The Identification and Description of Cuyamaca Oval Basin Metates

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Executive Summary

Cuyamaca Oval basin metates are a very distinctive and significant type of bedrock milling feature identified in the mountains of San Diego County. Despite their unique qualities, a definition of these features is absent from the archaeological literature. Local archaeologists recognize that they are associated with mountain sites, but these features are not recorded or described consistently so comparative studies could be done. It is the purpose of this paper to draw attention to these features, define and describe them, and encourage researchers to pursue studies of them. By recognizing these oval basin metates and using consistent terminology to describe them, archaeologists can work together cooperatively to further our understanding of why these sites were created and used, and how old they are.

An Introduction to the Study of Bedrock Grinding Features in California

Bedrock grinding features are a common artifact found throughout much of California. In spite of this fact, and considering the importance of these tools to Native cultures whose unique subsistence economies centered around the use of acorns, bedrock milling has received relatively little formal study by archaeologists. Stone mortars have always been a highly visible part of California archaeology. Early researchers regularly noted milling equipment, and even occasionally made observations on mortar use (Stearns 1882:203-207; Holmes 1900:166-173,186). Descriptive typologies that formally characterized portable milling equipment were developed a short time later (Lillard, et al. 1939; Johnson 1942). They have been described in innumerable archaeological reports, but bedrock mortars and other bedrock features were not the subject of formal research until the processual paradigm shift of the 1960s.

California has one State Park that officially commemorates the bedrock mortar, "*Tco'Se*", or "Indian Grinding Rock State Park" near Volcano in Amador County. It is here that the modern age of bedrock milling study began with an interesting analysis by Payen and Boloyan (1963). They hypothesized there might be a relationship between mortar size (as measured in volume) and "…the problem of population size and/or duration of occupation of the site." They theorized that "The amount of stone removed from the grinding process is …of importance" and "If volume change rate per unit of meal ground in the mortars …could be found, an insight into the amount of time and food consumed might be obtained (Payen and Boloyan 1963: 3)." To test this, they developed a method that involved volumetric measurement with water and a conversion formula that allowed them to calculate how much rock had been removed in the creation of a single mortar, and from the site as a whole. In retrospect, this study does not make a lot of sense since there is substantial evidence that mortars were intentionally manufactured, rather than developed through gradual use. Numerous accounts describe seed processing where a cushion of flour prevents contact between the milling stones (see Holmes 1900 and McCarthy et al. 1985). Nonetheless, Payen and Boloyan (1963) did describe an explicit means and rationale for comparative analysis of bedrock mortars, as well as some of the problems inherent in such research.

Charles Dills published another important paper (Dills 1975) which anticipated theoretical and methodological advances that were to come in the way this class of artifact would be considered by subsequent generations of archaeologists. He hypothesized that morphological differences between mortar shape might be used to identify ethnographic boundaries, and then developed a rigorous methodology for distinguishing mortar differences. In this study, he recognized the heuristic value of milling implements and their potential to address questions beyond the obvious ones related to their function.

The first statewide attempt to synthesize bedrock milling data in California was Alice Francisco's study of the distribution and function of the bedrock mortar (Francisco 1976). Other important studies followed, including Parkman's innovative functional analysis of the bedrock mortar complex at CA-ALA-60 (1982), Fenenga's (1984) land-use study of the differential distribution of bedrock mortars and metates in the Fresno River Basin, and McCarthy et al's. (1985) functional analysis of Western Monache bedrock mortars. Subsequent to all of these attempts to analyze bedrock mortars, the California OHP developed a new series of archaeological site recording forms, including one specifically designed for recording attributes of bedrock milling features. Theoretically, we now have a method for systematically recording data such as numbers and relative sizes of these artifacts, facilitating comparative studies with features of this sort. Indeed, research utilizing bedrock milling data is beginning to infiltrate the literature of California Archaeology (Jackson et al. 1990; Mundy 1990: 89-102; Stevens 2004 and others).

Parkman (1994) has recently returned to the topic of bedrock mortars and their relationship to Native land use. His work, like that of scholars calling for more stringent approaches to the study of milling equipment (Johnson 1993; Mikkelsen 1993), is among the examples of some of the new approaches currently being taken with this important class of archaeological data. The concepts discussed in each of these studies pertain directly to problems faced by scientists attempting to investigate the mystery of the Cuyamaca Ovals. In order to begin to study and explain these artifacts, we must develop a means to empirically discriminate between them and other forms of bedrock processing features. Once we are capable of doing that, the ovals may be useful for addressing theoretical issues such as those raised by bedrock milling research relating to prehistoric land use, seasonality, and subsistence change, population and gender studies, social boundary identification, or functional questions.

Cuyamaca Ovals

D.L. True was the first archaeologist to recognize Cuyamaca Ovals and describe them. In his study of the Cuyamaca Mountains, he noted bedrock mortars, milling stones, and miniature mortars. His description of milling stones consisted of the following:

> "Bedrock milling stones range from polished slicks to oval depressions up to 2 inches deep. It is obvious that this is not just a range of depth due to the length of time a grinding area was in use. The oval depressions are *consistently the same shape* and are not the end product of long use of a previous slick. It is uncertain, however, whether these forms represent differences in time or cultural affiliation, or are ecological in nature. Some specialization for processing different kinds of materials is to be expected, but for the present this cannot be demonstrated for this site." (1970: 17).

Dan Foster spoke to Dr. True about the "milling stones" while Foster was an archaeologist with California State Parks, working with Breck Parkman on the Cuyamaca Rancho State Park surveys in 1979-1981 (Foster 1980, 1981; Parkman 1981). True agreed with Foster about the special nature of the basin metates that Foster called Cuyamaca Ovals when they discussed the results of the 1981 surveys. Foster hypothesized that the oval metates may represent an Archaic component, predating the Late Prehistoric occupation that dominates the archaeological assemblages of San Diego's Cuyamaca Mountains. In this model, Cuyamaca Ovals may represent an Archaic emphasis on processing small seeds and nuts, in contrast to the Late Prehistoric emphasis on acorn processing. Foster also developed an alternative model for the interpretation of Cuyamaca Ovals – one that suggests these features functioned as specialized processing areas associated with Late Prehistoric villages and camps, and were used to mill or grind specific plant materials. There is evidence for both of these models, but evaluation will require further data collection and analysis.

The form and pattern of bedrock milling elements indicates a developmental continuum with an increasing focus on acorn processing through time (True 1993). True looked at sites along the San Luis Rey River from Guajome to Jaculi, on Palomar (CA-SDI-535). He looked at the distribution of five kinds of bedrock milling: mortars, bedrock metates (not basins), slicks, mortar collars (crescent shaped milling area adjacent to a mortar), and cupules (classified by

True as possible hulling pits). He also looked at combinations of these elements. For example, he recorded mortars associated with metates or slicks, or groups of mortars and slicks. He defined the following milling feature site types, based on a survey of many sites and his ethnographic information from the 1940s and 1950s:

1. An acorn processing station was represented by heavy concentrations of large, deep mortars with few or no associated metates or slicks. Mortar pockets are rare, and cupules are commonly associated.
2. Generalized processing and habitation villages had numerous mortars of various sizes, with associated pockets or collars, and metates and/or slicks in various combinations. There was a strong emphasis on acorns.
3. Generalized processing sites, and small sites where acorn processing was relatively unimportant had small to medium mortars, metates, and slicks alone and in combination. Mortars are shallow.
4. Hard seed, fiber, or small-animal processing was the primary focus at sites with metates and slicks.

D.L. True described bedrock milling features he recorded at CA-SDI-860, which he studied as part of his identification of the Late Prehistoric Cuyamaca Complex (True 1970). In the case of CA-SDI-860, it contained abundant mortars (40) and milling stones (100). His report did not specify the number of slicks and oval basins, which are grouped in to the category of milling stones.

As a result of the 1979-1981 surveys of Cuyamaca Rancho State Park, a number of sites were identified that contained the distinctive oval basin metates (Foster 1980,1981; Parkman 1981). Portions of the park were surveyed with the result that 47 previously unidentified sites were discovered and recorded. Further work in the West Mesa resulted in the discovery of 8 additional sites. There were over 170 previously recorded sites.

Foster described the features now known as Cuyamaca Ovals in this report. He raised the following questions based on this study:

Are Cuyamaca Ovals associated with early sites, and not the Late Prehistoric Cuyamaca Complex?
Are the ovals associated with meadows?
Are the ovals associated with seed processing (grass and annual seeds in meadows)?

At about the same time as the surveys of Cuyamaca Rancho State Park, ASM conducted a survey of the Laguna Mountain Recreation Area (LMRA). All individual milling features within the LMRA were measured (Graham 1981). The study used ethnographic information to describe the function of bedrock milling features. Graham noted that mortars were used to process acorns (Spier 1923: 335), while seeds were processed with milling stones. To process seeds, the hulls were cracked, then winnowed, and then the nut or meat was ground (Shipek 1970: 30). Tom Lucas, Kwaaymii Indian from Laguna Mountain, told Graham (1981: 101) that the Indians of Laguna Meadow periodically burned the meadow to promote the growth of seed-producing annuals.

Elliptical to ovoid basins were observed at 60.7% of the sites, and did not appear to be related to either processing or habitation sites (Graham 1981: 125). Mortars, however, were found at only 38.4% of sites; these were present at 85% of habitation sites, and absent from 75% of processing sites. Milling slicks were ubiquitous. Graham interpreted the findings to suggest that the gathered acorns were taken back to the residential area for processing, because there was an association with acorn processing and residential sites/loci.

Graham also conducted an analysis of the locations of mortars, basins, and slicks (Graham 1981: 126). The locational preference for basins was the meadow edge first, then a stream drainage. Graham used statistical analyses to look at the relationship between numbers of each milling element type, distance to stream flow, and distance to meadow edge. The resulting conclusion was that basins are associated with the processing of resources available from the meadow, possibly grass or seeds. Procurement and processing of seeds was done at the same place, unlike acorns which were taken back to the residential areas.

In conclusion, Graham stated that in the Laguna Meadows area there was limited processing of acorns, possibly because the oak trees occur not in groves but are scattered among other trees (Graham 1981: 155-156). The number of mortars is limited in this area, and seasonal acorn gathering was concentrated elsewhere, specifically in Crouch Valley. Basins were used to grind small seeds. Graham stated that there is ethnographic information on the storage of these seeds (not cited). He observed that basins are numerous at both habitation and processing sites in and around Laguna Meadow because annual and grass seeds were abundant there.

In 1991, Dan Foster worked with Brad Bartel, professor at San Diego State University, to study the relationships between sites with Cuyamaca Ovals, vegetation, and soil types. Dr. Bartel used existing information to tabulate site characteristics with natural resource information from Cuyamaca Rancho State Park. Unfortunately, this study was not completed. Foster provided Bartel with background information about Cuyamaca Ovals, including his observations about ovals in other parts of the state. In the South Lake Tahoe area, Foster (1982) identified at CA-ELD-527 oval basins that had the "classic" Cuyamaca Oval characteristics, including patterning in pairs and in curving arc formations. Foster (1983) identified two other northern California sites, CA-SIE-355 and CA-SIE-392, that contained many of the same oval basin types found in the Cuyamaca Mountains. He also noted that similar sites were found in Red Clover Valley (Jenkins 1985). The sites shared these characteristics:

- They are located at the edge of a large meadow
- There is a pine forest nearby
- They are within Hokan-speaking linguistic territory
- The features may represent a more ancient occupation, and may pre-date the mortars that were also found at the sites

In a note to Brad Bartel, Foster wondered if the oval basins at Sierra Valley were older than the mortars on the same rock. This issue of basin ovals being older than mortars is also relevant to San Diego sites, where there may have been multi-component occupation. The Late Prehistoric occupation of the San Diego Mountains was so intensive that it could have masked or destroyed the more ephemeral evidence for Archaic occupation, leaving milling features behind as the limited evidence for older occupation.

The data from the SDSU study have been lost and it is not known whether there were significant correlations between soil, vegetation, and milling feature type. This kind of study should be undertaken and completed, with an emphasis on more complete recordation of the milling elements.

One of the most intriguing aspects of Cuyamaca Ovals is their possible great antiquity. Some of the Cuyamaca Ovals show evidence of differential weathering; this aspect is particularly visible at CA-SDI-852, the Two Pines site. At this site, only the polished bottoms of the ovals are preserved, and the rock itself is highly weathered and exfoliated. At other oval sites, the milling feature has split and rock migrated apart—a sign of antiquity. This type of evidence for age is not seen at milling features with bedrock mortars.

At other oval sites, there are either few or no mortars, and pottery is scarce or absent. In fact, artifacts are scarce at many of the sites. Yet other sites have both ovals and mortars, and pottery is present. For example, the Arrowmakers Ridge village site (CA-SDI-913) in Cuyamaca Rancho State Park has extensive midden deposits and over 100 mortars. There are no Cuyamaca Ovals at this site. In contrast, there are other sites where mortars are absent; the sites have only Cuyamaca Ovals (e.g., SDM-W-365). The nature of the evidence for association of Cuyamaca Ovals with the Late Prehistoric sites that dominate the mountain regions needs evaluation. Questions that need to be addressed include: Are the bedrock milling features with Cuyamaca Ovals associated with the Late Prehistoric deposits, or are they at some distance? Could the mortars have been superimposed over the ovals at a later time? In a large, Late Prehistoric site complex, some of the features with Cuyamaca Ovals could represent an earlier occupation that has been masked by the later use of the region. There are a few examples of mortars worked into Cuyamaca Oval features.

What is a Cuyamaca Oval?

Many archaeologists have heard of Cuyamaca Ovals, and ask: what defines a bedrock basin metate as a Cuyamaca Oval? A Cuyamaca Oval is based on the following attributes:

- Uniform shape
- Elliptical; some are very narrow and some are narrow at one end
- Consistent depth and relatively steep sides
- Patterning of two or more, can be in curved arrangement that appears to be an arc
- “Deer hoof” pattern—closely spaced basins
- Minimal if any mortars present at sites with ovals

We do not yet have a systematic way to combine these attributes into an objective definition of a Cuyamaca Oval. In order for that to happen, archaeologists need to record more detailed information about milling features than has been gathered to date.

In January, 2006, Susan Hector and Michael Sampson visited two of the "classic" Cuyamaca Ovals sites in the Cuyamaca Mountains of San Diego County to measure a sample of the basins. Two clusters of oval basins were measured, at CA-SDI-10972D and CA-SDI-8861. A contour tool was used to take measurements of the depth and slope of the ovals. This tool consists of a series of parallel pins, and when pressed into a milling feature, it creates an exact replica of the element.

At CA-SDI-8861, seven basins in a cluster were measured across the horizontal (shorter) axis. The slopes were consistently 40-45 degrees at its midpoint. The basins ranged in depth from 2.2 to 3.9 cm. Twelve oval basins in a cluster measuring 90 by 140 cm at SDM-W-365/CA-SDI-10972D were measured. At this site, the slope was also 40-45 degrees. Depths ranged from 2.6 to 4.7 cm, although only one was over 3.9 cm in depth. Based on this limited experiment, a working hypothesis was developed for further testing and evaluation: Cuyamaca Ovals have depths that range from 2.2 to 3.9 cm, and their horizontal side slopes at midpoint are relatively steep, at 40-45 degrees. Additional important measurements could be a ratio of length to width (observations indicate that Cuyamaca Ovals are narrowly elliptical), and distance to similar elements (the features appear to cluster and form arcs or patterns).

Distribution of Cuyamaca Ovals sites

Cuyamaca Ovals were first identified and described in the mountains of San Diego County. Dan Foster and other state archaeologists noted the presence of these features on site record forms and in reports. Over the years, the authors and others have recognized Cuyamaca Ovals at sites in San Diego County. Comments by Dr. Lynne Christenson, County of San Diego, Department of Parks and Recreation, Dr. Lynn Gamble, San Diego State University, and Margaret Hangan, Cleveland National Forest, suggested that this form is present in San Diego's mountains and foothills.

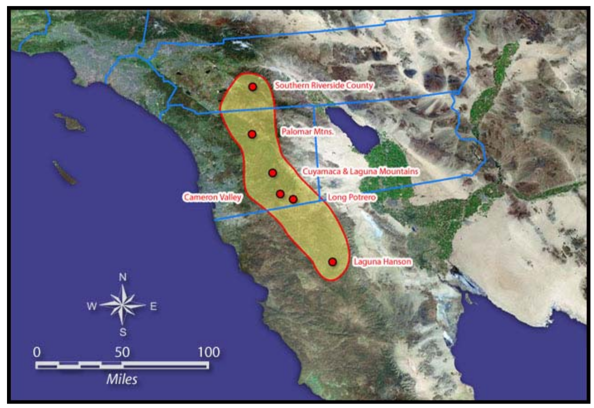

Figure 1. Map of the sites discussed in this article

Based on anecdotal comments, classic Cuyamaca Ovals sites appear to be present as far south as Laguna Hanson in Baja California, throughout the mountains and foothills of San Diego County, and scattered in Riverside County. Oval basin metates are present at most of the archaeological sites in Long Potrero, near the US-Mexico border in eastern San Diego County (Hector 2005a). They are not found in the deserts of southern California, nor on bedrock outcrops along the coastal margins. Figure 1 shows the preliminary distribution of Cuyamaca Ovals sites.

The following descriptions of important Cuyamaca Ovals sites were based on reports and site record forms, and on a limited field study. Field surveys in the Cuyamaca Mountains to visit some of these sites were conducted for this article by Susan Hector and Michael Sampson on September 17, 2005, October 3, 2005, and January 21, 2006. Other reports of Cuyamaca Ovals outside the San Diego area were provided by Dan Foster, Gerrit Fenenga, and John Foster.

CA-SDI-10903, The Repaired Olla Site. The site was recorded by Richard Jenkins and Dan Foster in 1986. It was noted as containing 10 Cuyamaca Ovals and 15 bedrock mortars. The site, a large Late Prehistoric village site, was recorded as having projectile points, pottery sherds, and flakes and flaked stone tools. The recorders noted the presence of a rim sherd with a repair hole. The site is in the Corte Madera region.

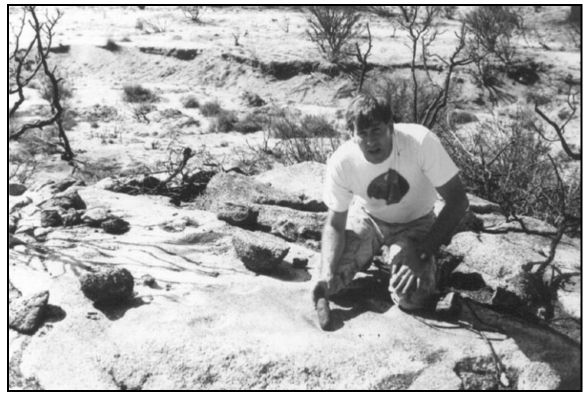

Figure 2. CA-SDI-10784 Cuyamaca Ovals (photograph by Rich Jenkins)

CA-SDI-10784, The Fireline Site. This site was recorded by Dan Foster, Rich Jenkins, and Greg Greenhoe in 1987 (Figure 2). Dan Foster collected an unusual mano from this site. It has a distinctive wear pattern on the end of the stone; approximately one inch of the stone was ground off at a 45 degree angle (Figures 3,4). Use in an oval basin may explain this kind of wear (see ethnography discussion below for analogies). Twenty-five Cuyamaca Oval basin metates were identified at the site, and mortars were also present. The site is at the northern end of a part of Cameron Valley. Many artifacts were noted, including numerous potsherds (Figure 5).

Figure 3. CA-SDI-10784 pestle (photograph by Dan Foster and Rich Jenkins)

CA-SDI-10816, West Side Site. The site was recorded by Richard Jenkins and Dave Volgarino in 1987. It is a large, Late Prehistoric village with abundant lithic artifacts and potsherds. It is located in Cameron Valley, above La Posta Creek. An unshaped cobble pestle with use on both ends was found (see ethnography discussion below for analogies). Basin metates were found. Site CA-SDI-10817, the East Side Site, was found nearby. This site, recorded at the same time as the West Side Site, contained five loci with basins metates and mortars. The site had a rockshelter with a stacked rock wall. These two sites are above La Posta Creek, in Cameron Valley.

Figure 4. CA-SDI-10784 pestle (photograph by Rich Jenkins)

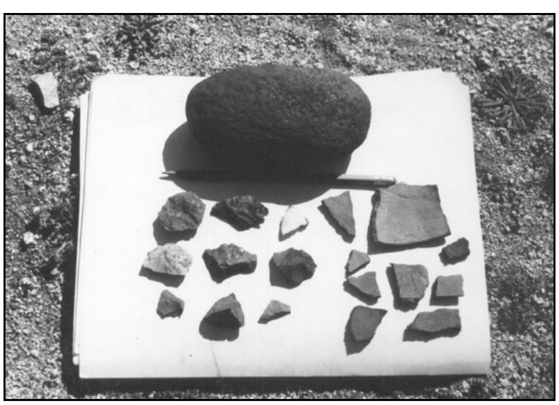

Figure 5. CA-SDI-10784 artifacts (photograph by Dan Foster and Rich Jenkins)

CA-SDI-8839, Milk Ranch Site at Cuyamaca Rancho State Park. This site was recorded by Dan Foster, E. Breck Parkman, Joe Hood, John McAleer, and John Kelly in 1981. Six occupation loci were noted. It was recorded as a Late Prehistoric village with a possible earlier component.

Figure 6. CA-SDI-8839 Cuyamaca Ovals (photograph by Susan Hector)

An earlier occupation featuring the use of Cuyamaca Ovals was proposed since a large oak, at least 200 years old, had grown over an edge of one of the oval basins. Over 63 oval basins are present at the site. Many of the Cuyamaca Ovals at Locus B are clustered and parallel in the classic pattern (Figures 6,7,8). This site was visited and photographed by Hector and Sampson in October, 2005. The bedrock outcrop is sloping, with the oval basins along the more level northern edge. There are no mortars at this site, although Canyon Oaks (*Quercus chrysolepis*) cover it with shade. There are basin metates at this site that do not fit the classic Cuyamaca Ovals pattern: they are wider, not as deep, and less well-defined (Figure 9).

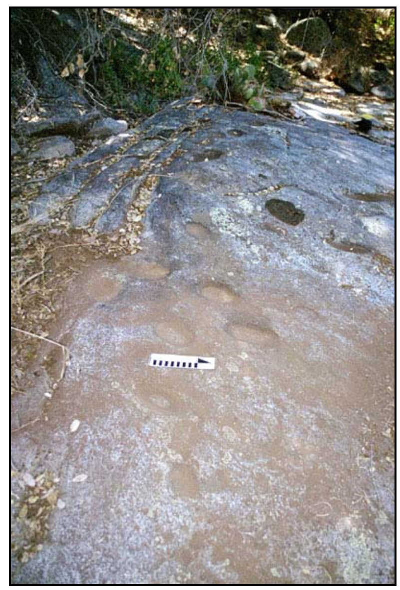

Figure 7. CA-SDI-8839 Cuyamaca Ovals (photograph by Susan Hector)

CA-SDI-8859, Cuyamaca Rancho State Park, across from Park Headquarters at the Dyar House. The site was recorded by Breck Parkman and Dan Foster in 1981. In addition to 7 oval metates, the site also has cupules. This location was visited by Hector and Sampson in October, 2005. A small site with limited milling, the oval basins here are less formed than at other sites, but meet the criteria. There are only two "classic" Cuyamaca Ovals present (Figure 10).

Figure 8. CA-SDI-8839 Cuyamaca Ovals (photograph by Susan Hector)

CA-SDI-8861, Cuyamaca Rancho State Park along State Route 79. The site was recorded by Joe Hood and John McAleer in 1981. It features over 25 classic ovals on a Julian Schist outcrop. These ovals look almost like deer hoofs-- they are strongly elliptical with uniform depth, and occur in a pattern (Figures 11.12). This site has a conical mortar; it is not round on the bottom but is pointed (Figure 13). The uniform depth of the basins at this site may suggest that after a certain amount of use the basins were not effective. The site is located in a pine and oak woodland, overlooking Green

Valley (Figure 14). It was visited by Hector and Sampson in October, 2005 and measurements of selected elements was undertaken in January, 2006. Few artifacts were noted at the site.

Figure 9. CA-SDI-8839 milling basins (photograph by Susan Hector)

Figure 10. CA-SDI-8859 Cuyamaca Ovals (photograph by Susan Hector)

Figure 11. CA-SDI-8861 patterned Cuyamaca Ovals (photograph by Susan Hector)

Figure 12. CA-SDI-8861 patterned Cuyamaca Ovals (photograph by Susan Hector)

Figure 13. CA-SDI-8861 conical mortar (photograph by Susan Hector)

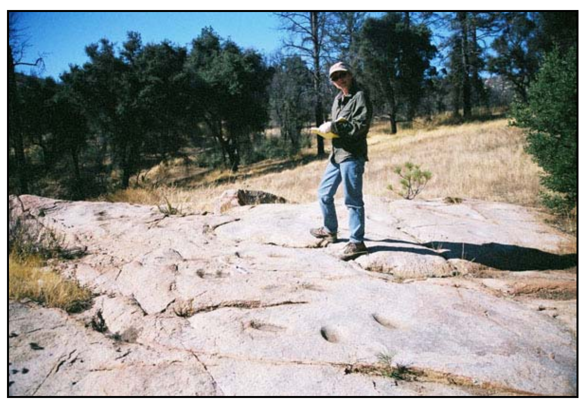

Figure 14. CA-SDI-8861 view of setting in pine forest (photograph by Susan Hector)

SDM-W-365, Cuyamaca Ranch. This site was originally recorded by Ken Hedges of the San Diego Museum of Man in 1968. He noted at the time: "large number of bedrock metates; no mortars." He also noted that there is only a light scatter of flakes near the milling features. The site was recorded by Dan Foster, Rich Jenkins, John Foster, and Michael Sampson as CA-SDI-10972D in 1988. This site is next to Sunrise Highway; the road has removed some portion of the midden deposit. The site has over 80 Cuyamaca Ovals. It was visited by Hector and Sampson in October, 2005 and measurements of a cluster of elements was accomplished in January, 2006. This site features highly patterned oval basins (Figures 15, 16, 17) in excellent condition. It is on the rim of the meadow above Lake Cuyamaca. There are no mortars at this site. There are relatively few artifacts on the surface of the site; the midden deposit located some 50 meters from the bedrock outcrop contains flakes and potsherds representing a Late Prehistoric occupation; this may not be associated with the Cuyamaca Ovals features.

Figure 15. CA-SDI-10972D patterned Cuyamaca Ovals (photograph by Susan Hector)

CA-SDI-852, Two Pines site. This site was recorded by D.L. True in 1961. It sits on a low ridge of Julian Schist. Chokecherry (*P. virginiana*) is growing in the milling outcrop (Figure 18). The pits were ground, leached, and eaten as flour (Spier 1923: 335). The Cuyamaca Ovals at this site are more elliptical than at other sites (Figures 19, 20, 21). They occur in pairs and groups, and are highly weathered. Depth and slope of sides tends to be uniform. Two mortars are present. This site is located at the edge of a meadow (Figure 22) The location was visited by Hector and Sampson in October, 2005.

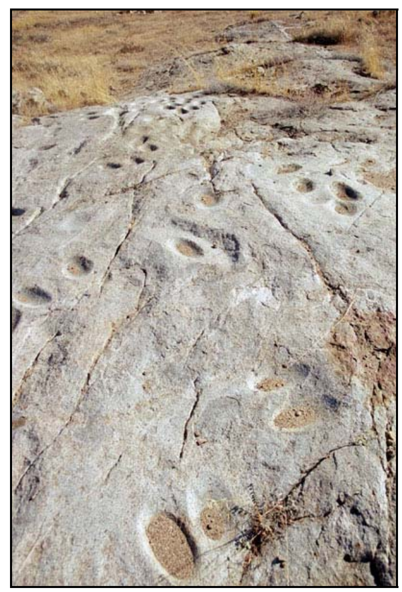

Figure 16. CA-SDI-10972D patterned Cuyamaca Ovals (photograph by Susan Hector)

CA-SDI-16265, Iguai. This site was recorded by Hector in 2002, and visited by Hector and Sampson in October, 2005, for this article. Iguai is a large, ethnographic village occupied as late as the 1870s and known for the processing of Black Oak (*Quercus kelloggii*) acorns (Hector 2006). Only one or two sets of Cuyamaca Ovals are present (Figure 23). There are many mortars and slicks at the site, which is located on a ridge above a large meadow above Lake Cuyamaca (Figures 24, 25). Chokecherry (*Prunus virginiana*) is growing throughout the lower site area. Currently, the slopes above Iguai are covered with burned pine trees, but formerly there were Black Oaks in this location. The oak trees were probably cut for local construction use or firewood, and have been replaced by pine trees.

CA-SDI-13720, Volcan Mountain. This site was recorded by Hector in 1994. It is the only site on Volcan Mountain that has classic patterned Cuyamaca Ovals (Figure 26); there are 23 oval basins at the small site. Of importance is the *Prunus virginiana* growing at this site; chokecherry grows at many of the sites on Volcan Mountain (Hector 2005b: 26). The site is on the end of a long, narrow ridge that then drops steeply; it is not near a meadow.

Figure 17. CA-SDI-10972D patterned Cuyamaca Ovals (photograph by Susan Hector)

Figure 18. CA-SDI-852 chokecherry growing on bedrock (photograph by Susan Hector)

Figure 19. CA-SDI-852 Cuyamaca Ovals (photograph by Susan Hector)

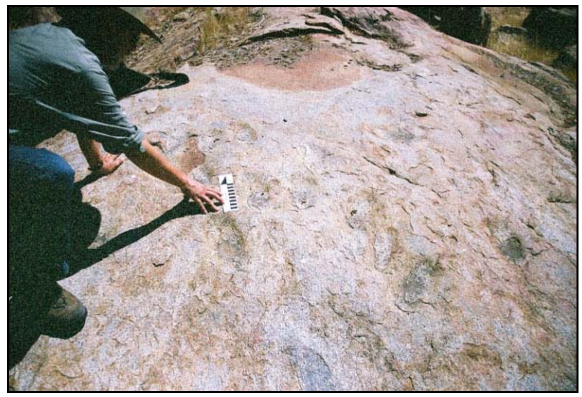

Figure 20. CA-SDI-852 Cuyamaca Ovals (photograph by Susan Hector)

Figure 21. CA-SDI-852 Cuyamaca Ovals (photograph by Susan Hector)

Figure 22. CA-SDI-852 view of setting at the edge of a meadow (photograph by Susan Hector)

Laguna Hanson, Baja California. Cuyamaca Ovals have also been observed by John Foster, Senior State Archaeologist, at Laguna Hanson in northern Baja California. Figure 27 shows an overview of Laguna Hanson; this area features a pine forest and meadows similar to those in the Cuyamaca Mountains. Figures 28-30 show the Cuyamaca Ovals that John Foster has observed at Laguna Hanson.

Figure 23. CA-SDI-16265 Cuyamaca Ovals (photograph by Susan Hector)

Figure 24. CA-SDI-16265 view of setting (photograph by Susan Hector)

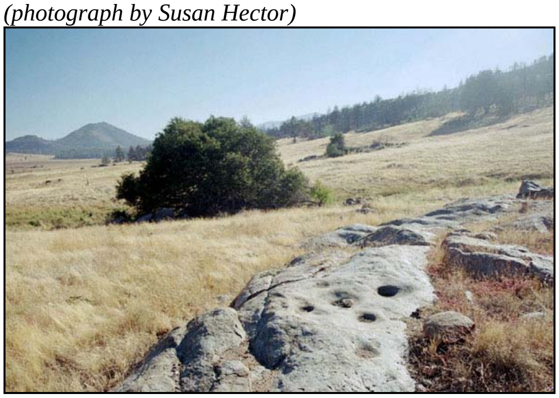

Figure 25. CA-SDI-16265 view of setting (photograph by Susan Hector)

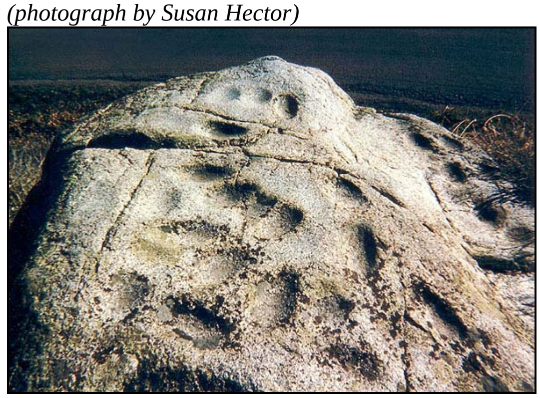

Figure 26. CA-SDI-13720, Volcan Mountain Cuyamaca Ovals (photograph by Susan Hector)

Figure 27. Laguna Hanson view showing the meadow and pine forests (photograph by John Foster)

Figure 28. Laguna Hanson Cuyamaca Ovals (photograph by John Foster)

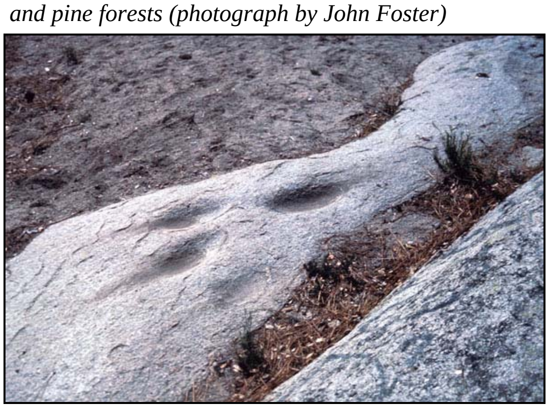

Figure 29. Laguna Hanson Cuyamaca Ovals (photograph by John Foster)

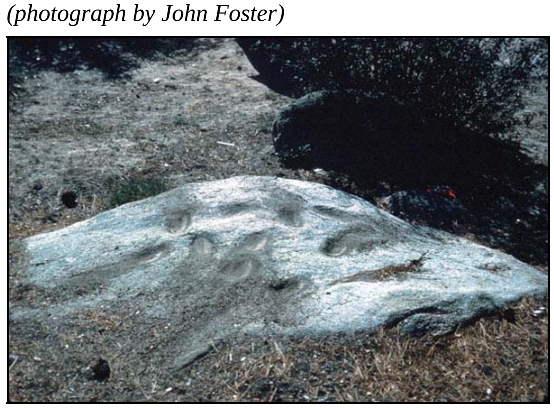

Figure 30. Laguna Hanson Cuyamaca Ovals (photograph by John Foster)

Over 50 sites with Cuyamaca Ovals have been confirmed to be present in Cuyamaca Rancho State Park in San Diego County. For researchers interested in seeing these features, their patterns, and settings, the following are additional sites that were recorded as containing basin metates: CA-SDI-820, CA-SDI-831, CA-SDI-837, CA-SDI-853 (A-ha-kwe-mac), CA-SDI-856, CA-SDI-857, CA-SDI-859, CA-SDI-861, CA-SDI-862, CA-SDI-863, CA-SDI-864, CA-SDI-869, CA-SDI-870, CA-SDI-872, CA-SDI-877, CA-SDI-879, CA-SDI-880, CA-SDI-882, CA-SDI-886, CA-SDI-889, CA-SDI-901, CA-SDI-905, CA-SDI-917, CA-SDI-924, CA-SDI-925, CA-SDI-937, CA-SDI-939, CA-SDI-1017, and CA-SDI-1027.

Similar Forms of Bedrock Features Found Elsewhere

One of the issues that comes to mind when looking at Cuyamaca Ovals is the fact that somewhat similar bedrock grinding features are found in other areas, beyond the range of the distinct archaeological cluster that is represented by the distribution of these in the interior of southern California we are attempting to describe in this paper. These other features may help us to assess the possible function of ovals, as well as aid in developing a protocol for discriminating ovals from other bedrock artifacts.

There are similar features to these known from various areas of the world, such as bedrock artifacts commonly identified as "ax-sharpening" grooves in the American Southwest (Figure 31). We also are aware of several localities in California where other kinds of bedrock features occur that resemble the oval basin metates considered here, and believe specific mention and depictions of these are warranted here. These locations are as follows:

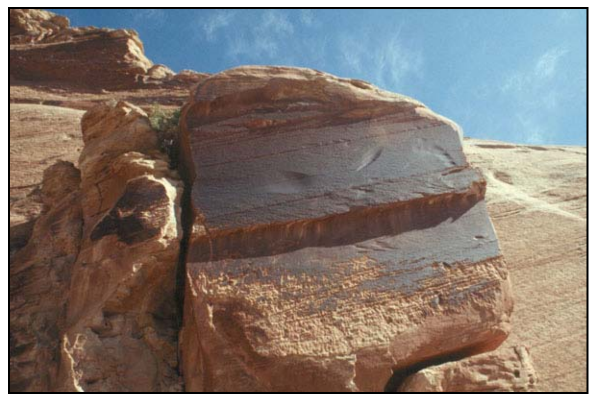

Figure 31. Ax-sharpening grooves at Butler Wash, New Mexico (photograph by Gerrit Fenenga)

Sierra County and El Dorado County Sites

Two sites that contain many milling features similar to Cuyamaca Ovals were recorded in Sierra Valley (Foster 1983): CA-SIE-355 and CA-SIE-392. Similar sites were found on the north side of Red Clover Valley (Jenkins 1985). Mortars and slicks were also found at these sites. All of the sites are on the edge of a large meadow, with a pine forest nearby.

In Eldorado County, site CA-ELD-527 was recorded as containing 11 classic, patterned Cuyamaca Oval-type milling features: they are paired and patterned in a curving arc (Foster 1982: 10). Bedrock mortars were also recorded at the site. This site is located on the south shore of Lake Tahoe, near a grassy meadow. One of the reasons that the research of CDF archaeologists is so valuable is that they conduct surveys and research throughout the state and are able to use their observations to compare and contrast the cultural resources of many areas. With their broad perspective, they are able to identify patterns and anomalies. During his CDF archaeological surveys, Dan Foster noticed these sites in Northern California that contain basin metates similar to those found in Cuyamaca Rancho State Park and other parts of San Diego County. These features are another example of a localized milling pattern. It is noteworthy that the northern sites are also in the Hokan language territory.

Copsey Creek Site (CA-LAK-188)

The Copsey Creek Site (CA-LAK-188) is located in the Lower Clear Lake Basin in the ethnographic territory of the Southeastern Pomo. Once on a trip through the area, archaeologist Fritz Riddell suggested we stop and visit the site and three of us (Dan Foster, Linda Pollack, and Gerrit Fenenga) were given a tour. Fritz indicated to us that the location had been identified by Pomo informants as a bead-making site where magnesite cylinder beads were ground into shape. The Pomo were extensively involved in the manufacture of both clam shell disk bead money (*ka yah*) and cylindrical beads made of magnesite (*poh*) during the latter part of prehistory and continued to do so until the end of the 19th Century (Yates 1877:30-32; Hudson 1897:101-108; Holmes 1900). The Southeastern Pomo, whose principal settlements were at *Kamdot*, Elem, and *Koi*. Kniffen (1939:371) stated that "A special resource was the magnesite deposit situated in the southeastern part of the *Koi* area." The Southeastern Pomo maintained a monopoly on the production of magnesite cylinders, and the source was kept a secret and highly protected. Heizer and Treganza (1944:334-335) described two sources, a locality near Sulpher Bank (Elem) and one at White Buttes on Cache Creek.


Figure 32. Copsey Creek troughs (photography Dan Foster)

The grinding features at Copsey Creek are found along exposed bedrock within the creek bed, as well as on outcrops situated on higher adjacent stream terraces. The lowest of these features have been effected by stream washing and are eroded and often difficult to distinguish from natural erosion of the bedrock, especially when they are oriented the same direction as the stream flow. The features consist of shallow troughs that have been carved into the matrix of the rock, presumably from grinding activities (Figures 32, 33). These grinding features resemble Cuyamaca Ovals, but are distinctive from them, particularly in terms of length. Like Cuyamaca Ovals, the Copsey Creek features tend to occur in clustered arrangements. Hudson (1897:107) made a comment on the number of individuals involved in bead-making that suggests it was quite a group activity. His passage is as follows:

> "Visitors at the rancheria cannot fail to note the number of coiners at work, and knowing that wampum has no favor with the grocer, often ask why so much labor is spent on a money that will not buy (Hudson 1897: 107)."


Figure 33.Copsey Creek troughs (photography by Dan)

Associated with the bead manufacturing grooves are bedrock mortars, as this site apparently contains typical occupational evidence, in addition to the specialized activity reflected by the unusual grooves or troughs. There have been no archaeological investigations at this site, and little else might be said about it. Due to its unique features and the functional attribution assigned to them, this site is clearly worthy of further study. At present, the only evidence that exists as to the function of the grooves comes from ethnographic testimony.

Descriptions of magnesite processing in the cited sources certainly suggest that the material is hard and abrasive enough to produce the abraded grooves seen at this site. One of the present authors (Gerrit Fenenga) once had a conversation with a Pomo clamshell bead maker who informed him that water was used in the grinding process, in the manner a whetstone is used to sharpen knives. The occurrence of these features in association with the bottom of a stream channel may be related to this technique.

Church Rock (CA-SHA-39)

The Church Rock Site (CA-SHA-39) is located just outside of Redding, California, an area inhabited by the Wintu in historic times. It has not been scientifically excavated, but the site has been mapped in some detail and its extensive petroglyph component recorded (Van Tilberg, et al. 1987). Among the features classified and inventoried in this study were a series of curious grooves found abraded into exposed sandstone bedrock in the bottom of a seasonal drainage that bisects this large village site. These were described by Van Tilberg and the Bocks as "incised grooves" or "deeply incised grooves" and illustrated in Figures 32-35 in their report. Photographs of some examples may be seen in Figures 34 and 35. These features are localized within this single area of the site, although abundant areas of exposed bedrock are present in and around the site. There also are none of these features in the bedrock exposed in the channel of Stillwater Creek, the permanent drainage that borders the eastern margin of the site.

Figure 34. Church Rock Site (photograph by Gerrit Fenenga)

Figure 35. Church Rock Site (photograph by Gerrit Fenenga)

Within the ephemeral drainage channel that bisects the site, there are a number of eroded holes produced by "tumble stones" at times when the stream carries water. These are typical geological features (unlike the Rock Basins found with cultural associations in the southern Sierra Nevada) whose origin is well understood. At Church Rock, however, these "tumble stone" basins or depressions have been culturally modified. Around their perimeter can be seen a large number of abraded grooves that are oriented in various directions and these clearly cannot be explained as a product of stream flow and erosional processes. These grooves vary in size and shape and are difficult to characterize in specific terms or dimensions. Compared to the features at Copsey Creek and to Cuyamaca Ovals, they tend to be more V-shaped in cross-section. Like the Copsey Creek finds, water seems to have played a role in their use. This behavior is inconsistent with seed processing such as that done with a mortar and pestle or mano and metate.

The grooves at Church Rock remain to be adequately explained. One possible clue to their function can be found in an obscure passage in Goldschmidt's Nomlaki ethnography (1951:421). While discussing acorn use by the Nomlaki, (the neighboring people to south of the Wintu), he stated:

> "Special stones were used as pestles. There may still be seen at Newville, where the best ones were obtained, the grooves in which the pestles were shaped." He further added "…A long slender stone of a bluish color and hard texture was found in the creek bed. This was roughly shaped by pecking with another stone and finished by rubbing in the bedrock grooves (Goldschmidt 1951: 421)."

In the absence of other evidence, this explanation seems plausible to explain these unusual features, although other hypotheses might also be advanced.

Salt Creek Site (CA-SHA-552)

This site is located a short distance from Church Rock and contains identical features to those described above. More that 100 grooves, plus cupules and other features are recorded at this site. Like Church Rock, this was a large complex village site. Also like Church Rock, the groove features are found in bedrock exposures within the creek bed. Presumably, the bedrock modification here is functionally the same as for the features at the Church Rock Site.

Ethnographic Information about the Use of Basin Metates to Process Seeds and Nuts

Ethnographic sources from the Kumeyaay Indians, whose territory covers the Cuyamaca Mountains, support the contention that oval basins could have been used to process seeds and nuts. Although acorns formed the basis for most Native meals, seeds and nuts were processed to add nutrition and flavor. It is likely that specialized tools were used to crack and grind seeds and nuts.

Cline (1984) wrote about the subsistence patterns of the Kwaaymii Indians of Laguna Mountain. She noted that the seeds of chia, gray sage, and pinyon nuts were ground (1984: 28). Page 41 of her book shows Maria Alto grinding seeds in 1917. Maria Alto was using a large cobble on end in what looks like a shallow basin; one end of the basin is higher than the other. Next to her is a brush and tray basket. The tray appears to hold large seeds. Cline (1984: 135) stated that the Kwaaymii used a brush made from pine needles to sweep seeds from milling features.

Shipek (1991) described the Kumeyaay grinding pine nuts into flour, mixed with water and honey. Her informant, Delfina Cuero, stated that the Indians ground most nuts and seeds, including wild cherry, lilac, flowers, and grass. The seeds were winnowed and sifted it in a round, flat basket after grinding them on a flat grinding stone (Shipek 1991: 30). Specifically, according to Shipek (1991), the Kumeyaay ground the seeds of the following mountain plants:

Species	**Common Name**	**Use**
Bromus carinatus	California Brome	food
Chenopodium sp.	Goosefoot	food
Marah macrocarpus	Chilicothe	seeds ground for pigment
Pinus torreyana	Torrey Pine	food
Rhus integrifolia	Lemonade Berry	medicine
Rosa californica	Wild rose	food
Rumex crispus	Curly Dock	food

In addition to these plants, mountain species whose seeds were processed by the Kumeyaay included pine, wild cherry (*Prunus ilicifolia*), and white sage (*Salvia apiana*) (Hedges and Beresford 1986).

Nuts were a particular favorite of the Kumeyaay, for their flavor and high food value. Campbell (1999: 158, 161) described how nuts were processed by lightly pounding them on a grinding slab to crack the shell, then grinding with a mano into pinole. An oval basin was used for pine nuts.

These plants were available to the Indians of the Cuyamaca area. In addition, native California Indians used many flowers and annuals for their seeds. Annual flowers found in the meadows of the Cuyamaca Mountains, whose seeds were used as food by California Indians, include *Calandrinia ciliata* (Red Maids), *Wyethia ovata* (Southern Mule's Ears), *Layia platyglossa* (Common Tidy-Tips), *Ranunculus californicus* (Southern Buttercup), *Lasthenia californica* (Common Goldfields), and *Clarkia purpurea* (Wine-cup Clarkia) (Mead 2003; Strike 1994).

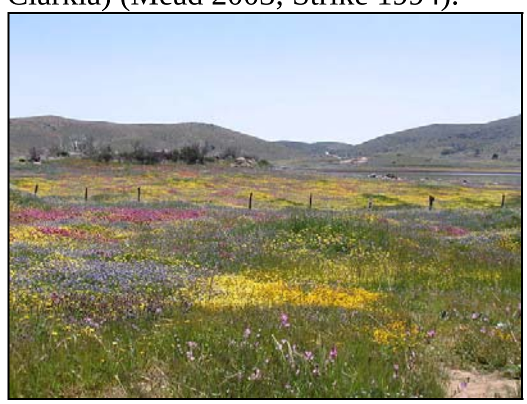

Figure 36. Meadow flowers at Lake Cuyamaca meadow, 2005 (photograph by Susan Hector)

The pine forest and meadow environments may have been managed by the Indians to promote the growth of plants whose seeds and nuts could be processed. Shackley (1980) studied the co-occurrence of Late Prehistoric sites and certain species (specifically, buckwheat and elderberry) within Cuyamaca Rancho State Park and determined that these plants were encouraged and maintained by the site occupants. One of the authors (Hector) has noted that western chokecherry (*Prunus virginiana)* is strongly associated with sites in the area; the seeds of the wild cherry were ground and used for flour (Spier 1923: 335; Timbrook 1982). The notion of incipient horticulture as practiced by California Indians has been documented at length by Anderson (2005). Controlled burning, for example, encouraged the growth and diversity of preferred plants while discouraging other plant growth.

Annual flowers bloomed in abundance around the meadow above Cuyamaca Lake in spring 2005 (Figure 36). This is a good example of what the density and diversity of annual plants and grasses may have been like after the Indians conducted controlled burns of the meadows, since this display followed the 2003 fire. However, bear in mind that we are not seeing what was there prior to cattle grazing and the introduction of non-native grass and weed species.

The Use of "Milling" Equipment in Ceramic Technology

Most archaeologists describe and interpret any "grinding" implements they encounter (mortars and pestles, manos and metates, handstones and millingstones) as a product of seed processing technology associated with Native subsistence behavior. The implication of these in archaeological assemblages is usually that these reflect the use of seed crops of various sorts, although many other plants were pulverized in these (Payen and Boloyan 1963: 2), as were small mammals. There also were uses for these tools outside of foodways and many of these are documented in ethnographic literature. Examples of "milling" implements used for minerals and other non-food products have been described by archaeologists (Crabtree 1974), but mostly these tools are assumed to reflect dietary behavior.

Figure 37. Basketmaker with metate for pottery clay processing (photograph by Gerrit Fenenga)

In southern California, Native peoples produced ceramics as part of their material culture. The appearance of this technology is used to characterize developments during the most recent period of prehistory, and the pattern persisted into the period of European contact. A recent revitalization of this tradition has emerged among the Cahuilla of Riverside County, the Kumeyaay of San Diego County and the Pai Pai of northern Baja California (Griset 1990). Modern potters have largely remained faithful to traditional methods of production, although there have been some transformations (especially in vessel form).

Figure 38. Paipai potter grinding clay for pottery (photograph by Gerrit Fenenga)

In 1900, William Henry Holmes described Cahuilla women making pottery at Agua Caliente which began with them "…grinding the clay in a mortar (Holmes 1900:186). Malcolm Rogers worked with the Kumeyaay in the 1930s and described clay processing in stone milling equipment (Rogers 1936:6). Van Camp revisited Kumeyaay ceramic technology and also described the "refining" of raw clay in a metate or mortar. Finally, recent work with the Pai Pai at Santa Catarina in Baja California by several scholars has documented the use of metates to process clay for ceramic production (Michelsen 1971a, 1971b, 1972; Fenenga and Heredia 1995). Figure 37 shows a basketmaker storing a metate used for working pottery clay. Figure 38 depicts a modern Pai Pai potter pulverizing clay in a metate (which incidentally, was collected by her from an archaeological site near her community).

The implications of these observations are clear. Any analysis of bedrock milling tool function must take ceramic technology into account, including any model of Cuyamaca Oval function.

Conclusions

Information about bedrock milling features is difficult to obtain; ethnographic information is scarce, and most archaeologists do not take the measurements that would fully record the milling elements. In fact, site forms often refer simply to Basins, Mortars and Slicks. More than anything, this article is a call to improve recording methods for bedrock milling features, at least during testing and data recovery. Clear definitions and measurements will assist in clarifying the nature and distribution of Cuyamaca Oval type milling elements.

The study conducted by McCarthy et al. (1985) for the Western Mono area is an example of the level of detail necessary for the study of bedrock milling features. Beginning with ethnographic research using knowledgeable informants, Mono people were videotaped processing acorns. In general, seeds were processed in the deepest mortars, after being crushed against the sides. In the Mono area, some seed mortars were identifiable by informants because this crushing action made a sharp angle at the edge of the mortar (McCarthy et al. 1985: 317). Mortars in three sites were then measured, and data were analyzed. The researchers recorded profiles for each mortar, calculated volume, and noted the configuration of the milling elements. As a result, the model developed from Mono consultants strongly agreed with the archaeological analysis, and the researchers recommended that relative proportions of mortar types could be used in future research and interpretation in the Mono culture area (McCarthy et al. 1985: 343).

In the introduction to this article, the authors proposed two models for the presence of Cuyamaca Ovals:

Model 1 defines Cuyamaca Ovals as milling implements used by Late Prehistoric people to process specific types of resources, possibly meadow plants such as seeds or grasses. The milling areas are often not adjacent to the occupation areas of the site, but can be near or associated with specific late period villages and camps. This model is supported by the presence of Cuyamaca Ovals at some Late Prehistoric sites, but is not supported by the fact that many of the large villages in the region do not have these features (see Iguai, above).

Model 2 is based on chronology. Cuyamaca Ovals may represent the Archaic occupation of the mountains, which could have been focused on gathering and processing meadow seeds and nuts in contrast to the later emphasis on acorn processing. This model is supported by the apparent antiquity of some of the ovals, and their isolation from large Late Prehistoric sites. However, Archaic assemblages are rarely found, and no Archaic site has been found with Cuyamaca Ovals in direct association.

Some sites with Cuyamaca Ovals have been excavated in San Diego's mountains; these projects are reported in the gray literature and are not widely known. These reports should be searched for the presence of ovals, and the artifacts associated with the features should be described. Unique artifacts may be found in association with oval features. For example, the shaped pestle found at CA-SDI-10784, the Fireline Site, could be part of the tool kit needed for processing at oval basins.

In addition, future excavations at sites where only ovals are present could provide strong data about the chronology of the features and their function. Tools expected at these ovals-only sites could be shaped and unshaped pestles with angular or worn ends. Soils testing and radiocarbon dating would also help define these sites.

The authors support continued research on the subject of Cuyamaca Ovals, and suggest the following studies:

- Research the local gray literature for information on sites with Cuyamaca Ovals that have been excavated, and study the artifacts and chronology of these sites to develop a characterization of the site type;
- Identify sites that have only Cuyamaca Ovals milling features for test excavation and analysis;
- Be consistent in terminology and recording protocols for milling features so the data are comparable; and
- Pursue studies of the relationships between native plants, site types, and milling features (e.g., Shackley 1980).

With the distribution of this article, the authors are encouraging more detailed consideration of bedrock milling features, and in particular ask researchers in southern California and other areas to identify those elements referred to as Cuyamaca Ovals in reports and on site forms. With additional data, a clearer definition of the distribution, form, and function of these milling features may be possible.

Acknowledgements

The authors would like to acknowledge the contribution of the late D.L. True to the study of Cuyamaca Ovals. He was the person who initiated the work with these features. The late Fritz Riddell visited some of the Cuyamaca Ovals sites several times as the State Parks Archaeologist and as a mentor to some of the authors. Breck Parkman, convinced of the validity of the Cuyamaca Oval as a distinctive site type, recorded many of the ovals sites in Cuyamaca Rancho State Park. John Foster reported his observations of Cuyamaca Ovals, particularly in Mexico, and also visited sites and gave tours to initiate local interest in ovals. Michael Sampson has always supported Cuyamaca Ovals research, and shared information about ovals with the authors. Dr. Brad Bartel, formerly of San Diego State University, accepted a contract with CDF and used students to study Cuyamaca Ovals, although his study was cut short by his transfer to another position. Dr. Lynn Gamble, San Diego State University, went with some of the authors to look at the sites in Cuyamaca Rancho State Park. Rich Jenkins recorded many Cuyamaca Ovals sites in San Diego County, and found reference material for the authors. Greg Greenhoe, on loan to CDF from the USFS, spent four years recording major Cuyamaca Ovals sites in San Diego County. As the CDF unit forester for San Diego County, he also had access to private ranch lands where ovals sites were located. Although many San Diego archaeologists do not note Cuyamaca Ovals as a distinct type of bedrock milling element, Dr. Lynne Christenson and Margaret Hangan assisted the authors with their local expertise and broad field experience. The authors would also like to thank the managers at Cuyamaca Rancho State Park for allowing CDF archaeologists and the authors to visit sites in the park in the spirit of interagency cooperation.

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