Were Vernal Pools Born of Abandoned Mammoth Wallows?

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Among California's most precious natural resources are the state's vernal pools, seasonally flooded depressions found on ancient Ice Age soils with an impermeable layer such as a hardpan or claypan. The origin of the pools has always been a mystery, but there are several theories that have been offered to explain them. During earlier times, these features in California's Great Central Valley were often referred to (perhaps derisively) as "hogwallows" just as similar features were referred to as "buffalo wallows" on the North American Great Plains. I have added a new theory to the mix. In 2003, I hypothesized an association between vernal pools and ancient Rancholabrean wallows. My reasoning began with an observation at the Mammoth Rocks site in 2001.[2] The site contains an unusual wetland depression which measures about 1/2 ha in size. The depression is encircled by four loci of polished rocks. As unlikely as it may seem, I believe the depression may be a relic wallow left over from the late Pleistocene. If that is the case, then its presence helps explain the rubbing rocks that encircle it.

Contemporary rubbing rocks are typically associated with the bathing and grooming behavior of megafauna. For example, African elephants wallow at waterholes in order to coat themselves in mud, then, as the mud dries, they rub it off against a hard object, often a large boulder. This helps remove extoparasites from the animal's skin. Bison use both dry and wet wallows for a similar purpose. I suspect that Ice Age mammoth and bison had practices similar to their modern-day counterparts. If so, then it seems probable that some of California's vernal pools began as animal wallows. In the case of those that did not, it seems likely that they served as useful waterholes in late spring and early summer, and would have been affected by the very presence of the megafauna (e.g., African elephants are known to enlarge and "improve" waterholes, trample the vegetation around their edges, and create muddy embankments).

California's vernal pools are typically associated with late Pleistocene soils and landforms. While some of the Pleistocene pools have undoubtedly filled in over time, it is likely that many of these depressions have survived through the ages. The use of the vernal pools by megafauna during the late Pleistocene would have maintained many of the pools' depressions until the time of the megafauna's extinction, perhaps as late as 10,000 CALYRBP. The repeated use of the wallows by the megafauna would have prevented the California flora from colonizing the depressions for any length of time. However, upon the demise of the megafauna, and for the past ten millennia, the plants would have been free to move in and colonize the abandoned wallows. It is likely that plant adaptations and ecological dynamics mitigated against the in filling of many of the pools. Thus, is it possible that many of California's vernal pools were born of abandoned wallows at the dawn of the Holocene?

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[1] This is a slightly revised version of a paper written on March 1, 2005.

[2] An earlier revelation came in 1988 as I flew across the Laotian Plain of Jars in Southeast Asia. On the ground below, I could see many thousands of bomb craters delineating the former Ho Chi Minh Trail, which the North

Vietnamese once used to resupply their war efforts in South Vietnam during what the locals call the “American War.” What was striking about the craters was the fact that they were filled with water, just like California’s vernal pools after the winter rains. Over time, plants and animals have adapted to the craters, and they are now a part of the local ecology. Indeed, local farmers often use them for growing fish. If plants can adapt to bomb craters in Southeast Asia, they should have adapted similarly to abandoned wallows in California. The fact that wetland plants have colonized abandoned bedrock mortars and tire ruts in California’s Central Valley, thus making miniature or linear vernal pools of them, seems proof enough that wallows would have been colonized by such plants in earlier times.