Prehistoric Food Intensification in the Santa Clara Valley

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The Santa Clara Valley archaeobotanical record spans the central California Early, Middle, and Late periods. Sites CA-SCL-12, -478, -674, and -919 have robust assemblages of plant remains from distinct periods which are used here to evaluate alternative models of plant use in interior and bayshore settings. The interior model is a better fit for the Santa Clara Valley, even for the near-shore site SCL-12. The existence in the South Bay of poorer and more difficult to access aquatic faunal resources appears to explain the greater focus on plant foods there than in the East and North Bay.

More than 1,000 flotation samples comprise the current archaeobotanical data on dietary plant remains around San Francisco Bay. By examining dietary plant remains recovered from 111 samples from sites CA-SCL-12, -478, -674, and -919, remains that span a period of 3,000 years, trends in dietary plant use can be predicted in the Santa Clara Valley. With an NISP of more than 22,000, there is sufficient data to confidently compare changes in dietary plant use in the Santa Clara sites with trends in sites found along San Francisco Bay.

Bayshore and Interior Models

Recent archaeobotanical research in central California has highlighted two divergent models of the evolution of plant use that can be tested against the trajectory of use of dietary plants in the Santa Clara Valley, immediately south of San Francisco Bay. The temporal scheme utilized here is the updated version of Scheme D of the Central California Taxonomic System, following Groza (2002), Milliken and Schwitalla (2009), and Groza et al. (2011). Temporal periods are divided into Early (5,000 – 2,450 years before present), Early/Middle Transition and Middle (with a combined range of 2,450 – 930 B.P.), and the Middle/Late Transition and Late Prehistoric (930 – 180 B.P.).

In the interior reaches of the greater San Francisco Bay area, the southern North Coast Ranges, and the Sacramento Valley, early period sites exhibit generalized plant use characterized by a relatively balanced use of plants, notably nuts and berries, with a lesser use of small seeds. Intensification of acorn use is seen in interior Middle Period central California sites, followed by a more intensive use of small seeds of annuals and grasses in the Late Period, in order to maintain denser and more sedentary populations in constricted group territories (Wohlgemuth 1996, 2004). Alternatively, shell mounds along the north and east shoreline of San Francisco Bay show a similar generalized use of plants during the Early Period, but with the advent of intensive shellfish use around 2,800 cal B.P., the amount of plant-food debris found drops dramatically, suggesting a decreased use of plants. Although shellfish data have not been compiled to show the advent of intensive shellfish collection in the North and East Bay regions, there is good evidence of this in two key localities. CA-MRN-67 has a broad stratigraphic change from the Stratum II “Bone Midden” with minimal shell to the Stratum III “Shell Midden.” The second example is found at Emeryville, with the change at 2,800 B.P. marking the beginning of occupation of CA-ALA-309, the largest shell midden in the San Francisco Bay Area (Wohlgemuth 2014). In the North Bay and in some areas of the East Bay, plant use rebounded in the last 1,000 years, with marked increases in acorn debris, while plant foods remained relatively unimportant in other East Bay localities, notably at the
also included foothill communities, provide additional data for the Middle Period (Wohlgemuth 2007). Late Period site SCL-919 is located 10 kilometers from the shoreline and has a habitat similar to SCL-478, with marsh land, wet meadows, oak woodland, willow groves, and riparian areas (Kajjankoski 2013). While there are minor differences in habitat between the four sites (Fig. 1), all of them had access to productive oak stands and open grasslands or meadows. Habitat differences between sites therefore seem unimportant, although SCL-674, the farthest inland site, had more small seeds from drier settings than the other sites.

**DATA SET AND ANALYTICAL APPROACH**

The sites used for comparative analysis date from 3,300–2,400 cal B.P. for the Early Period, a range of 2,500 to 1,050 cal B.P. for the Middle Period, and 440–380 cal B.P. for the Late Period site (Fig. 2). Some 33 samples totaling 329 liters of sediment were analyzed from the Early Period component of SCL-12, a combined total of 56 samples and 262.3 liters of sediment from the Middle Period sites, and 30 samples comprising 155 liters of sediment from the Late Period, providing sufficient data sets to evaluate chronological changes in plant resource use in the pre-contact Santa Clara Valley (Table 1).

Acorn intensification has been quantitatively measured by increases in the proportion of acorn nutshell versus total dietary nutshell, and by the ratio of acorn nutshell (by weight) to the total density of small seeds identified to genus, all expressed as densities per liter of sediment. Prior research in central California shows that assemblages of plant remains in Early Period sites contain a broad spectrum of seeds and nutshell, with a relatively low proportion of acorn in the dietary nutshell and low acorn:small seed ratios, whereas Middle Period sites display an increase in the relative abundance of acorn compared to other nutshell and in the acorn:small seed ratio. Late Period interior sites show continued high acorn proportions but a substantial drop in the acorn:small seed ratio, signaling an intensified use of small seeds as well as a heavy reliance on acorns (Wohlgemuth 1996, 2004).

**SANTA CLARA VALLEY ARCHAEOBOTANICAL DATA**

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that show a focus on terrestrial plant foods by people living in the Santa Clara Valley that is unparalleled in central California. Isotopic data collected from the South Bay reflect a diet of plant foods with trophic levels similar to those of herbivorous animals, which contrasts with the high marine-based diet that is suggested by isotopic studies from the North and East Bay (Bartelnik 2014; Bartelnik and Beasley 2016). More research is needed to not only validate the archaeobotanical patterns found to date, but also to integrate macrofossil data with other subsistence data and non-subistence information to account for the distinctive patterns in the South Bay.

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DISCUSSION

Archaeobotanical data from a 3,300-year sequence in the Santa Clara Valley show that the interior pattern of a stepwise intensification of acorns followed by small seeds fits far better than the model of Middle Period plant de-emphasis from the North and East Bay shoreline. The interior model of changes in plant use and intensification is reflected in the Santa Clara sites and archaeobotanical data, starting from the Early Period more generalized diet of seeds and nutshell to the Middle Period sites with a significantly increased use of acorns with respect to both small seeds and other dietary nutshell. The Late Period site shows low-ranked small seed intensification. This is not surprising given the interior location of most sites sampled and the poorer marine habitat of the South Bay. But even at near-shore site SCL-12, the Early to Middle Period shift matches the sequence of interior central California. The SCL-12 Middle Period component parallels the interior Middle Period sites of SCL-478 and -674, with no evidence of the plant use decline seen at CAMRN-67 and Emeryville.

The reliance on plants throughout the sequence is consistent with findings from human bone isotopic studies.

Early Period in the Santa Clara Valley sites Islay [Pinus tścioloala], buckeye [Aesculus californica], Grey pine [Pinus sabiniana], and bay [Umbellularia californica] were relatively common among dietary nuts recovered from SCL-12 Early Period samples, and all are located in distant patches 5 to 15 kilometers to the west. The assemblage of the Middle Period component of SCL-12, however, yielded only local acorn debris, probably reflecting decreased group territory size and loss of access to foothill habitats. An identical pattern of extensive use of distant nuts at Early Period CA-AALA-312, followed by a Middle Period retraction at adjacent CA-AALA-309 to more proximate acorn, is also found in Emeryville (Wohlgemuth 2013).

The shift in focus to acorns in the Middle Period component at SCL-12 is also consistent with the acorn intensification seen in interior central California sites. A high acorn proportion is found at Middle Period SCL-478 and SCL-674. As SCL-478 samples were sorted only to the 10-millimeter grade for nutshell, while other sites were systematically sorted to the 0.7-millimeter grade, acorn proportion is surely underestimated at SCL-478. This is because the only other identified nutshell at SCL-478 is bay nut, which is more durable and is found less in the 0.7-millimeter grade than more friable acorn nutshell. The percentage of acorns to other dietary nutshell for Late Period SCL-919 is similar to those of the Middle Period sites, showing the relative lack of nut diversity and the clear reliance on acorns.

The Early component of SCL-12 has a very low acorn:small seeds ratio of 0.38 compared to its Middle Period counterpart, where it increases dramatically to 6.7, showing a Middle Period increase in acorn use with a significantly increased use of acorns with respect to both small seeds and other dietary nutshell. The Late Period site shows low-ranked small seed intensification. This is not surprising given the interior location of most sites sampled and the poorer marine habitat of the South Bay. But even at near-shore site SCL-12, the Early to Middle Period shift matches the sequence of interior central California. The SCL-12 Middle Period component parallels the interior Middle Period sites of SCL-478 and -674, with no evidence of the plant use decline seen at CAMRN-67 and Emeryville.

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Early Period in the Santa Clara Valley sites Islay [Pinus tuechfolia], buckeye [Aesculus californica], grey pine [Pinus subiriana], and bay [Umbellularia californica] were relatively common among dietary nuts recovered from SCL-12 Early Period samples, and all are located in distant patches 5 to 15 kilometers to the west. The assemblage of the Middle Period component of SCL-12, however, yielded only local acorn debris, probably reflecting decreased group territory size and loss of access to foothill habitats. An identical pattern of extensive use of distant nuts at Early Period CAALA-312, followed by a Middle Period retraction at adjacent CAALA-309 to more proximate acorns, is also found in Emeryville (Wohlgemuth 2013).

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Changing Palates and Resources: Regional and Diachronic Trends in Plant Use in Prehistoric California

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Despite considerable differences in plant communities across western California, the region's hunter-gatherers often have been viewed as having a broadly similar plant resource orientation. The paper re-assesses this perspective by explicitly examining spatial and temporal variation in plant use west of the Sierra Nevada. In doing so, the study capitalizes on a growing body of paleoethnobotanical data to explore similarities and differences in plant food resource emphasis across six main regions in western California. Discussion emphasizes trends in the relative reliance on exploited resources, focusing on three main plant food groups—seeds, nuts, and geophytes—the 'Sister Trilogy of California.' The results provide an archaeological baseline to explore to what degree observed spatio-temporal patterns in plant use are primarily a function of resource distribution and density, and in what contexts social factors (such as investment in labor, risk assessment, population density, settlement organization, and cultural preference) play a more prominent role.

California has long impressed, fascinated, and challenged scholars interested in characterizing its natural history and indigenous lifeways. Owing to its sheer size and staggering variation in topography and rainfall, California is not surprisingly characterized by a tremendous range of climatic zones, vegetation communities, and potential food resources. This variation is particularly the case when coastal, inland valley, montane, and desert settings are contrasted. Indeed, one could argue that these varied locations are only considered together because they fall within a single modern political entity—the state of California.

Anthropologists have written extensively on the Native Americans of California, variously highlighting their linguistic diversity; high population densities; their political, social, and ideological traditions; and the distinctiveness of their hunting and gathering lifeways (e.g., Bean and Blackburn 1976; Heizer and Whipple 1925; Kroeber 1925; Powers 1877). Others, particularly in recent years, have tended to emphasize the wide range of resources exploited, noting the importance of roots and small seeds, and the role of intentional burning in promoting resource richness and diversity (e.g., Anderson 2005; Bean and Lawton 1976; Jacknis 2004; Lightfoot and Parrish 2009).

These reconstructions of plant resource orientation provide important insights into Native California, but are drawn almost exclusively from a rich body of ethnographic and ethnohistoric information rather than being built from direct evidence of plant remains in the archaeological record. As a result, they are most applicable to understanding indigenous lifeways at the time of European contact, come with their own set of biases, and are invariably incomplete. Prehistoric hunter-gatherers in California likely would have had a broad range of plant resource strategies at the time of European contact, given strong differences in local settings, settlement patterns, population densities, and social complexity. To understand the origins of particular plant food procurement tactics, and how such strategies