New Mexico, Albuquerque.

2005a *Archaeological Investigation at FS No. 05-01-55-159, Aliso Canyon, Northern San Gabriel Mountains, Los Angeles County California*. USDA - Forest Service, Angeles National Forest, Arcadia, California.

2005b *Archaeological Assessment at the Tri-Levels Site (FS No. 05-01-54-162) near Sheep Creek Canyon, Northern San Gabriel Mountains, San Bernardino County California*. USDA - Forest Service, Angeles National Forest, Arcadia, California.

2006a *Archaeological Investigations at Alimony Ridge, Northern San Gabriel Mountains, Los Angeles County, California*. USDA - Forest Service, Angeles National Forest, Heritage Resources Section, Arcadia, California.

2006b *Angeles National Forest Passport-in-Time (PIT) Archaeological Project - Grandview Canyon Segment, Northern San Gabriel Mountains, Los Angeles County, California*. USDA - Forest Service, Angeles National Forest, Arcadia, California.

2008a *Archaeological Investigations in Aliso and Arrastre Canyons, Northern San Gabriel Mountains, Los Angeles County, California*. USDA - Forest Service, Angeles National Forest, Heritage Resources Section, Arcadia, California.

2008b *Archaeological Investigations at Upper Big Tujunga Canyon, Northern San Gabriel Mountains, Los Angeles County, California*. Manuscript on file USDA - Forest Service, Angeles National Forest, Heritage Resources Section, Arcadia, California.

Milburn, Douglas H. and U. K. Doan

2008 *Archaeological Examinations of Prehistoric Cook Stone Structures along the Baldy Mesa - Cajon Pass Divide, San Bernardino National Forest, San Bernardino County, California*. USDA - Forest Service, San Bernardino National Forest, Front Country Ranger District, Lytle Creek, California.

Padon, Beth and Chris Padon

2008 Nine Prehistoric Sites in Northern Los Angeles County. Paper presented at the 42nd Annual Meeting of the Society for California Archaeology, Burbank.

Puseman, Kathryn and Jaime Dexter

2005 *Macrofloral Analysis at the Aliso Junction Earth Oven Site, FS No. 05-01-55-159, California*. Paleo Research Institute Technical Report No. 05-50. Golden, Colorado.

Puseman, Kathryn and Linda Scott Cummings

2007 *Macrofloral Analysis, Fourier Transform Infrared Spectrometry (FTIR), and AMS Radiocarbon Dating For Sites CA-SBR-5569/H, CA-SBR-10073, CA-SBR-10074, CA-SBR-10075, CA-SBR-10078, and CA-SBR-12464 for the Baldy Mesa OHV Survey, Southern California*. Paleo Research Institute Technical Report No. 07-20. Golden, Colorado.

Reimer, Paula J., Mike, G.L. Baille, Edouard Bard, Alex Bayliss, Warren Beck, Chanda J. H. Bertrand, Paul G. Blackwell, Caitlin E. Buck, George S. Barr, Kirsten B. Cutler, Palu E. Damon, R. Lawrence Edwards, Richard G. Fairbanks, Michael Friedrich, Thomas P. Guilderson, Alan G. Hogg, Konrad A. Hughen, Bernd Kromer, Gerry McCormac, Stuart Manning, Christopher Bronk Ramsey, Ron W. Reimer, Sabome Remmele, John R. Southon, Minze Stuiver, Sahra Taalamo, F.W. Taylor, Johnees van der Plicht, and Constance E Weyhenmeyer

2004 IntCal04 Terrestrial Radiocarbon Age Calibration. *Radiocarbon* 46:1029-1058.

Romani, Gwendolyn R., John F. Romani, June A. Schmidt, and Dan A. Larson

2002 *Results of an Archaeological Phase I Survey for Proposed Southern California Edison Company's Transmission Line Access Roads Maintenance Project in the Angeles National Forest, Los Angeles National Forest*. Compass Rose Archaeological, Van Nuys, California.

Sanders, Charles F.

1923 *The Southern Sierras of California*. Houghten Mifflin, Boston.

Schneider, Joan S., Elizabeth Lawlor, and Deborah L. Dozier

1996 Roasting Pits and Agave in the Mojave Desert: Archaeological, Ethnobotanical, and Ethnographic Data. *San Bernardino Museum Association Quarterly* 43:29-33.

Singer, Clay A., John E. Atwood, Cheryl Sinopoli, and Tarquin Preziosi

1995 *Archaeological Testing at CA-LAN-1254, Sulfur Springs Campground, Arroyo Seco District, Angeles National Forest*. C. A. Singer and Associates, Cambria, California.

Stephenson, John R., and Gena M. Calcarone

1999 Southern California Mountains and Foothills Assessment: Habitat and Species Conservation Issues. General Technical Report PSW-GTR-172. USDA-Forest Service, Pacific Southwest Research Station, Albany, California.

Strudwick, Ivan H., and Bradley L. Sturm

1996 *Results of Archaeological Testing at Sites CA-LAn-2117, CA-LAn-2118, CA-LAn-2119 and CA-LAN-2120, Angeles National Forest, Los Angeles County, California*. LSA Associates, Irvine, California.

Stuiver Minze, A. Long, R. S. Kra, and J.M. Divine

1993 Calibration – 1993. *Radiocarbon* 35(1).

Stuiver, Minze, Paul J. Reimer, Edouard Bard, J. Warren Beck, G.S. Burr, Konrad A. Hughen, Bernd Dromer, Gerry McCormac, Johannes van der Plicht, and Marco Spurk

1998 INTCAL98 Radiocarbon Age Calibration 24,000-0 cal BP. *Radiocarbon* 40:1041-1083.

Talma, A. S. and J. C. Vogel

1993 A Simplified Approach to Calibrating C14 Dates. *Radiocarbon* 35:317-322.

Thoms, Alston V.

2003 Cook Stone Technology in North America: Evolutionary Changes in Domestic Fire Structures during the Holocene. In *Le feu domestique et ses structures au néolithique et aux* *ages des metaux*, edited by Marie-Chantal Frere-Sautot, pp. 87-96. Collection Prehistories No. 9, Editions Monique Mergoil, Montagnac, France.

Vance, Darrell
2008 Investigation of the Paradise Ranch Knoll Earth Oven Site, CA-LAN-2464, in Response to Site Damage Resulting from the 2006 "Day" Wildfire Incident. Paper presented at the 42nd Annual Meeting of the Society for California Archaeology, Burbank.

Vogel, J. C., A. Fuls, E. Visser, and B. Becker
1993 Pretoria Calibration Curve for Short-Lived Samples, 1930-3350 B.C. 24,000-0 cal BP. *Radiocarbon* 35:73-86.

Wessel, Richard L.
1990 *Impact Assessment of Archaeological Site CA-LAN-1166, Rowher Flat Off-Highway Recreation Area, Saugus Ranger District, Angeles National Forest*. USDA Forest Service, Angeles National Forest, Heritage Resource Section, Arcadia, California.

Wessel, Richard L., and Michael J. McIntyre
1986 *Archaeological Investigations at Rowher Flat, Northern Los Angeles County, California*. USDA Forest Service, Angeles National Forest, Heritage Resource Section, Arcadia, California.

Wessel, Richard, and Terri Caruso Wessel
1985 *Archaeological Assessment of LAN-1235, Near Vasquez Canyon, Saugus Ranger District, Angeles National Forest*. USDA - Angeles National Forest, Heritage Resource Section, Arcadia, California.

Wohlgemuth, Eric
1995 *Archaeological Impact Assessment Investigations at CA-LAN-1304, Littlerock Canyon, Los Angeles County, California*. Far Western Anthropological Research Group, Davis, California.

Zigmond, Maurice L.
1981 *Kawaiisu Ethnobotany*. University of Utah Press, Salt Lake City.