DOWN BY THE RIVER: THE CHANGING ECONOMIC ROLE OF RIVERINE RESOURCES IN OWENS VALLEY

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The Owens River has always been an important part of the economy of Owens Valley. Shifts in use of this environment extend back to the early Holocene. This paper takes an in-depth look at some of the more notable resources, exploring changes in use from an economic standpoint. It offers explanations as to why some of the more dramatic changes took place, and the regional effects they may have had on hunter-gatherer behavior.

There is little doubt that the Owens River has always played an important role in the economy of Owens Valley. Recent survey work along the river, within the valley proper, has identified use of the environment going back to the early Holocene, recording several shifts in riverine land use throughout the Holocene (Larson 2009). This paper, however, focuses on two of the major shifts: one occurring approximately 550 B.C. (2500 B.P.), or just before the late Newberry period, and the other at roughly A.D. 1250 (700 B.P.), just prior to the Marana period. These changes in riverine use were associated with valley-wide adaptive shifts that affected the subsistence-settlement systems throughout the region. This paper discusses these changes in riverine use economically, by looking at them in terms of optimal foraging theory, lending some insight into how or why these changes came about.

The Owens River begins at the northwest edge of Long Valley Caldera at Big Springs, flowing southeast across the Caldera, then descends through Owens River Gorge and into Owens Valley north of Bishop. The oxbowed river bisects Owens Valley from north to south, down to Owens Lake, where it once emptied. Within the Owens Valley proper, the elevation of the slow-moving river drops only about 5.5 ft. per mile, from an elevation of 4,300 ft. in the north to 3,600 ft. in the south (Miller 1978). However, the riparian zone is not homogenous along its length, with more woody perennials in the north and larger, still marshy areas in the south. The river is fed by some springs, but mainly by the extensive runoff of the Sierra Nevada mountains, making it a very productive environment that supports a variety of plants and animals. Early explorers and settlers described a wide, flowing river and extensive wetlands with lush vegetation communities (Chalfant 1933; Simpson 1983; Wilke and Lawton 1976). In modern times, the river has become narrow and slow-moving, and the marshes small and sparse, resulting from most of the water being diverted into the Los Angeles Aqueduct since 1913 to supply the city of Los Angeles with drinking water. In fact, the river is totally diverted into the aqueduct at some locations, leaving stretches of dry riverbed. The differences in vegetation along the corridor today can be traced to the aqueduct and the pumping of ground water from the valley (Brothers 1984).

Prehistorically, the river supported numerous resources that were important to the economy of local inhabitants. Common exploited resources that occur within the riverine environment include seeds, roots, greens, fish, large game (mainly deer and antelope), small game (such as rabbits and rodents), freshwater mussel, and waterfowl. Of these, only fish and many of the plants occur in any significant numbers within this environment. Arguably, the most economically important resources within the riparian zone included many of the seeds, roots, fish, and perhaps the waterfowl, all of which were procured between the spring and fall months. Of particular importance were species of plants such as *Typha*, *Scirpus*, *Carex*, and *Juncas* for their seeds, roots, and stalks.

As stated earlier, work along the Owens River has identified shifts in land-use patterns that date back to the early and middle Holocene. Two of these shifts, in particular, highlight dramatic changes in subsistence-settlement patterns that took place valley-wide. Figure 1 is used as a proxy for changes in

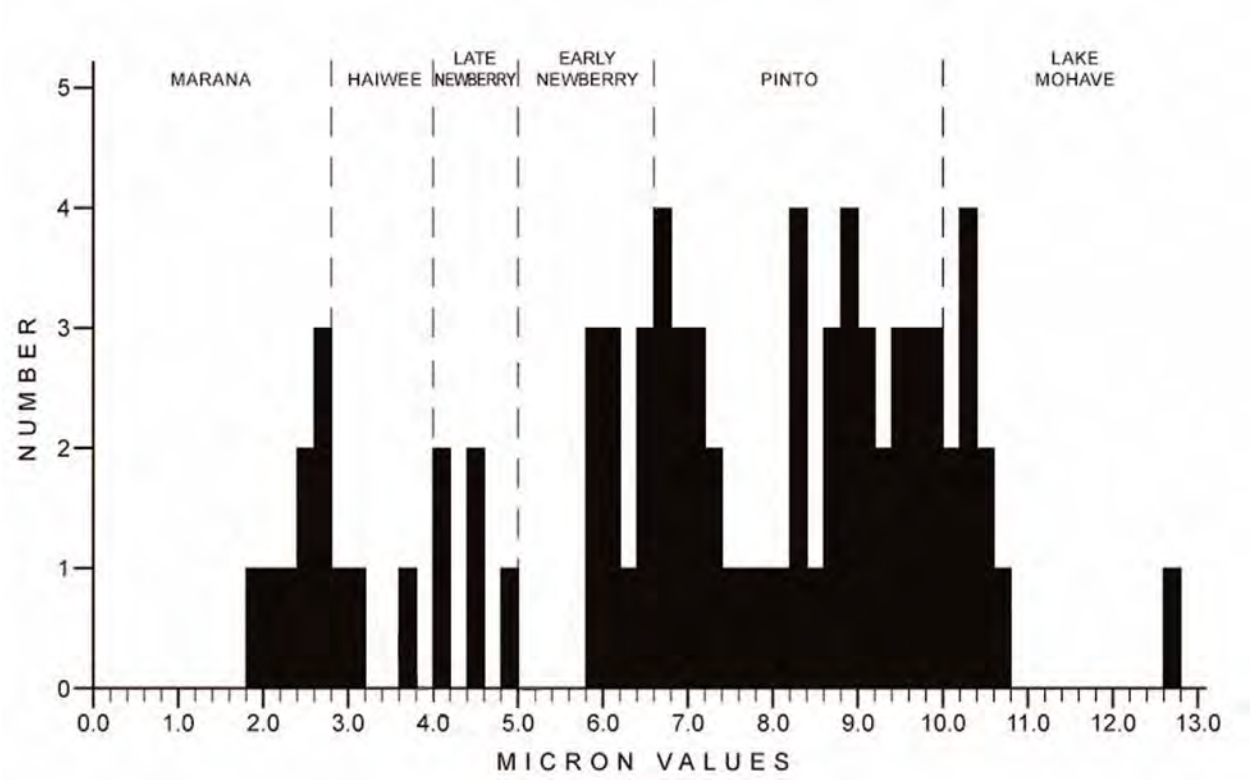

Figure 1. Hydration results from Fish Springs debitage. (Figure by B. Wall)

riverine use. It shows hydration of Fish Springs obsidian collected during the survey at different areas along the river and best highlights when these changes occurred. The figure indicates a large pulse of activity within this environment starting just before the Pinto period and lasting through much of the early Newberry period, roughly from 6050 B.C. to 550 B.C. (8000-2500 B.P.), with only minor fluctuations during this time. This was followed by a long period of inactivity within this environment. Throughout the late Newberry and lasting through the early Haiwee periods, roughly from 550 B.C. to A.D. 1250 (2500-700 B.P.), use of the Owens River appears to have been sporadic and random. This lasted until the end of the Haiwee and beginning of the Marana period (around A.D. 1250), when the last major shift began to take place and the river was again being occupied on a regular basis, with riverine resources targeted intensively.

Simple Optimal Foraging theory and models can be used to help explain these shifts in resource use. For this paper, Bettinger and Baumhoff's (1982) "traveler/processor" or the "time minimizer/energy maximizer" model is referenced, which assumes that prehistoric foragers chose the foods which provided the best returns on their efforts. Simply put, by using aspects of diet breadth and patch choice, the model consists of two foraging strategies on opposite ends of a continuum. On the one end "travelers" or "time minimizers" sought the highest immediate returns from resources, to minimize the time it took to meet basic dietary needs and in return allow excess time for other activities. "Travelers" possessed a narrow diet breadth and tended to exploit resources with high return rates, high search costs, but low handling costs. This strategy required people to be more mobile so they could seek out the most productive resource patches and, in turn, generally maintain low population densities.

On the other end of the continuum, "processors" or "energy maximizers" essentially attempted to maximize the amount of energy available within the environment, with little concern for the amount of time involved in procuring and/or processing. They possessed a wide diet breadth that includes resources with low return rates, high handling costs, but low search costs. Because of this, processors tended to be

more sedentary, but could have regularized settlement patterns, revisiting the same locations year after year, or central places from which they foraged with movements dictated by seasonal availability of certain plants that could be intensively exploited. This also generally allowed them to maintain higher population densities than travelers.

Within Owens Valley, use of the riverine environment began with early people who traveled through the valley camping/living along the river, taking advantage of the abundant plant and animal resources. They did not remain in one place long, and with low populations, competition for resources was low. The economy was good, and people could afford to be more selective in their food choices. Although overall diet breadth was narrower than later peoples', day-to-day meals were likely more varied and nutritious. These people were "travelers" on the far end of the "traveler/processor" continuum, who took advantage of the rich riverine environment. They were essentially "time minimizers," seeking the highest immediate returns while foraging along the river.

Archaeologically, along the river this is seen in the surface record as small, ephemeral flaked stone-dominated sites, some with small amounts of ground stone as well. There is usually a wide variety of toolstone material being used, including all regional obsidian sources. The sites appear to be small camps that occur along the river. Often these assemblages are hard to tease out because most are overprinted by later occupations.

The faunal record from the Alabama Gates project in southern Owens Valley documented that one of the earliest uses of this environment was for the seasonal procurement of large fish (Delacorte 1999).

By the late Newberry, diet breadth had expanded to include more dryland resources such as large seeds (like chenopods) and, to some extent, pinyon. The expansion of diet breadth was likely a response to increased population or the need to procure more storable foods to help get through harsh winter months, or a combination of factors. Some of these dryland resources were "back-loaded" or required more processing time to extract the available energy. In other words, people were beginning to maximize the available energy within their immediate environment. They began to move off the river, into desert scrub settings, to be more centrally located to exploit some of these economically important resources, many of which could be stored to help people get through the winters. Although pinyon was being exploited, it was not the staple resource we see later in time. People remained mobile; however, duration of residential stays increased, and certain locations were seasonally occupied year after year. By all accounts, movement through the valley was not restricted, and people maintained a seasonal round that trended north/south, making forays to the east and west to access the best patches available for targeted resources. Acquisition and processing of some of these dryland resources likely caused scheduling conflicts with some of the riverine resources, like large fish, which in turn resulted in decreased use of the environment. People were shifting from "traveler-like" to more "processor-like" behavior, with longer duration of habitation that was centrally placed in order to more intensively exploit resource patches to maximize available energy, even if the resources were more time-consuming to process.

Use of the riverine environment remained sparse throughout the late Newberry and early Haiwee periods, with people likely meeting most wetland resource needs from large drainages or creeks coming out of the Sierras and extensive marshes created by springs and runoff, as well as Owens Lake and other lacustrine environments. Without mobility restrictions, seasonal movements remained more fluid up and down the valley and beyond, with premium resource patches available for people to exploit, including wetland patches not associated with the river.

Archaeologically, this period is hard to see along the river, with few artifacts being left behind. It is mainly represented by isolated projectile points and small lithic scatters. Sites from this period are more common in desert scrub and other environmental settings. The Alabama Gates project, however, did record well-built houses from late Newberry contexts. These houses appeared to be seasonally inhabited, with the occupants not as focused on the riverine resources as earlier people at the same sites (Delacorte 1999). In other words, some people may have technically inhabited the riverine environment, but they did

not retain a riverine resource focus. Other late Newberry houses at CA-INY-30 in southern Owens Valley and INY-1384/H in the north are within close proximity to the river, though there does not seem to have been much riverine focus during this period as well. However, there do appear to be seasonal bases located near other sources of water, and lithic material profiles suggest large movements to the north and south (Basgall and Delacorte 2012**;** Basgall and McGuire 1988).

The next big shift in use of the riverine environment occurred around the end of the Haiwee or beginning of the Marana period. There were larger populations in the valley at this time, creating more competition for resources. The diet breadth had increased to include many low-ranked resources (especially small seeds), and pinyon had essentially become a staple resource. Food storage had become a priority or necessity, and this, along with the acquisition of bow and arrow technology, had drastically changed the economics within the valley. Hunting could be done more individually, food could be stored, and people were more dependent economically on the household and less on the group for their daily needs.

Scheduling conflicts changed, with a wider diet breadth and intensified foraging methods allowing people to begin exploiting the river again in a big way. Use, however, was more specialized; the people did not live in the riverine environment, but intensively exploited many of the resources, such as small seeds, possibly the smaller game, and, to some extent, mussels. By all accounts, people were still moving around the landscape seasonally, but were more tethered to certain resource patches, such as pinyon, as evidenced by the appearance of pinyon camps. Movements, however, especially to the north and south, were more restricted (likely from population pressure), probably limiting access to some of the more productive patches. This in turn caused people to intensify their use of the available resources, especially along the river, as their seasonal movements start trending more east/west. They were further along on the "traveler/processor" continuum, toward the opposite end, practicing more "processor-like" or "energy-maximizing" behavior.

This is seen in the archaeological record along the river in the form of large seed processing sites, especially in areas with higher dunes that would have overlooked the flood plains. The sites consist of large amounts of ground stone (especially milling slabs), flaked stone (usually debitage and simple flake tools), mussel shell, and pottery in the south. Lithic toolstone material is not as diverse, with usually only the most local obsidian sources represented, and, in some cases, Last Chance Chert from the east. Many of these late sites along the river appear to be processing stations for small wetland seeds, with other activities taking place more ephemerally. Most of the habitation sites from this time period are located farther from the river, in other environmental settings, such as the desert scrub.

In conclusion, changes in use of the Owens riverine environment can be effectively described in terms of the "traveler/processor" model, with early inhabitants practicing "time-minimizing" strategies as they foraged along the river (Figure 2). During the late Newberry, as needs changed, people moved away from the river to be more centrally located to dryland resources. With continuing access to other wetland environments, coupled with scheduling conflicts over the use of resources like large fish, the river ceased to be a primary economic focus. Finally, the late inhabitants of the valley, being tethered to certain resource patches and having more restricted mobility, intensified on many lower-ranked resources, including several from the riverine environment. They were maximizing the available energy within their immediate environment. Whatever the catalyst, be it environmental conditions, population pressure, social issues, or a combination of different things, by the late period the river and its resources had again become an integral part of the subsistence economy within the Owens Valley.

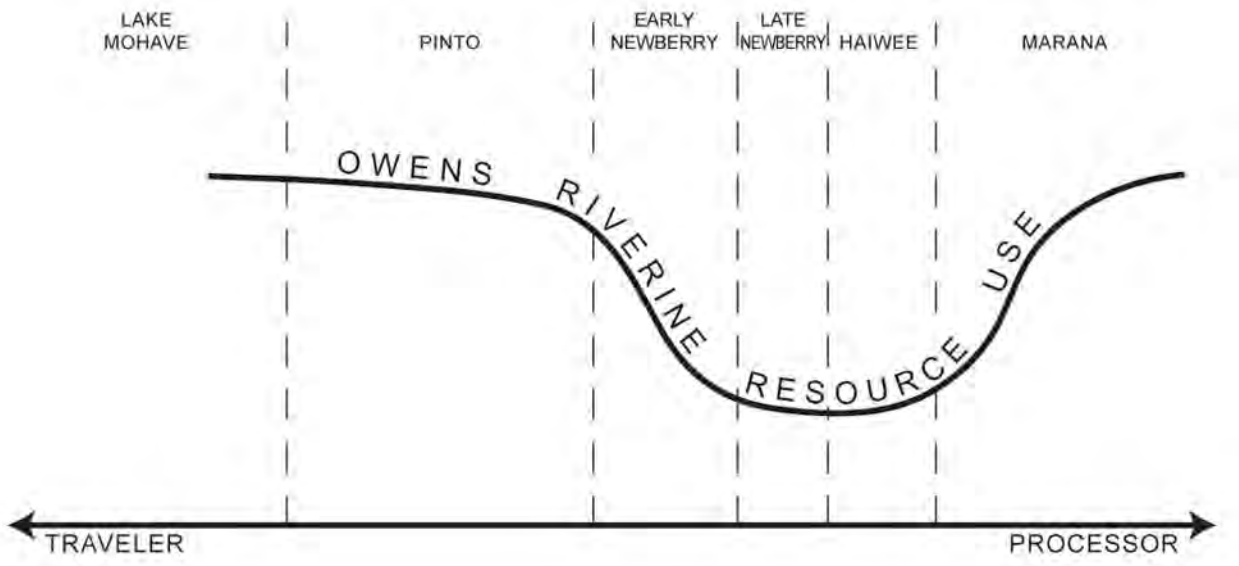

Figure 2. Riverine resource use and subsistence-settlement strategy. (Figure by B. Wall)

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