A PRELIMINARY REPORT ON MILLING TOOL ASSEMBLAGES FROM THE ANDERSON FLAT ARCHAEOLOGICAL PROJECT, LAKE COUNTY, CALIFORNIA

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ABSTRACT

This paper reports preliminary results of a study of milling tools recovered during the Anderson Flat Archaeological Project (AFAP) in Lake County, California. Analytical methods were designed to identify potential wear surfaces, distinguish wear formed through use versus intentional shaping, and sort tools into types. A goal of the analysis is to relate AFAP findings to previous models regarding milling tool use in the region. In comparison with findings of past studies, the AFAP data support an increasing proportion of pestles/mortars in assemblages through time, but show greater temporal and geographic variation in milling tool assemblages than previously acknowledged.

INTRODUCTION

The Anderson Flat Archaeological Project (AFAP) investigated several midden and non-midden loci which are situated in the southeast portion of Clear Lake Basin in the North Coast Ranges. Milling tools were recovered from all AFAP loci and study methods were designed to organize these artifacts into types which could be useful for defining assemblages and comparing the collection to milling tools from other sites. Assemblage definition is especially important in the Clear Lake Basin, since it is proposed that, during the Archaic period, the area was used by two contemporaneous groups related to the Houx and Mendocino Patterns (White and Fredrickson 1992). Houx florescence within Clear Lake Basin involved increased sedentism after 2,500 B.P., and, in contrast, Mendocino occupation within the basin narrowed through time, but continued in surrounding upland areas (White and Fredrick-son 1992:148-149). Cultural materials found at any Anderson Flat locus could potentially relate to either Houx or Mendocino assemblages. Therefore, it was necessary to identify potential differences in assemblages.

In the course of background research for the study it was necessary to evaluate past investigations of milling tool use in the region and, in some cases, revise data from previous studies. The revised data, in addition to AFAP milling tool data, resulted in a reformulation of changes through time in milling tool assemblages within Clear Lake Basin. Findings of the study document variability in milling assemblages through time and space. This variation is related to interaction between Houx and Mendocino Pattern subsistence systems and changes in Houx Pattern adaptations.

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METHODS

Analysis of AFAP milling tools followed methods developed and applied to archaeological collections from the North Coast Ranges by Mikkelsen (1985). These methods, which examine morphological and functional attributes, were further developed to analyze a collection from four sites in Shasta County (Mikkelsen 1989). Morphological attributes describe the degree of intentional modification and the general form of a tool, such as size and shape. Functional attributes, such as wear patterns, provide clues regarding processing activities and the way a tool was used.

Initially, milling tools were separated into handstones, millingslabs, pestles, and mortars. However, a number of tools in the AFAP collection exhibit wear patterns related to multiple uses. For example, some handstones have end wear which could result from use as either a pestle or hammerstone, and some pestles exhibit a bevelled, polished side similar to a handstone face. AFAP milling tools also show wear patterns reflecting secondary uses, such as anvils and awl sharpeners. The potential problem which multiple use creates for separating milling tools into types is especially difficult for fragments which are missing potential wear surfaces such as ends.

Furthermore, identification of tool use(s) is inhibited by difficulty in distinguishing between wear patterns formed through deliberate shaping versus wear patterns formed through use. Handstones often have pecked ends which could represent either pestle use or intentional shaping. Our analysis concluded that the clearest evidence of pestle use on a handstone is spalling and battering along the ends, since these wear attributes are less likely to occur through deliberate shaping. Handstone use on a pestle was distinguished from intentional shaping on the basis of a well-worn, beveled surface along a side. Wear along a pestle may develop through rubbing against the side of a mortar, although, in contrast to handstone wear, this side wear would not extend evenly across the entire length of a pestle.

BACKGROUND

Most past and recent studies of assemblages in California organize milling equipment into four basic types, and this division is strongly tied to a theoretical perspective which correlates handstones/ millingslabs with seed processing and pestles/ mortars with acorn processing. As Mikkelsen (1985:2) notes, a shift from predominant use of millingslabs to mortars is generally argued to have occurred throughout most of California between 2,000 and 3,000 B.P., and is attributed to a shift in the predominant staple plant resource from seeds to acorns. Data in support of the shift for different regions within California, including the North Coast Ranges, are summarized by Basgall (1987), who views increasing dependence on acorns as an intensification of subsistence practices in response to population-resource imbalances. Evidence for intensification within the North Coast Ranges is derived from several sites and localities, including LAK-261, the Warm Springs Dam locality, the Mendocino National Forest, and LAK-510.

Milling tool data from components at LAK-261 suggested that early site occupation was characterized by use of handstones and millingslabs, and this technology was replaced at 2,000-2,500 B.P. by exclusive use of pestle and mortar during later occupation (Fredrick-son 1961, 1973). Investigation of sites within the Warm Springs locality in north-central Sonoma County showed a similar shift in milling technology after 2,500 B.P., although handstone/millingslab use continued throughout the sequence. It was proposed that millingslab use was retained in upland areas, such as the Warm Springs locality, while milling technology in lowland areas was characterized by exclusive use of mortars (Baumhoff and Orlins 1979). A study of upland areas in the Mendocino National Forest indicated that millingslabs remained the dominant technology throughout the chronological sequence, although the proportion of pestles and mortars in assem-

blages increased, especially after 2,500 B.P. (McCarthy et al. 1985:133-134).

Investigation of LAK-510, a multicomponent site along Cache Creek in Clear Lake Basin, supports exclusive use of pestle-mortar technology in lowland areas after 2,500 B.P. (White 1984). The proposed sequence of component assemblages shows exclusive use of handstones/millingslabs prior to 2,800 B.P., use of both millingslabs and mortars between 2,800-2,500 B.P., and predominant use of pestles and mortars in assemblages after 2,500 B.P. An "overwhelming predominance" of pestle/mortar use within the middle Houx assemblage is described in the report (White 1984:395) and a table shows this component to be characterized by exclusive use of pestle-mortar technology (White 1984:254).

Thus, evidence for exclusive use of pestles and mortars in lowland areas of the North Coast Ranges is derived from two multi-component sites, LAK-261 and -510. The main LAK-261 components are horizontally stratified, while LAK-510 has horizontally and vertically stratified components. The potential mixing of assemblages at LAK-261 is possibly limited, since the components were defined as horizontally separate. However, a later re-analysis of milling tools from the site identified two handstones (originally categorized as pestles) within the later component and, on the basis of projectile point styles and hydration rim values, it was suggested that some component overlap existed and the handstones were attributed to the earlier component (Mikkelsen 1985:171).

Mixing of assemblages related to different components is evident at LAK-510. The vertically stratified components of the gray ('C2') and brown ('C1') middens are relevant to the current discussion, since these components (early and middle Houx) represent a transition from millingslab dominated assemblages to mortar dominated assemblages as presented by White (1984) and Basgall (1987). The physical distribution of milling tools within the brown and gray middens shows that all tool types are present in both soils, although there is a shift towards a greater proportion of pestles in the brown midden (middle Houx). Due to mixing of assemblages between the two contiguous soil horizons, determination of component affiliations for milling tools was apparently based on the presumed exclusive use of pestles and mortars after 2,500 B.P.

In sum, previous researchers attributed the co-occurrence of handstone/millingslab and pestle/mortar technologies at lowland sites to mixing of assemblages within deposits. Assignment of different milling tool types to particular components was based on a model which hypothesizes that assemblages of components after 2500 B.P. are characterized by exclusive use of pestle-mortar technology. However, a recent presentation of LAK-510 data based component assemblages on the stratigraphic distributions of different milling tool types (White and Fredrickson 1992:54). The sequence presented by White and Fredrickson (1992) for Clear Lake Basin shows a gradual increase in the proportion of pestles/mortars in assemblages and is culminated by exclusive use of this technology during the latest (terminal Houx) period, although this last assemblage is based on a single pestle (Table 1).

AFAP COMPONENT SUMMARY

Milling tools were recovered at all AFAP loci (Table 2), but these artifacts were most abundant at three intensively sampled middens (LAK-72EA, -510WA, and -510WC) which contain Houx Pattern components. A moderate number of milling tools was recovered from a non-midden, Mendocino Pattern component (LAK-509/881). Handstones and pestles, the most common milling tools, occurred as unassociated midden finds. Most millingslabs and mortars at LAK-72EA and LAK-509/881 were associated with features.

LAK-510WC, a midden deposit, yielded an Early Houx component assemblage (2,800-2,500 B.P.) and included a variety of milling tool types which are unshaped, slightly shaped, and shaped. Milling tools at the locus were recovered in the

highest density per cubic meter of any AFAP locus, and the relative abundance of unshaped forms suggests an even higher density, since fragments of unshaped tools, such as pestle spalls, are difficult to identify in the field.

Most milling tools recovered at LAK-72EA are from an artifactually-rich midden which extends over most of the locus and is generally a meter thick. Most assemblages within the midden relate to Houx Pattern components which range from early to late Houx (2,800-1,300 B.P.). The midden lacks stratigraphy and overlies a brown clay deposit which extends to the surface beyond the midden to the south and west. Assemblages related to the Hultman Aspect of the Mendocino Pattern occur within the brown clay sub-midden and are probably older than 3,000 B.P.

Both shaped and unshaped milling tools were recovered from LAK-72EA, although pestles are predominantly shaped. Most shaped pestles are fragments, and the more complete pestles exhibit a greater degree of formalized shapes in comparison with pestles from LAK-510WC. For example, the AFAP pestle collection includes a cylindrical pestle form which was recovered exclusively at LAK-72EA.

LAK-72EA was the only AFAP locus where a deep, continuous deposit containing milling tools was sampled. The sample was derived from Area Exposure #2, which was excavated to a depth of 270 cm below the ground surface, although the size of the unit varied with depth. Initially the exposure consisted of two contiguous 2 x 4 meter units, which were narrowed below the midden into one 2 x 2 meter unit. The vertical distribution of milling tool types within the unit shows mainly pestles and mortars within the midden and hand stones and millingslabs within the sub-midden (Table 3).

Within the area exposure, was found at 20-40cm (below the ground surface) above a rock lined hearth or oven and a millingslab was found (at 130cm) above a large pile of thermally-altered rocks. The latter artifact is problematic, since it shares attributes of both a millingslab and a hopper mortar. It was decided that a circular pecked area on the milling face was intended to roughen the surface and retain milled resources towards the center of a millingslab. A millingslab was also encountered (at 170 cm) in the sidewall of the unit above a burial. The burial and millingslab were left in place and no information is available regarding attributes of the artifact.

A group of five mostly complete basin millingslabs was found at a relatively shallow depth along the northern edge of LAK-72EA. The feature probably represents a cache which is unrelated to the main site components. The similar oval-shaped basins and size of the millingslabs indicate intensive processing of a hard resource, such as seeds.

A relatively high number of milling tools was recovered from LAK-510WA, although the disturbed nature of the shallow midden deposit may limit the information potential of the locus. The midden varies in thickness from 30 cm to less than 10 cm, and was possibly redeposited during highway construction. Early to late Houx assemblages (2,800-1,300 B.P.) were recovered from the midden and an assemblage related to a Mendocino Aspect component was found in a brown clay deposit which underlies the midden. The milling tool collection is similar to the LAK-72EA assemblage; shaped and unshaped milling tools were recovered, although most pestles are shaped and occurred within the midden. Handstones were recovered from both the midden and sub-midden, and most are shaped. Two adjoining sections of a well-shaped bowl mortar occurred in the brown clay 10-30 cm below the midden.

Mendocino Pattern assemblages were recovered from LAK-509/881 and LAK-72WC, which are both non-midden deposits. The Early Hultman component (5,000-3,000 B.P.) present at LAK-509/881 yielded a sparse lithic assemblage, but a relatively large number of milling tools. Most milling tools were recovered from a burial cairn which contained a hopper mortar, a deep-basin millingslab, and three bowl mortars. Once

Table 1

Changes Through Time in Clear Lake Basin Houx Component Milling Tool Assemblages (after White and Fredrickson 1992:54)				
site LAK-/ component	millingslab/ handstone	mortar/pestle	proportion within assemblages	
			slab-handstone	mortar-pestle
589	- / -	- / 1	0.0%	100.0%
261 SOUTH B	- / 1	2 / 6	11.1%	89.9%
510 C1	6 / 7	9 / 24	28.3%	71.7%
510 C2	3 / 17	1 / 13	58.8%	41.2%
380/381	3 / 7	2 / 1	76.9%	23.1%

Table 2

Frequency of Milling Tool Types at Anderson Flat Localities, Lake County, California					
Locality	Handstone	Millingslab	Pestle	Mortar	TOTAL
LAK-72EA	11	8	20	5	44
LAK-72WA	2	1	2	1	6
LAK-72WC	0	0	1	1	2
LAK-509/881	4	2	2	4	12
LAK-510EB	3	0	0	0	3
LAK-510WA	13	4	7	2	26
LAK-510WB	2	2	1	0	5
LAK-510WC	20	7	12	3	42
LAK-542	2	0	0	1	3
LAK-1375	1	0	0	0	1
TOTAL	58	24	45	17	144

the burial was encountered, these artifacts were drawn, briefly described, and then returned to the cairn for reburial. Each milling tool was possibly "killed" (ritually broken) prior to interment. The feature is similar to millingstone assemblages from sites in southern California which are characterized by broken, oval-shaped basin millingslabs that are often associated with burials (Treganza and Bierman 1958; Owen et al. 1964). The milling tool assemblage recovered from LAK-509/881 includes two distinctive trifacial handstones, one of which is stained with ochre. Ochre stains are also present on a loaf-shaped, bifacial handstone. This tool is well-shaped and both faces are multi-

Table 6

Change Through Time within Houx Component Tool Assemblages in Clear Lake Basin			
Site/Component	Milling Tool : Projectile Point Ratio	Houx Aspect Phases	
LAK-72EA	1 : 6.6	Unnamed	1,000-1,800 B.P.
LAK-261 South B	1 : 9.2	Houx	1,800-2,200 B.P.
LAK-510 C1	1 : 2.2	Houx	1,800-2,200 B.P.
LAK-510 C2	1 : 0.9	Creager	2,200-3,000 B.P.
LAK-510WC	1 : 0.9	Creager	2,200-3,000 B.P.
LAK-380/381	1 : 3.4	Mostin	3,000-7,000 B.P.

As discussed previously, the narrowing of Mendocino Pattern subsistence activities in Clear Lake Basin is possibly related to an increase in population and anthropogenic depletion of large game after Houx Pattern florescence (White and Fredrickson 1992:149). These changes represent population-resource imbalances which could lead to subsistence intensification. However, the proportion of projectile points relative to milling tools within Houx components increases through time (Table 6). These milling tool:projectile point ratios suggest that, in comparison with LAK-510WC, more hunting activities relative to plant processing are represented at LAK-72EA, but (unlike Mendocino Pattern subsistence practices in Clear Lake Basin) plant processing did not drop out of later Houx component subsistence systems.

REVISED SEQUENCE

Most sequences for the North Coast Ranges tend to show an almost exclusive use of pestle-mortars in middle and late Houx assemblages, although previous research demonstrated that handstones co-occur with pestles within assemblages in upland settings. Data from the Anderson Flat Archaeological Project--a lowland setting--shows greater emphasis on pestle use among later Houx components, although handstones continue to represent an important part of milling assemblages. The best evidence for exclusive use of pestles/mortars in Clear Lake Basin appears to be the assemblage from LAK-261 south 'B' component, which was originally thought to contain no handstones. Later analysis of the assemblage identified potential handstones, the presence of which was attributed to component mixing (Mikkelsen 1985:171).

As discussed above, analysis of AFAP milling tools recognized that milling tools exhibit a variety of wear patterns which may relate to different processing stages or functional differences. Analysis of tool use must also distinguish wear patterns formed through use from similar patterns formed through deliberate shaping. The LAK-261 south 'B' component milling assemblage was reanalyzed for the current study in view of methods applied to the AFAP collection. Three handstones, initially identified as pestles, and four pestles are present within the collection. The handstones include one complete specimen and two fragments which consist of various end portions (Figure 1 a-b). The ends of these tools are not spalled or battered and appear to be shaped through pecking. A bevelled, polished wear face is apparent along the fragmentary sides of each tool. One artifact (Figure 1 c) may represent a pestle spall which retains a pecked end; the fragmentary condition of this tool obscures any potential evidence of handstone use, although it is similar to handstones in the collection. The LAK-261 handstones are similar in size, shape, and

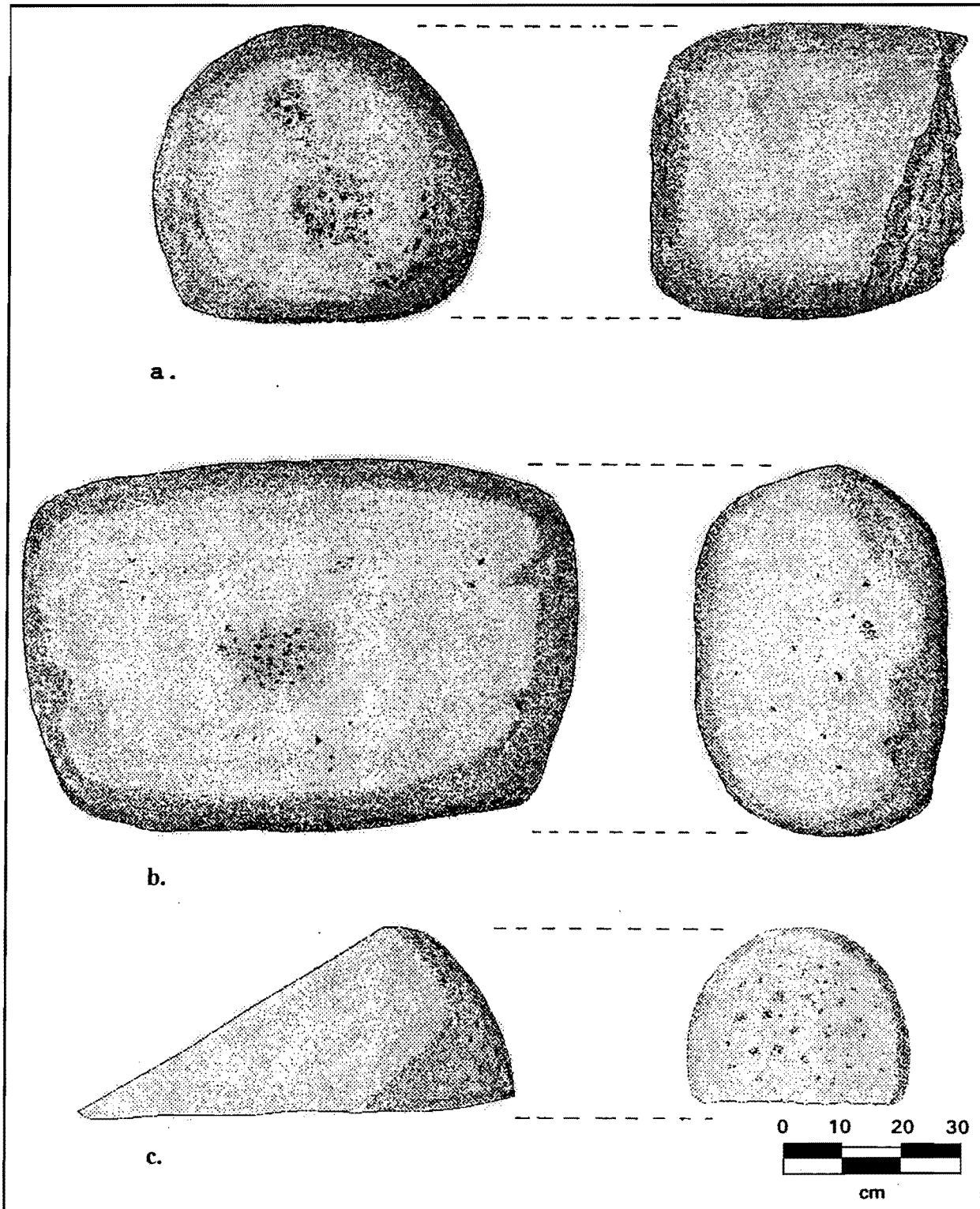

Figure 1. Milling tools from LAK-261: a. (70-1-1097) and b. (70-1-1066) handstones with pecked ends; c. (70-1-2192) pestle.

Pattern subsistence activities within Clear Lake Basin is evident by the large, diverse milling assemblage recovered from an early Hultman component and the minimal assemblage recovered from a late Hultman component. The early Hultman assemblage shares attributes with millingstone cultures of southern California and may represent a similar adaptation. The change in Mendocino Pattern assemblages is probably a response to increased competition with Houx Pattern populations within Clear Lake Basin.

Milling assemblages recovered from AFAP Houx components demonstrate changes related to increasing use of pestle/mortar technology through time, but also show continued use of hand-stones/millingslabs in lowland settings of the North Coast Ranges. The development of pestle/mortar dominated assemblages, as reflected by Houx components within Clear Lake Basin, is a gradual change rather than an abrupt shift. In comparison with later Houx components, an early Houx component yielded a high density of milling tools and an assemblage containing a higher proportion of milling tools relative to projectile points. Thus, the Houx components investigated during the project show greater temporal and geographic variation in plant processing activities than suggested by previous research in the North Coast Ranges.

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