Prehistoric California Indian Textile Technology: The Unseen Culture

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Throughout prehistory, California Indians created a wide variety of textiles, including baskets and other items. These artifacts are rarely found in archaeological sites. However, they were of critical importance to traditional culture. How can we learn to see what is unseen in the archaeological record? Using information from southern California ethnography and archaeology, it is possible to identify evidence of the activities necessary to produce textile artifacts. The level of effort needed to procure materials for textiles and produce them can be examined as well, making interpretations of site activities possible although the textile artifacts themselves are no longer in existence.

Many articles and papers have been written about the types of baskets made by California's Indians, and about the plants used to make the baskets. However, there has been little discussion about the preparations necessary to produce the number and variety of baskets and other textiles needed by a household and community. As Barrows has stated, "no single manufactured article is of the same importance as the basket...." (Barrows 1900:40). This paper discusses the efforts needed to procure and process basketry material, and provides suggestions on the types of artifacts and features that archaeologists should recognize as associated with textile production. The paper also argues that archaeologists should become more familiar with botany and habitat types, since it will not be possible to recognize the components of the textile production system without significant knowledge of the entire cultural landscape used by prehistoric people.

Tending Patches: How Native Plants Were Managed for Textiles

Baskets are the most recognized type of textile made by southern California Indians. Coiling was the method used most frequently to make baskets in Luiseno and Ipai/Tipai territory. In this method, foundation materials are stitched together in a coiled manner, with one circuit of a coil sewn to the next with overhand stitches. Twining was used to make other types of textiles, such as seed beaters and winnowing baskets.

Southern California Indians used six main plants to create a variety of baskets: deergrass (*Muhlenbergia rigens*), rush (*Juncus textilis*), sumac (*Rhus trilobata*), yucca and agave (*Yucca whipplei* and *Agave deserti*), and pine (various long needle pines; Farmer (1993:145) used Coulter pine) (Hedges and Beresford 1986:9; Merrill 1923:231). The use of pine needles is probably historic.

Deergrass was used as the foundation for coil baskets (Merrill 1923:231); rush and sumac were used to bind the deergrass foundation coils together (Kroeber 1973:56). Rush and sumac were dyed to create pattern in baskets (although the dark or brown lower stem of rush was prized for its color, and it was used undyed in baskets). The Diegueño and Luiseño used sea blite or seepweed (*Suaeda* spp.) to dye rush black, and they also used elderberry on sumac as a black dye (Merrill 1923:221-222). Other mineral and plant substances were also used to color basketry materials.

In addition to a wide variety of baskets, many other textile products were made and used. Agave fibers were spun on the leg; this fiber could be used as rope, or as sturdy cordage to make all types of nets and bags by knotting the spun fiber. Nets of agave were strung on posts and used during rabbit drives (Michelsen 1974:39).

Matting was made of woven tule or rush (Sparkman 1908:213). Other objects included sandals, brushes, and clothing—even saddle blankets in the historic period (Barrows 1900:47). Acorn granaries were woven out of willow; these took eight days, including material gathering and weaving (Ortiz 1995:21). The Cahuilla had large amounts of yucca fiber in their households, because it was a superior material for "bowstrings, netting, brushes for body painting, starting material for baskets, and strings for shell money" (Bean and Saubel 1972:152).

Before a basket could even be started, substantial planning and effort was needed to procure and process the plant materials needed. Native people established patches of basketry plants and maintained the conditions necessary for good color and quality of raw materials (Peri and Patterson 1993:180-182). Once areas were identified that contained the plants of the desired type, these plant groves were carefully maintained to ensure consistency and quality.

For example, only straight rush stems were harvested; crooked or twisted ones were not useful (Campbell 1999:106). Likewise, only the new, long stems of sumac, called "witch hazel" by Tom Lucas (Cline 1984:30), were taken for use in basket weaving; the older growth was burned after shoots were gathered to ensure a good crop the following year (Farmer 1993:144).

Ethnographic references for the Cahuilla and the Diegueño state that stands of "basket grass" were burned every three years to keep the quality of the grass high (Lewis 1993:41). Sumac was also burned to

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maintain the young, long shoots needed for basketry (Anderson 1993:165). Burning would clear out undesirable plants and debris, and allow cultivation of the basketry plants (Ortiz 1993:204-205). Deergrass stands were maintained by burning every three to five years; this was to ensure a healthy patch of grass with long seed stalks (Anderson 1996). Only the seed stalks were used for basket making (Hedges and Beresford 1986).

In addition to burning, pruning sumac for straight stems was also practiced by native people (Stevens 2004:8). Adaptive management of wetlands and other habitats to enhance textile production created a traditional landscape that contained the plants needed to support the community's need for a large quantity of textile goods. These horticultural efforts ensured that a crop of plants would be available for harvesting.

Lesson: Traditional management efforts ensured that a crop of plants would be available for harvesting. Archaeologists should consider the paleo- and ethnobotany around cultural resources to understand the full range of site-related activities.

PROCESS: FIBER PREPARATION

Once harvested, additional energy was expended preparing the plants for basket weaving. During the CIBA basket weaving workshop in the summer of 2004, Abe Sanchez emphasized that preparing the plants for weaving was an extensive effort. It takes six months to a year to prepare basketry materials. The rush needs to be bleached in the sun, so that the yellow color comes out. It has to be brought in each night so that the dew does not get to it and make it moldy and brittle. Campbell (1999:106-107) described a similar process. Then, the rush can be stored until ready to use, when the stalk is split into three strands. The longer it ages, the better quality the basket will be. Sumac has to be split as soon as it is gathered, or it will harden and be impossible to split (Hedges and Beresford 1986). Yucca and agave leaves have to be soaked and macerated to remove the pulp material and obtain the fine fibers needed for textile production.

If dyed designs were desired in a basket, additional steps were needed. Rush could be dyed black by leaving it buried in the dark mud for three weeks or more. Then it was removed and placed into the coals of a recent fire with leaves of a dye plant. This mixture was left for at least eight days (Campbell 1999:106). Acorns could be used to create a black dye; the fermentation process would take a minimum of two months.

Lesson: Planning, storage capability, and long-term commitment to manufacturing were needed for textile production. Consider these when reconstructing land use patterns.

FEATURES: POUNDING, RUBBING, AND ROLLING ON ROCKS

Many so-called "milling" features were probably used to process fibers for textile manufacturing (Figure 1). Michelsen (1974) described in detail the procurement and processing of agave fibers. Leaves of agave were removed using an oak digging stick. This does not affect the edible center part of the plant. Spines and sharp tip were removed with a stone. A fire was made in a shallow pit. When it was reduced to coals, and the sand below was heated, leaves were placed in the pit and covered with coals and hot sand. Partially burned small logs were then put on top of this mound, and coals and brush were added to it. The leaves were roasted overnight and in the morning they were stripped of the outer husk and pulp. This process involved a board as a platform and a small abalone shell used to strip off the pulp and expose the fibers. The fibers were then washed and spread to dry. When ready to use them, the fibers were dampened by placing them on a gunnysack and covering with sand, which is damp.

Figure 1: Fiber processing features, Anza-Borrego Desert State Park.

This description provides clues about several tools used to process fibers, in addition to the use of an earthen oven to roast the leaves and a board or platform used to abrade or macerate the leaves to separate out the fibers. Hohenthal (2001:178) described a similar process for agave when he stated that the leaves were pounded with a small stone on a larger stone used as an "anvil." Campbell (1999:53) stated that the Southern Diegueño Indians pounded the dried agave leaves on a rock, then soaked them in water to remove pulp for making cordage from the fibers. Rogers (1939:50) had an informant in the 1930s who described the process of fiber production; he noted that pulping the agave fibers on the surface of granite boulders left a "smooth polished area."

The process for preparing yucca leaves was similar. Yucca fibers were prepared by soaking the leaves in water, then pounding them on a flat rock with a wooden hammer; care would have been taken not to break the fibers, but only to pound the leaves enough to remove the pulp (Cornett 2002:61). The Luiseño made cordage from yucca leaves by soaking the leaves in water until the pulp rotted away (Campbell 1999:53).

Other fibers were processed in a similar manner. Milkweed and Indian hemp were also used for making cordage, and the fibers were extracted from the plant stalks by soaking them in boiling water. The Chumash processed Indian hemp for cordage by rolling the stalk on stones to remove the fibers for processing (Campbell 1999:53).

There is one possible example of a pit that may have been used to process agave fibers for textile. Wallace (1962) excavated a boulder-outlined pit oven in the Anza-Borrego Desert. The pit was filled with charcoal then rocks. Wallace (1962:10) stated that "one pit contained a mass of carbonized fiber." There would have been no reason to put the leaves in a pit except to process them for fiber; the hearts were roasted after the leaves had been cut off (Hicks 1963:108).

Lesson: Archaeological features associated with fiber preparation include boulder abrasion or maceration platforms and sand or earthen ovens. Such features may be recorded as "milling" features associated with food processing unless the archaeologist is familiar with textile production technology.

Tools: None or Few

Few tools are needed to produce textiles. Often, a weaver used her teeth and fingernails to remove and split fibers. Perishable tools made of plant parts will not be preserved. Other tools may be present in the archaeological assemblage but may be classified as food processing features or food cutting tools, or as ornaments. Or they might not be recognized at all.

Awls. Awls were used to create a small hole through which a piece of fiber was inserted to bind the textile elements together. Most archaeologists are familiar with the deer bone awl, which was a long bone reduced in size and pointed to create a handle and tip. The awl must fit comfortably in the weaver's hand, so that she doesn't have to put it down to pass the fiber through the hole. So, the awl will be approximately 10 cm in length; longer shaped bone implements were probably not used as awls. The Chumash made many different kinds of awls, depending on personal preference as to whether the awl was long or short, thick or thin; they made awls from split ribs, whole bird bone, or a mammal bone splinter (Hudson and Blackburn 1986:244).

Another type of awl was used that would not be preserved archaeologically. The Panamint awl was a cactus spine with a creosote sap handle; the sap, when heated, can be formed into a proper customized handle shape (Kirk 1952:83-84).

Today, traditional basket weavers use a modified metal drill bit, screwdriver, or nail attached to a short wooden handle. The size and shape is still determined by user preference, but is typically fitted to the weaver's palm length.

Sizers. Modern basket weavers use a pierced metal can lid to make the fibers increasingly thin. The metal prongs that have been created when the can lid was pierced will cut the fibers down in diameter as they are passed through the holes. You start with the largest holes, then get progressively smaller until the fibers are the same desired size. Prehistorically, shell and stone tools were used for this purpose.

The Chumash used a small clam shell, held in a piece of buckskin, to size the fibers. The edge of the shell was bitten off to make and keep it sharp. The cutting edge was on the inside of the shell, with the pith of the fiber facing the sharp inside edge so that it could be removed. The Chumash also trimmed sumac stems by shaving them with a shell (Campbell 1999:106-107; Hudson and Blackburn 1986:218-221). The Chumash used other sizes of shells to trim the fibers during later stages of manufacturing: they used clam shells to trim the edges of the fibers, clam shells were used to straighten the stitches in a coiled basket, and the edge of the sewing or weaving strip was kept sharp with a sharpened clam shell (Hudson and Blackburn 1986:227, 231).

Scrapers, Pulpers, and Pounders. Shells and stones were used to remove the pulp from agave and yucca leaves. An informant from Manzanita, in San Diego County, told Malcolm Rogers that stone planes were used to scrape the leaves of agave after they were placed on flat rocks (Rogers 1939:50). An experimental study by Wheeler (1984), based on archaeological evidence, used several different types of stone planes and scrapers to process yucca leaves. The tools were used to remove pulp from the leaves after they had soaked in water. The yucca leaves were placed on a stone platform for processing. Interestingly, Wheeler found that the use of a plane or scraper produced wear on the platform stone that appeared similar to "milling" stones. The edges of the flaked stone tools were "abraded, rounded, and dulled" (Wheeler 1984:C-4). Hoover (1974) reported the use of stone and bone scrapers to process yucca and agave fibers.

Michelsen (1974) described the use of a small abalone shell by the Paipai to remove pulp from agave leaves to expose the fibers. Scraping tools made from abalone were also used by the Chumash, probably for basketry preparation (King 1995:XIII-65). Campbell (1999:55) stated that the southern Diegueño in Baja California used a shell to scrape the agave leaves after they had been softened by baking in an earthen oven.

Wooden hammers (Cornett 2002:61) and hammer stones (Hohenthal 2001:178) were used to pulp, macerate, or pound yucca and agave. The term "pound" conveys more of a force than was needed or desired, but the stone implements would show abrasion or wear as they made contact with the platform rock.

Pebbles. The seed stalk of deergrass is spiky, and these sharp bracts must be removed before the basket weaver can use it. Small pebbles were used to rub off the spikes; these rubbing stones could just be whatever was at hand. In modern times, a leather glove or corn cob is used.

In areas without pottery, the interior of baskets was coated with tar to make them waterproof. Concentrations of tarring pebbles covered with natural tar, or asphaltum, were found by Gamble (1983:126-127) during an excavation at a Chumash site. She suggested that these tarring pebbles represented basket manufacturing activities within the site, areas where baskets were coated with tar—necessarily a messy process that would have produced an abundance of spilled tar and tarry stones.

Lesson: Archaeological artifact assemblages may include tools used for textile production that have been overlooked.

SEASONS AND WEAVERS

The basket weavers had to make sure that the plants were harvested at the appropriate time. Seasonal gathering was essential to make sure that the plants were not too mature, did not produce branches or side shoots that would weaken the fibers, or did not go to seed too soon.

Rush can be harvested at any time during the year, since it grows throughout the seasons (Farmer 1993:143). Deergrass is gathered in the fall when the seed becomes mature (Farmer 1993:145); by March it will be too brittle. Sumac is gathered in the wintertime (Farmer 1993:144).

How long does it take to weave a basket? The process of weaving alone was very time-consuming, and required sitting for hours during each session. Tipai weavers told Hohenthal (2001:164) that it took 15 days to make a winnowing tray, a month to make a small coiled basket, and several months to make a large coiled basket between 30 and 45 cm in diameter. Justin Farmer, Ipai weaver, stated that it took several hundred hours to weave a basket (Farmer 1993:142). These estimates do not count the time needed to gather, tend, and process the plant materials needed to make the basket.

Preparation of a sumac weaver strand takes three to five times as long as to prepare a rush strand. It takes approximately 100 hours to weave a rush basket, plus 100 hours spent "gathering, curing, splitting, trimming and sizing" the materials (Farmer 2004:13-14). A sumac basket would take 400 hours. But sumac is more durable, so for a sturdy basket it was worth the effort.

Among the Paiute, a coiled basket could require 100-200 hours of weaving time alone. This does not include gathering or processing the materials. An open-twined willow basket would require much less time, approximately 11 hours (Dean et al. 2004:7).

In an ethnographic study, a Panamint coiled basket was observed to require nearly 200 hours of work, including gathering, preparing, and weaving (Kirk 1952:85). This basket was a typical form and size, and included decorative elements.

Lesson: The time involved in cultivation, management, harvest, preparation, and manufacturing is not trivial. The major investment in energy and resources indicates that textile production was an important activity that required social and cultural stability over time.

ARCHAEOLOGICAL EVIDENCE FOR TEXTILE PRODUCTION

There is little direct archaeological evidence for textile production. A basket maker's kit was discovered in Death Valley (Wallace 1954). The cache consisted of prepared bundles of willow and devil's claw (used as a color element), a porcelain cup without a handle, a round cake of white chalk, a piece of hide, and a chunk of rock salt (Wallace 1954:218-219). These items were in a box hidden at the base of a mesquite tree.

It would be very unusual to discover this type of kit. However, there are many other artifacts and features associated with textile production that could be found archaeologically. Based on research conducted for this study, the following might be represented archaeologically as evidence of textile production:

- "Milling" features such as anvils, rubs, or abrading surfaces used as platforms to process agave fibers in the desert and yucca fibers elsewhere; this would leave evidence for macerating, rubbing, and abrading
- Sand pits or earthen ovens to roast agave leaves to remove the pulp
- Shell sizers, with the edges ground on a slant to remove pith
- Bone awls, which will be approximately 10 cm in length
- Cactus spine or agave tip awls in the desert
- Bleaching or dyeing areas potentially present as pits or depressions only
- Containers for water to wet the materials
- Rubbing stones to remove the seed hulls from the deergrass stalk prior to use
- Stone knives to cut the fiber materials and trim the weaving ends

- Stone hammers to pulp agave and yucca leaves
- Stone scrapers to remove the pulp and size the fibers
- Tarring pebbles to coat baskets and make them waterproof

Archaeologists need to be familiar with textile production processes so they can see the unseen culture represented by the vast array and quantity of baskets, mats, sandals, and other products that are not preserved. The unseen culture is represented by features and artifacts, but also by a cultural landscape that was rich in resources used for textile production.

But the destruction of native grasslands, and native habitat in general, is rapidly erasing the unseen culture of the California Indians. With the natural decay of textile goods over time, the very source materials from which they were made are becoming scarce. Deergrass, once abundant in the landscape, has all but vanished in southern California. Archaeologists need to be aware of the entire cultural landscape associated with sites, so that this element can be recorded and recognized before it is gone forever.

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