

Chapter 14

Nomadic Potters

Relationships between Ceramic Technologies and Mobility Strategies

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THERE is always a give and take when people, and societies collectively, incorporate the production and use of new material technologies. People usually alter the technology to suit their needs, but they are also often fundamentally changed by the technology as well. Such changes can come quickly and consciously, as deliberate adjustments are made, or they may happen at a slower and imperceptible rate. This chapter examines the interplay between material technology and one aspect of prehistoric lifestyle, settlement strategies, especially residential mobility. Lithic analysis has been heavily engaged in this type of research as stone tools are a common find at archaeological sites spanning the transition between different mobility strategies (Rafferty 1985; Parry and Kelly 1987; Kelly 1988; Basgall 1989; Henry 1989; Lurie 1989; Andrefsky 1991; Bamforth 1991; Odell 1996; Rosen 1989; Thacker 1996). This chapter examines a second, in this context much less studied, technology, pottery. As a case study I draw from the Mojave Desert and the North American Great Basin, or more properly the Basin and Range, where I have been focusing my research the last decade (figure 1). I will refer to this area simply as the Western Great Basin, although I recognize that it includes parts of the Mojave Desert and the Western Sierra Nevada Mountains which are technically not part of the Basin and Range geographic province.

The late prehistoric (ca. 700-100 BP) archaeological record in the Western Great Basin provides an interesting case for examining these relationships for several reasons. First, the aboriginal populations of this

¹ In this chapter I focus on residentially mobile hunting and gathering populations. However, as discussed during the workshop at the Cotsen Institute of Archaeology at UCLA, June 2004, there ought to be analogous predictions for the material technologies of nomadic pastoralists as well. Some of the discussion in this paper may apply in such settings, but others, such as the heaviness of technologies, may be less restrictive elements.

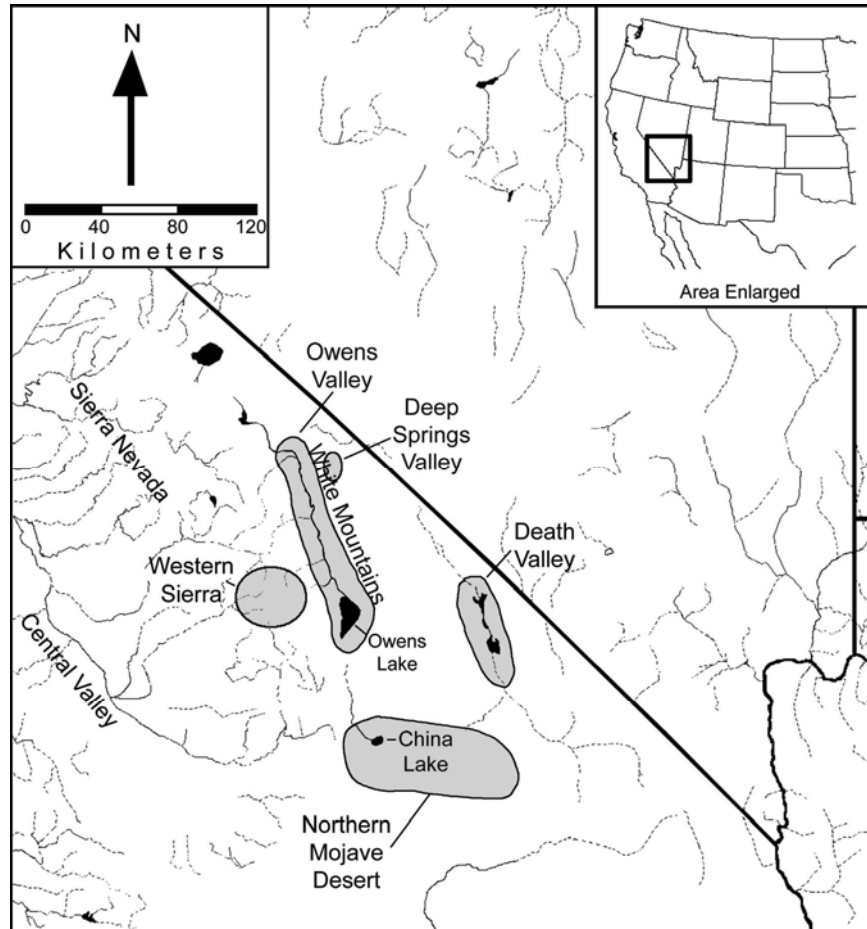


Figure 14.1. Map of the border region between California and Nevada, showing the study areas (in gray).

area were composed of hunting and gathering groups, controlling for subsistence mode in the study. Second, ethnographic and archaeological data indicate several settlement patterns were found within the region, ranging from nearly sedentary in the Owens Valley to highly mobile in the Mojave Desert. Third, although ethnographic data on pottery-making are scarce, pottery is a common component of late prehistoric sites across the entire region and has been the subject of archaeological investigation. Although the coarseness of the archaeological record does not allow us to determine exactly how pottery affected people and vice versa, it does allow us to examine general patterns between pottery making, pottery use, and mobility strategies.

Mobility and Pottery Technology

There has been a common wisdom or stereotype among many archaeologists that sedentism, agriculture and pottery technologies are necessarily and positively correlated. Indeed, some archaeologists use the presence or absence of pottery in the archaeological record as an independent measure of residential mobility. The presence of pot sherds at a site would indicate sedentism, and a lack of pottery some degree of seasonal transhumance. Although examples of pottery in sites occupied by mobile hunter-gatherers are known (Arnold 1985), as Sassaman (1993:2-3) notes, in such cases the pottery is usually defined as 'crude' and 'technologically unimpressive' thereby relegating it to a lesser and non-important status and reinforcing the stereotype (but see Barnard, this volume). There are, of course, good reasons to believe that mobile hunter-gatherers should not make pots. I present five conflicts or problems that hinder the use of pots among mobile societies, both hunter-gatherers and pastoralists. To make pottery a worthwhile technology, mobile societies must resolve these issues.

First, pots are heavy relative to other containers and are taxing to carry around during seasonal movements. This is particularly true for societies that lack pack animals and goods must be carried by people on their backs. And even among societies that have pack animals, including dogs, the extra energy required by the animals to move heavy objects requires additional nourishment and grazing time. When lighter alternatives, such as baskets, gourds, animal skin pouches or other containers are available, such technologies should be more attractive from an energy standpoint than heavy fired clay ones.

Second, because they are relatively fragile, pots are exposed to high rates of breakage when carried around during residential movements. Although they can be insulated from impact shock by packing them in softer materials, each packing up and unpacking of pots increases the chance of breakage. Accidents, such as dropping during transport, increase the risk of breakage. These risks, however small, make ceramic pots inferior relative to other container technologies for mobile groups. Again, baskets and hides are more resistant to impact shock and should be preferable to pots.

Third, mobile peoples may not stay in one place long enough to see the pottery production cycle through. From the collection of clay, to forming a pot, to drying and firing it, the making of a clay pot can take from several days to several weeks (Arnold 1985). In particular, the crucial step of drying an unfired pot may take several days and may require significant oversight to ensure an even and thorough drying. Mobile people, particularly during certain times of the year, may have to move before they can complete the steps necessary to produce pots.

Fourth, and related to the third issue, is that the most opportune time to produce pots, the dry season, is also the time when many seeds, nuts, berries and greens ripen. Time conflicts between gathering food that is only available during narrow temporal windows and the production of ceramic pots may make the latter too expensive. This is particularly poignant if a significant quantity of plant products must be harvested and stored for later consumption. One way to solve such a time conflict is to divide these tasks by sex, or some other societal division. Yet plant gathering and pottery production are both typically performed by women, even among mobile hunter-gatherers.

Fifth, the small population sizes typically encountered among mobile hunter-gatherers tends to limit the demand for pots. As discussed by Brown (1989), one of the significant advantages of pots over other containers is that there is an economy of scale in the production of the former. As multiple pots can be fired at once, this step can be performed almost as easily for one pot as for a dozen. This is not true of other common containers, such as baskets or sewn skins, where each item must be made individually, and making a dozen takes twelve times as long (and twelve times as much raw material) as making one. In arid landscapes, such as the Great Basin, limited fuel resources makes this factor of particular importance (Bettinger et al. 1994). Fuel needed for cooking and warmth may be in such high demand that the fuel needed to fire only a small number of ceramic vessels may simply be unavailable.

In sum, ceramic technologies do not lend themselves well to a mobile lifestyle. Yet, we know of many archaeological and ethnographic examples of pottery-making in mobile societies (Arnold 1985; Barnard, this volume). Indeed, the origins of ceramic technologies often occurs within such settings (Ikawa-Smith 1973; Reid 1984; Aikens 1995; Close 1995; Hoopes and Barnett 1995; Rice 1999). So why do these mobile groups engage in pottery production? And when they do, how does their mobility affect the way they organize the production and the use of pots? And finally, how do they resolve the conflicts and problems listed above? These issues have not been extensively investigated by archaeologists. Simms et al. (1997; see also Bright and Ugan 1999) have explored some of these questions in the Eastern Great Basin and Braun (1983) in the eastern US, but there are few published accounts on this topic. This chapter builds on their work, but takes it in a different direction by examining pottery and mobility practices within the Western Great Basin.

Steward (1938) believed residential mobility to be inversely correlated with population density, which itself was correlated to precipitation and bioproductivity. Residential mobility was necessary to exploit spatially variable and low density food resources. People followed the distribution and availability of ripening plant foods, especially piñon nuts and small seeds. Table 1 gives the estimated population density (persons/square mile),

precipitation (cm/year), level and density of pottery for six regions representing a range of different populations within the Western Great Basin, though all are hunter-gatherers practicing some degree of residential mobility. The table ranks residential mobility and the degree of engagement in pottery. It is evident that the degree of residential mobility did not have a predictable or consistent effect on the amount or density of pottery in a region. This suggests that mobility did not affect the degree of reliance on pots in the material culture (Eerkens 2003a).

Table 14.1: Population levels, average precipitation and estimated degree of residential stability.

Region	Population density	Annual rainfall	Mobility rank	Sherds/acre	Sherds/projectile points	Pottery rank
Western Sierra	0.5	57.7	1	N/A	11.9	3
Northern Owens	2.1	16.0	2	0.02	5.2	6
Southern Owens	2.1	14.5	3	0.14	33.9	1
Deep Springs	10.7	15.4	4	0.06	7.9	4
Death Valley	30.0	5.3	5	0.09	17.7	2
Northern Mojave	> 30	11.9	6	0.05	7.7	5

Note: The population density is given in persons/square mile (Delacorte 1990; Eerkens 2003a), the annual rainfall is in cm/year.

Although there is variability, vessels from the Western Great Basin are generally medium-sized (18-22 cm high and 18-25 cm wide at the mouth) and undecorated. In most areas, less than 10% of the rim sherds have fingernail impressed decoration around the rim (Eerkens 2001). Painting, slipping and burnishing are not evident. Straight-sided and direct-rimmed conical boiling pots are the most common vessel type, though more spherical bowls with recurved rims are also present, particularly in the eastern part of the Western Great Basin (Bettinger 1986; Lyneis 1988; Pippin 1986; Prince 1986; Touhy 1990). Vessels were constructed mainly by stacking coils of clay onto a circular disk base, welding the coils together by scraping with the fingers, a bundle of sticks or a small object. Sand or crushed rock temper is usually present and was probably part of the local clay matrix. Organic temper is occasionally present in the form of grass blades and other vegetable matter. Vessels were fired at relatively low temperatures (around 600°C) and appear brown-red in color, giving rise to the general category of 'brownwares'. Figure 2 shows a nearly complete pot from Owens Valley, typical for the size and shape of the region. Holes near the rim of the pot were drilled on either side of a crack. Cordage would have been looped through the holes to hold the pot together to extend its use-life.



Figure 2: Whole cooking pot from Owens Valley, California, with repair holes near the rim.

Pottery-making is clearly a late technology in the Western Great Basin. Dating of ceramics has not been actively pursued in most regions, but it is clear that they are consistently associated with other artifacts that date to the latest period in prehistory, after 700 BP (Feathers and Rhode 1998; Pippin 1986; Rhode 1994). In Owens Valley, people seem to have been experimenting with ceramic technologies around 1200 years ago (Eerkens et al. 1999), yet the craft does not become commonplace until 500-700 years ago (Delacorte 1999). Pots seem to have been used mainly for boiling seeds and other vegetable products and only rarely were used to process meat (Eerkens 2005). Pots were rarely carried outside their region of manufacture, further than 80 km, and production was organized at a small-scale or family level (Eerkens et al. 2002).

Resolving Conflicts

The presence of pottery among the mobile hunter-gatherers of the Western Great Basin is particularly interesting in light of the problems and conflicts mentioned above. Basketry technologies were highly developed in this region, such that they could perform virtually all the tasks that pots could. Baskets were woven so tightly they could hold water, they were durable and strong enough that they could be used to boil foods and they were long-lasting enough that they were used to store and serve foods. All these activities could be performed at a fraction of the weight of ceramic pots and with much greater resistance to impact stress. Baskets, then, would seem ideally suited to a mobile lifestyle. This begs the question, why did these people ever get into the business of making pots? Similarly, how did they modify pottery technologies to suit their lifestyle and how did the use of pottery modify their lifestyle? I address these issues by examining how the Paiute, Shoshone and Mojave Desert people of the study area resolved the five problems listed above.

One solution to the heaviness and fragility of pots is simply not to move them at all. Caching pots may have been a way to avoid carrying pots during the seasonal round (Eerkens 2003a). In the Western Great Basin, two pieces of information suggest caching was an important strategy to deal with these problems. First, though uncommon, cached pots from rock shelters and caves have occasionally been recorded and described by archaeologists (Campbell 1931; Wallace 1965; King 1976; Bayman et al. 1996). The

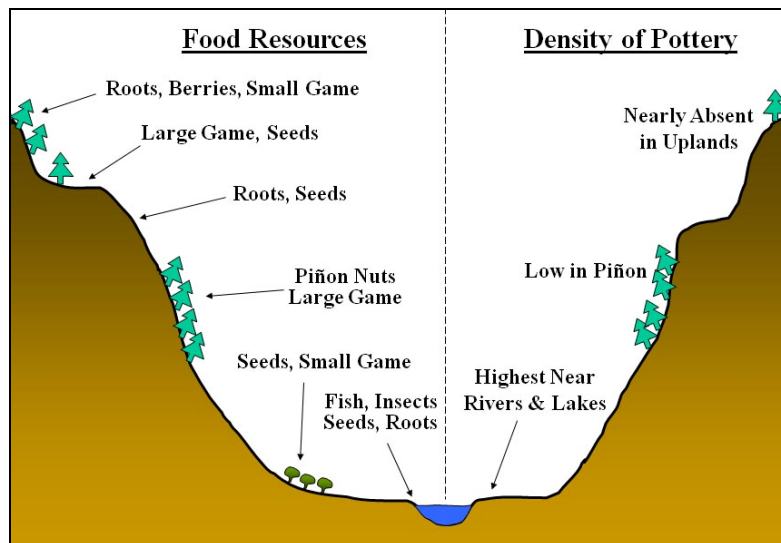


Figure 14. 3: Distribution of pottery in Owens Valley (food data from Bettinger 1975).



Figure 14.4: The Owens River near Big Pine.

discovery, in March 2002, of a nearly complete pot stowed away in a narrow rock crevice near Little Lake, just south of Owens Valley, is a clear example of a cached pot (Eerkens n.d.). All these caches are in lowland locations. Second, the distribution of pot sherds across the landscape is clearly uneven, heavily skewed towards valley bottom and wetland locations, as shown in figure 3 (Eerkens 2003a). Figures 4 through 7 depict some of these different environments in and to the east of Owens Valley, California, all within several kilometers of one another. Note the dramatic changes in both the density and makeup of vegetation communities in these different environments.

Alfred Kroeber (1922) recognized this pattern but did not attach any particular meaning to it. Subsequent archaeological investigations have supported his impressions. Surveys in many valleys in the Central and Western Great Basin demonstrate that the frequency of pottery is significantly higher in riverine and lakeside locations on the valley bottom (Hunt 1960; Thomas 1971; 1983; Bettinger 1975; Wallace 1986; Weaver 1986; Delacorte 1990; Plew and Bennick 1990; Gilreath and Hildebrandt 1997; Hildebrandt and Ruby 1999). Table 2 shows the results from five regions with comparable survey strategies and coverage. Between 63% to 100% of the pot sherds are located near the valley bottom, even when adjusted for the total number of artifacts found or the area surveyed (Thomas 1971; Bettinger 1975; Delacorte 1990; Gilreath and Hildebrandt 1997; Hildebrandt and Ruby 1999). Despite the fact that archaeological sites from the ceramic period are present in all parts of the landscape,



Figure 14.5: The Owens Valley desert shrub landscape.



Figure 14.6: The Piñon-Juniper landscape of the White Mountains (courtesy of the Far Western Anthropological Research Group).



Figure 14.7: The high altitude alpine desert landscape of the White Mountains.

from valley bottom to alpine zones, pottery is differentially distributed within the former. This suggests that these were locations where people broke, and presumably used, the majority of their pots and furthermore that pots were not often carried to other parts of the landscape. Besides the fact that they have all the resources necessary to make pots (clay, sand, water and firewood), a major advantage of the valley bottom is that this is a predictable source of water. As a result, the food resources in these locations are spatially and temporally predictable, particularly when compared with other Great Basin resources such as piñon nuts and dryland seeds (Thomas 1972). Thus, caching only works in areas that have relatively stable and predictable food resources.

Although caching pots would have solved the heaviness and fragility conflicts, it would have had major repercussions for the lifestyles of people doing so. In particular, since they could not have cached a pot at every spot on the landscape, caching would have tethered people to particular points on the landscape, where they had left pots. This results in higher rates of site re-occupation, also referred to as 'occupational redundancy' or 'persistent places' in the literature (Eerkens 2003a). Such tethering may have promoted reliance on foods associated with these locations and may have encouraged the notion of land ownership and territoriality. At the same time, it is also likely that caching behavior would have prompted people to modify pottery technologies to make their products more suitable for storage during the off-season. Thicker and stronger pots may have been the byproduct of this behavior.

Table 14.2: Distribution of pottery by environmental zone (adjusted by area surveyed).

	Valley bottom	Piñon/ juniper	Above piñon	Reference
Northern Owens	86%	12%	4%	Bettinger 1975
Deep Springs	64%	36%	0%	Delacorte 1990
Northern Mojave	63%	37%	N/A	Gilreath and Hildebrandt 1997; Hildebrandt & Ruby 1999
Reese River	100%	0%	0%	Thomas 1971
Monitor Valley	76%	15%	9%	Thomas 1983

The third conflict, the need to be in one place long enough to see the production cycle through, may have been solved by remaining in certain spots on the landscape for longer periods of time or more frequently. Combined with the reasoning above, spending more time at these locations may have led to a positive feedback cycle with the tethering and caching behavior. In particular, spending longer periods of time in places where pots were made and cached may have promoted an increased reliance on the resources available in those areas. If pots had to be constructed for use, and were not already available as cached items, people may have needed to arrive several days or weeks ahead of the availability of such resources to prepare for such activities. Time spent making pots while seed resources were ripe would have subtracted from time that could be devoted to gathering. It is possible that women traveled to valley bottom seed patches several months prior to, or after, the availability of seeds, constructed pots there and cached them for future use. This would have also solved the fourth conflict, namely time conflicts in the dry season between seed gathering and pot production.

All these factors would have forced individuals to alter the way that they made pottery by limiting the amount of time devoted to production. A minimum of time investment is consistent with the ceramic technology seen in the Western Great Basin. The minor amount of decoration, the lack of extensive surface finishing (burnishing, polishing, slipping) and the minimum attention given to symmetry and evenness (rims are often undulating and walls often have a variable thickness) all indicate that pots were hastily made. The use of sand and crushed rock as temper, most likely native to the matrix from which the clay was collected (Schaeffer 2003), also indicates little investment in production activities. Moreover, if pots were constructed in the rainy season, there would have been a need for quick-drying pots, to minimize the chances of getting wet again while drying.

Several methods exist to reduce the time required to dry a pot prior to firing, including addition of fiber temper, roughening the exterior or thinning the pot (Schiffer et al. 1994; Skibo et al. 1989). All these factors are evident

in areas where people were more mobile. Although fiber temper is not dominant in pots from the Western Great Basin, it is present in most sherds in small amounts, again supporting the notion that these pots were constructed to minimize time investment. These findings are consistent with those of Simms et al. (1997) who suggest that mobile foragers invested less in their ceramic pots than sedentary agriculturalists in the Eastern Great Basin. At the same time, there are indications that within the mobile hunter-gatherer groups, that greater residential mobility may have fostered greater investment in ceramic technologies, likely due to the greater demands that residential mobility places on the material technology (Eerkens 2003a, 2003b). Pots in regions where people were more mobile are smaller in diameter, thinner, more often roughened on their exterior surface, contain finer temper and are less diverse in size and shape. Although other factors can contribute to these attributes, such as the intended vessel function, the nature and availability of clays and different learning traditions, there are good reasons to believe mobility would have an effect on these attributes (Simms et al. 1997). Finally, as Brown (1989) has argued, one of the main advantages of pottery technologies is the economy of scale in production. Pottery is a particularly advantageous technology when large numbers of containers are needed. Unfortunately, mobile societies usually maintain low population densities that do not allow them to take advantage of this attribute of pottery.

All indications from ethnographic and archaeological data confirm that the Western Great Basin was home to low population densities. Although population density certainly varied across the region (Steward 1938), it is clear that areas with higher population did not necessarily produce more pots. Some of the highest densities of pottery in the study area occur in areas where people were quite mobile and some of the lowest densities occur in areas with semi-sedentism (Eerkens 2003a). Nor does it appear that pottery production was organized at a higher region-wide level by a few specialists, who provided pots to a large area to take advantage of the economy of scale. Pots in the Western Great Basin seem to have been produced on a small scale at a local family or village level (Eerkens et al. 2002).

Low-temperature firing, to conserve fuel, and extensive efforts to increase the use-life of pots, for example by repairing cracks (figure 2), may have been responses to the expenses involved in pottery production. These strategies may have been employed to make the costs of production versus artifact use-life for pots more equal to that of baskets. Once people were investing in the production of pots, it is likely that pots were put to an increasing range of uses. Analysis of the pot sherds from the region suggests an increase in shape and size diversity over time. As people became familiar with the technology, they altered the design to increase heating efficiency and minimize the amount of raw materials needed by making pots thinner (Eerkens 2003b). Once the technology was incorporated into the lives of

prehistoric people in the Western Great Basin, it gradually encouraged other changes in day to day activities.

Discussion

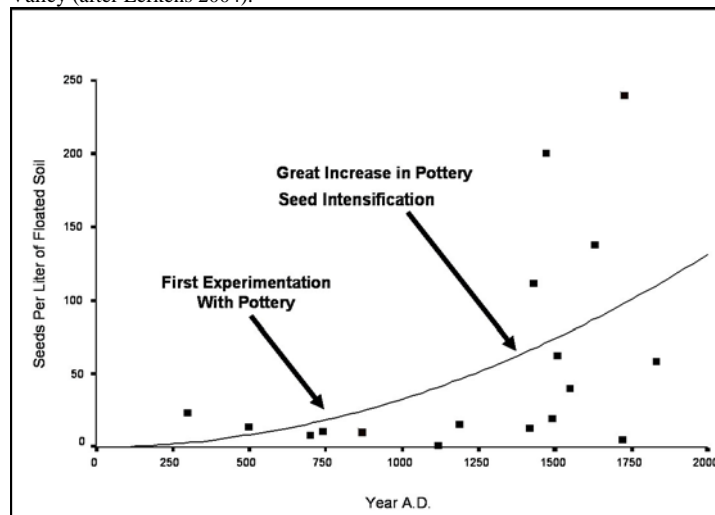
There are many hurdles for mobile peoples to clear before they can incorporate pottery technologies within their material culture. Overall, these hurdles may account for the general relationship between pottery-use and mobility strategies seen worldwide. More specifically, most fully sedentary and semi-sedentary societies use pots (91% and 75% respectively), but less than a third of mobile nomadic people engage in this activity (Arnold 1985). Yet, in some instances mobile groups are able to resolve these issues to make the technology work for them. The Western Great Basin was one of these areas.

Rather than disregard ceramic technologies altogether, late prehistoric societies of the Western Great Basin were extremely inventive and designed ways around the problems that typically beset mobile societies. They actively manipulated aspects of the form, function, use and production of their pots to fit this technology within their mobile lifestyles, that is, to suit their specific needs. At the same time, it also appears that the use of pots had effects on the lifestyles of these people. It probably tethered people to particular tracts of land, promoted an increased reliance on the resources available in these areas, especially seeds, and may have required much travel and foresight to produce and cache pots ahead of time in patches where high seed yields were anticipated. While tethering may promote decreased mobility or sedentism in the long run (Kelly 1990; 1995), mobile peoples can also be tethered to certain locations by making consistent and repeated use of them (occupational redundancy). Caching and occupational redundancy allowed such groups to take advantage of technologies that are normally reserved for more sedentary groups, including the use of heavy or fragile tools such as ceramic pots. In this respect, caching may be an important strategy for mobile pottery-using hunting and gathering groups. However, the success of caching is highly dependent on the spatial predictability of the resources for which the tools are needed.

There is little patterning in the degree of residential mobility versus the amount of pottery (table 1). This suggests that once people resolved the conflicts associated with pottery production they were free to engage in vessel production to whatever degree was necessary. In other words, once people had figured out how to incorporate pot production and use into their lifestyles (by redesigning shape, temper and texture as well as caching) the degree of residential mobility did not have an influence over how many vessels they made. It did, however, affect how they made pots. A design favoring rapid drying, increased post-firing strength, overall lightness and durability was clearly favored.

The above may explain how it was that mobile people were able to make and use pots. A remaining question, of course, is the matter of why they did. Although beyond the scope of this chapter, I have argued elsewhere that the main reason for this change relates to demands on the time and labor of women (Eerkens 2001; see also Crown and Wills 1995). Prior to the adoption of pottery, stone boiling in baskets was the main method for boiling foods, especially small seeds. Figure 8 shows the density of small seeds recovered from flotation studies from house floors in Owens Valley. Clearly, low numbers of seeds were eaten from the third century CE onward (Eerkens 2004). These were probably boiled in baskets. However, around 1350 CE the density of small seeds greatly increased and seed-boiling must have become a major activity. Stone boiling in baskets is an inefficient method as it demands constant attention from women to replace cooled stones with heated ones and to avoid burning holes in the bottom of the basket. Pots may have provided a more efficient boiling container than baskets because they can be set over the fire with little further attention. As a result, greater numbers of seeds could be processed at once.

Figure 14.8: Density over time of the concentration of small seeds found on house floors in Owens Valley (after Eerkens 2004).



In conclusion, the restrictions on technology imposed by a residentially mobile lifestyle may force mobile groups to modify technologies in predictable ways. For example, we may expect to see more standardization in certain attributes, especially size, shape and weight. A mobile lifestyle may not allow for a range of shapes to be made and used, and experimentation with new designs may not be possible, particularly in more

marginal environments where the costs of failure are high. Similarly, we may expect to see a low amount of time invested in these technologies (Simms et al. 1997; Bright and Ugan 1999). Only after people become more sedentary, and crafts becomes established, will we see elaboration in shapes, sizes and styles as the technology is applied to other purposes (Hoopes and Barnett 1995; Simms et al. 1997:783). For items that are cached, we may not see much in the way of decoration or other modifications. While potters may add decoration for their own artistic enjoyment, such effort may not be worth the time if the goal is to transmit social information (such as status or faction membership) when it would be out of view most of the year. It is important to stress that these are expectations only and not blind rules to be applied to the archaeological record. As with all archaeological interpretation, the design, standardization and distribution of material artifacts should help our reconstructions of mobility but, if at all possible, they should represent just one window on this aspect of prehistoric ways of life.

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