An Overview of Cuyamaca Oval Bedrock Basin Metates

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Cuyamaca Oval bedrock basin metates are a very distinctive type of bedrock milling feature identified first in the mountains of San Diego County. However, there is no definition of these features in the archaeological literature. Cuyamaca Ovals are not recorded or described consistently, so comparative studies are difficult. It is the purpose of this paper to draw attention to these features and encourage researchers to pursue study of them. By recognizing these oval basin metates and using consistent terminology to describe them, archaeologists can further our understanding of why these sites were created and used, and determine their age.

Definition of Cuyamaca Ovals

What is a Cuyamaca Oval?

Many archaeologists question what defines a bedrock basin metate as a Cuyamaca Oval. A Cuyamaca Oval is defined based on the following attributes:

- elliptical shape; 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 or a "deer hoof" pattern of closely spaced basins
- if any mortars are present, numbers are minimal

We do not 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. Figure 1 illustrates the appearance of the classic Cuyamaca Ovals feature.

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 many sites in San Diego County. Recent observations by local archaeologists suggested that this form of archaeological feature is present in both the mountains and foothills of San Diego County.

Based on anecdotal comments, typical Cuyamaca Ovals sites appear to be present as far south as Laguna Hanson

Figure 1. Classic Cuyamaca Ovals.

in Baja California, throughout the mountains and foothills of San Diego County, and scattered through Riverside County. Oval-shaped 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 have been recently identified in Jamul, at the western edge of the foothills. Similar archaeological features are not found in the deserts of southern California, nor along the coastal margins. Figure 2 shows the currently known distribution of Cuyamaca Ovals sites.

The following descriptions of sites were based on reports and site record forms, and on limited field study. Susan Hector and Michael Sampson conducted field surveys in the Cuyamaca Mountains in September and October of 2005 and in January of 2006 to visit some of these sites in support of the preparation of this article. Dan Foster, Gerrit Fenenga, and John Foster provided other reports of Cuyamaca Ovals located outside of the San Diego area. These sites represent a strong sample of classic Cuyamaca Ovals, and some contrasting examples.

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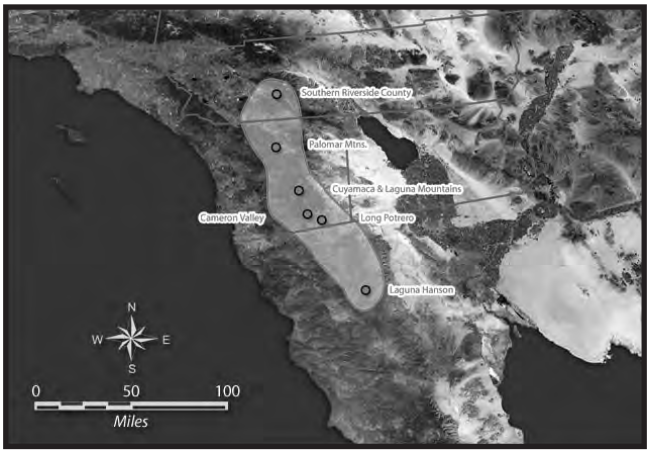

Figure 2. Currently known distribution of Cuyamaca Ovals sites.

CA-SDI-10903, the Repaired Olla Site.

This Late Prehistoric village site was recorded by Richard Jenkins and Dan Foster in 1986 as containing 10 Cuyamaca Ovals and 15 bedrock mortars, along with projectile points, pottery sherds, and flakes and flaked stone tools. The recorders also noted the presence of a ceramic rim sherd with a repair hole. The site is located in the Corte Madera region.

SDI-10784, the Fireline Site.

This site was recorded by Dan Foster, Rich Jenkins, and Greg Greenhoe in 1987. Foster collected an unusual mano that had a distinctive wear pattern on the end of the stone; approximately 1 in. of the stone was ground off at a 45-degree angle. Use of the artifact in an oval basin may explain this kind of wear (see ethnography discussion provided below for analogies). Twenty-five Cuyamaca Oval basin metates were identified at the site, and mortars are also present. The site is located at the northern end of Cameron Valley. Many artifacts were noted, including numerous potsherds.

SDI-10816, the West Side Site.

The site was recorded by Richard Jenkins and Dave Volgarino in 1987 as 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-wear on both ends was found (see ethnography discussion provided below for analogies). Basin metates were also found. Site SDI-10817, the East Side Site, is recorded nearby and contains five loci with basins metates and mortars. A rockshelter with a stacked rock wall is documented at SDI-10817 as well. These two sites are located above La Posta Creek, in Cameron Valley.

SDI-8839, the Milk Ranch Site (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 at the site. It was documented as being a Late Prehistoric village with a possible earlier component. This site was visited and photographed by Hector and Sampson in October, 2005.

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. More than 63 oval basins arewere present at the site. Many of the Cuyamaca Ovals at Locus B are clustered and parallel in the classic pattern. The face of the bedrock outcrop is steeply angled, with the oval basins along the more level northern edge. There are no mortars identified at this site, although canyon live 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, shallower, and less well defined.

SDI-8859 (Cuyamaca Rancho State Park).

The site was recorded by Breck Parkman and Dan Foster in 1981. In addition to seven oval metates, the site also contains cupules. Hector and Sampson revisited SDI-8859 in October of 2005. Site SDI-8859 is a small site with limited milling; the oval basins here are not as well developed as those at other sites, but two meet the criteria for "classic" Cuyamaca Ovals.

SDI-8861 (Cuyamaca Rancho State Park).

The site was recorded by Joe Hood and John McAleer in 1981. It features more than 25 classically shaped ovals on a Julian Schist outcrop. These ovals look almost like deer hoofs, being strongly elliptical with uniform depth, and occurring in pairs. The site has a conical mortar that is pointed rather than being the typical round shape at the base. The uniform depth of the basins at this site suggests that use of the basins was discontinued when they were no longer effective. The site is located in a pine and oak woodland, overlooking Green Valley. Hector and Sampson visited the site in October, 2005 and took measurements of selected elements in January, 2006. Few artifacts were noted at the site.

SDI-10972D (SDM-W-365), Cuyamaca Ranch.

Ken Hedges of the San Diego Museum of Man originally documented this site in 1968 as SDM-W-365. Hedges noted a "large number of bedrock metates; no mortars." He also noted that there was only a light scatter of flakes near the milling features. The site was formally recorded as SDI-10972D by Dan Foster, Rich Jenkins, John Foster, and Michael Sampson

in 1988. This site is located adjacent to Sunrise Highway, and construction of the road removed some portion of the midden deposit. The site has more than 80 Cuyamaca Ovals. It was revisited by Hector and Sampson in October of 2005, and they returned the following January to take measurements of a cluster of elements. This site features highly patterned oval basins in excellent condition. Site SDI-10972D is located on the rim of the meadow above Lake Cuyamaca. There are no mortars at this site. Relatively few artifacts were identified on the surface of the site; a Late Prehistoric midden deposit located some 50 m from the bedrock outcrop may or may not be associated with the Cuyamaca Oval features.

SDI-852, the Two Pines Site.

This site was recorded by D. L. True in 1961 and revisited by Hector and Sampson in October, 2005. It sits on a low ridge of Julian Schist. Chokecherry (*Prunus virginiana*) is growing in the bedrock outcrop. The pits of chokecherries were ground, leached, and eaten as flour (Spier 1923:335). The Cuyamaca Ovals at this site are more elliptical than at other sites. They occur in pairs and groups, and are highly weathered. The depth and slope of sides of the ovals tend to be uniform. Two mortars are present. The site is located at the edge of a meadow.

SDI-16265, Iguai.

This site was recorded by Hector in 2002, and revisited by Hector and Sampson in October of 2005 for this article. Iguai is a large ethnographic village that was occupied as late as the 1870s. Site components lead to the conclusion that the processing of black oak (*Quercus kelloggii*) acorns was important at Iguai (Hector 2006). It is notable that only one or two sets of Cuyamaca Ovals are present. There are many mortars and slicks at the site, which is located on a ridge near a large meadow above Lake Cuyamaca. Chokecherry grows throughout the lower site area. In October, 2005, the slopes above Iguai were covered with burnt pine trees, but historic records noted that black oaks formerly grew in this location. The oak trees were probably cut for local construction use or for firewood, and were replaced by pines. This site presents an example of a large, late site with a focus on acorn processing, but with no oval basins.

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; there are 23 oval basins at the small site. Chokecherry is growing at this site, as it does at many of the sites located on Volcan Mountain (Hector 2005b:26). The site is located on the end of a long, narrow ridge that then drops steeply; no meadows are located nearby.

SDI-17094, Volcan Mountain.

This site presents a very unusual setting for a Cuyamaca Ovals site. Recorded by Hector and Pallette in 2006, it is located in a dense pine forest on a steep slope. There are several large boulders along the side of a narrow drainage, and the most level rock is covered with ten ovals. There are no other archaeological sites in the vicinity, nor are any artifacts present at this site.

Laguna Hanson, Baja California.

John Foster, Senior State Archaeologist, has identified Cuyamaca Ovals at Laguna Hanson in northern Baja California. Laguna Hanson features a pine forest and meadows similar to those located in the Cuyamaca Mountains.

Additional sites located within Cuyamaca Rancho State Park.

More than 50 sites with Cuyamaca Ovals have been confirmed in Cuyamaca Rancho State Park in San Diego County. For researchers interested in seeing the features, and their patterns and settings, the following sites have been documented as containing basin metates:

SDI-820, -831, -837, -853 (*A-ha-kwe-mac*), -856, -857, -859, -861, -862, -863, -864, -869, -870, -872, -877, -879, -880, -882, -886, -889, -901, -905, -917, -924, -925, -937, -939, -1017, and -1027.

Background to the Study of Cuyamaca Ovals

D. L. True was the first archaeologist to recognize and describe Cuyamaca Ovals. In his study of the Cuyamaca Mountains (1970), he noted "milling stones," as he called them. His description 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 (after ca. 1100 B.P. [A.D. 850]) occupation that dominates the archaeological assemblages of San Diego's Cuyamaca Mountains. In this model, Cuyamaca Ovals may represent an Archaic emphasis on the processing of 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 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.

True (1993) felt that the form and pattern of bedrock milling elements indicated a developmental continuum with an increasing focus on acorn processing through time. He reached this conclusion through his study of sites located along the San Luis Rey River between Guajome and Jaculi, on Palomar Mountain (SDI-535). He looked at the distribution of five kinds of bedrock milling features: mortars, bedrock metates (not basins), slicks, mortar collars (crescent-shaped milling areas located adjacent to mortars), 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 on his ethnographic information from the 1940s and 1950s:

1. An acorn processing station is represented by heavy concentrations of large, deep mortars with few or no associated metates or slicks. Mortar collars or pockets are rare, and cupules are commonly associated.

2. Generalized processing and habitation sites have numerous mortars of various sizes, with associated pockets or collars, and metates and/or slicks in various combinations. There is a strong emphasis on acorn processing.

3. Generalized processing sites, and small sites where acorn processing is relatively unimportant, have small to medium-sized mortars, metates, and slicks alone and in combination. Mortars are shallow.

4. Hard seed, fiber, or small-animal processing is the primary focus at sites with metates and slicks.

True did not identify oval basins as a separate type in his San Luis Rey studies or his work at SDI-680, which he studied as part of his identification of the Late Prehistoric Cuyamaca Complex (True 1970). Site SDI-860 contained abundant mortars (n = 40) and milling stones (n = 100). His report did not specify the numbers of slicks and oval basins, which are grouped into the category of milling stones.

As a result of the 1979-1981 surveys of Cuyamaca Rancho State Park, numerous sites were identified that contained the distinctive oval basin metates (Foster 1980, 1981; Parkman 1981). Foster described the features now known as Cuyamaca Ovals in his survey report and raised the following questions based on the 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 the processing of grass and annual seeds that are present in meadows?

At about the same time the surveys of Cuyamaca Rancho State Park were being carried out, ASM Affiliates conducted a survey of the Laguna Mountain Recreation Area. All individual milling features identified within the Recreation Area 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 nutmeat was ground (Shipek 1970:30). Tom Lucas, *Kwaaymii* Indian from Laguna Mountain, related that the Indians of Laguna Meadow periodically burned the meadow to promote the growth of seed-producing annuals (Graham 1981:101).

Elliptical and ovoid basins were observed at 60.7 percent of the sites, but did not appear to be related to either processing or habitation (Graham 1981:125). Mortars, however, were found at only 38.4 percent of sites; these were present at 85 percent of habitation sites but only 25 percent 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 of the 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 primarily along the edge of meadows and then along drainages. Graham used statistical analyses to look at the relationship between the number of each milling element type, distance to stream flow, and distance to meadow edge. He concluded that basins were associated with the processing of resources available

from the meadow, possibly grass or seeds. Procurement and processing of seeds was done on site, unlike acorns, which were transported to the residential areas for processing.

In conclusion, Graham stated that in the Laguna Meadows area there was limited processing of acorns, possibly because the oak trees were scattered among other trees rather than occurring in groves (1981:155-156). The number of mortars in this area is limited, 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. He observed that basins are numerous at both habitation and processing sites in and around Laguna Meadow because annual flower and perennial and annual grass seeds were abundant there.

In 1991, Dan Foster worked with Brad Bartel, professor at San Diego State University (SDSU), to study the relationships between Cuyamaca Ovals, vegetation, and soil types. Bartel used existing information to tabulate site characteristics with natural resource information from Cuyamaca Rancho State Park. Unfortunately, this study was never 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) had identified oval basins at CA-ELD-527 that had the "classic" Cuyamaca Oval characteristics, including patterning in pairs and in curving arc formations. He also identified two other northern California sites, CA-SIE-355 and SIE-392 in Sierra Valley, which 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). Shared characteristics between the sites include the following:

- locations near the edges of large meadows
- proximity to pine forests
- locations within Hokan linguistic territory
- the possibility that the features predated the mortars that were also found at the sites

In a note to Bartel, Foster wondered if the oval basins at Sierra Valley were older than mortars situated on the same rock. The issue of oval basins being older than mortars is also relevant to San Diego sites, where there may have been multi-component occupations. The Late Prehistoric use of the San Diego mountains was so intensive that it could have masked or destroyed the more ephemeral evidence left during the Archaic period, leaving only the milling features as evidence for older occupations.

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, focusing on more complete documentation of the milling elements.

One of the most intriguing aspects of Cuyamaca Ovals is their possible great antiquity. Some of them show evidence of differential weathering; this aspect is particularly visible at 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 the two halves of the boulder have migrated apart, which is considered a sign of antiquity. This type of evidence for age is not seen at milling features with bedrock mortars.

The nature of evidence for the association of Cuyamaca Ovals with the Late Prehistoric sites that dominate the mountain regions of San Diego requires further evaluation. For example, the Arrowmakers Ridge village site (SDI-913) in Cuyamaca Rancho State Park has extensive midden deposits and more than 100 mortars. There are no Cuyamaca Ovals at this site. In contrast, there are other sites where mortars are absent; the sites are composed solely of Cuyamaca Ovals (e.g., SDM-W-365). Village sites such as *Ah-ha kwe-mac* and *Iguai* have both ovals and mortars. Questions that need to be addressed include these: Are the bedrock milling features with Cuyamaca Ovals associated with the Late Prehistoric deposits, or are they separated by some distance? And could 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.

Ethnographic Information About the Use of Basin Metates (Cuyamaca Ovals) to Process Seeds and Nuts

Ethnographic information 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. Cline (1984:28), in writing about the subsistence patterns of the Kwaaymii Indians of Laguna Mountain, noted that the seeds of chia, gray sage, and pinyon pine were ground. Illustrations in her book depict Maria Alto grinding seeds in 1917 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 are a brush and a tray basket that 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 and mxing it with water and honey. Her informant, Delfina Cuero, stated that the Indians ground most available nuts and seeds, including wild cherry, lilac, flowers, and grass. The seeds were winnowed and sifted in a round, flat basket after grinding on a flat stone (Shipek 1991:30). According to Shipek, the Kumeyaay ground the seeds of many San Diego mountain plants. Table 1 provides a summary of known plants whose seeds were ground.

Table 1. San Diego Mountain Plant Seeds Ground by the Kumeyaay (Cline 1984; Hedges and Beresford 1986; Shipek 1991; Spier 1923)

Species	Common Name	Use
Bromus carinatus	California Brome	Food
Chenopodium sp.	Goosefoot	Food
Linum lewisii	Flax	Food
Marah macrocarpus	Chilicothe	Pigment binder
Opuntia sp.	Prickly Pear Cactus	Food
Pinus spp.	Pine	Food
Prunus ilicifolia	Wild Cherry	Food
Prunus virginiana	Western Chokecherry	Food
Rhus integrifolia	Lemonade Berry	Medicine
Rosa californica	Wild rose	Food
Rumex crispus	Curly Dock	Food
Salvia apiana	White Sage	Food
Salvia columbariae	Chia	Food
Salvia sp.	Gray Sage	Food

Nuts were a particular dietary favorite of the Kumeyaay, being sought out for their flavor and high nutritional 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.

California Indians used many flowers and annuals for their seeds. Although not specifically documented for the Kumeyaay, annual flowers found in the meadows of the Cuyamaca Mountains and 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).

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. Anderson (2005) documented at length the notion of incipient horticulture as practiced by California Indians. Controlled burning, for example, encouraged the growth and diversity of preferred plants while discouraging other plant growth. 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. Hector has noted that western chokecherry 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). Prickly pear (*Opuntia* sp.) also grows at many mountain sites; these seeds were eaten when the fruit was ripe (Spier 1923: 336).

Annual flowers bloomed in abundance in the spring of 2005 in the meadow located above Cuyamaca Lake. Since this display followed the devastating wildfires that took place in 2003, it may be a good example of what the density and diversity of annual plants and grasses were like after the Indians conducted controlled burns of the meadows. However, the reader is cautioned to bear in mind that we are not seeing the plant diversity that was present prior to cattle grazing and the introduction of non-native grass and weed species.

CONCLUSIONS

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 flower or grass seeds. 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. Model 1 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 the description of *Iguai*, above).

Model 2 is based on chronology. Cuyamaca Ovals may represent Archaic occupation of the mountains, which could have focused on the gathering and processing of 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 well-dated Archaic site has been found with Cuyamaca Ovals in direct association.

Some sites with Cuyamaca Ovals have been excavated. Reports resulting from such excavations should be closely reviewed and the artifacts associated with the features should be identified and examined. Unique artifacts may be found in association with oval features. For example, the shaped

pestle found at SDI-10784, the Fireline Site, could be part of the specialized 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 sites could include shaped and unshaped pestles with angular or worn ends. Soils testing and radiocarbon dating would also help define these sites.

Documentation of bedrock milling features is difficult to obtain, and most archaeologists do not record measurements that would fully document 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.

A 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 located at 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).

The authors support continued research on the subject of Cuyamaca Ovals, and recommend the following studies be carried out:

- 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;
- target sites that have only Cuyamaca Oval 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, we encourage more detailed consideration of bedrock milling features, and in particular ask archaeological researchers in southern California and other areas to clearly 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.

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The authors would like to acknowledge the contribution of the late Dr. 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 Oval 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. 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. Lynn Gamble, San Diego State University, accompanied 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, 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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