Holocene Seawater Incursion of California's Valleys

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Introduction

This paper speaks to three events that supposedly affected the California area when the Pleistocene ended and the Holocene began. The research literature indicates that 15000 years ago sea level along the California coast was lower by 300 feet, placing it just beyond the Farallon Islands 20 miles west of the Golden Gate Bridge. Apparently rising waters due to glacial melting reached the Golden Gate about 10000 BP. According to the literature nothing much has happened since, other than minor configuration changes within San Francisco Bay itself. Human migration into California is thought to have occurred sometime between 12000 and 10000 BP. Some researchers (e.g., Martin, 1973) have speculated that the disappearance of a number of large mammals about 10000 BP is related to the predatory habits of these early humans.

The Inundation of California's Valleys

Two things intrigue me about circumstances in California at the end of the Pleistocene. Why had people not migrated to this area sooner and how could such a miniscule number of people decimate the area's mega-fauna to the extent that mass extinctions occurred in such a short time? One might surmise that the simultaneous migration and disappearance of species would involve a significant and far-ranging event or sequence of events. My analysis of topographic maps and aerial photos leads me to believe that these events revolve around a drastic change in sea level at this time rather than the literature's rather incipient change. This contradicts studies of California's valleys, which indicate that episodic erosion and deposition events were due to climate change and not sea-level rise (Atwater, 1980; Harden, 1987; Janda and Croft, 1967; Lettis, 1985; Marchand and Allwardt, 1981). In my scenario the valleys perpendicular to today's San Francisco Bay were submerged by seawater to very high levels. San Francisco Bay is a minor remnant of what was in place 10000 years ago. Although all the valleys were inundated this paper concentrates primarily on the Central Valley because the water that passed through the strait at Golden Gate did not get east of the barrier provided by the foothills of the Sierra Nevada Mountains. The configuration of this water level is not provided for scale reasons, however, Figures 1 and 2 depict it graphically. Figure 1 displays the elevation isolines for this water level in California. The isolines are shown as straight lines but they actually curve slightly. The degree of curvature reflects that of the latitude lines relative to the map projection used. In lieu of a map of the water body readers can follow the shoreline by using Figures 1 and 2 in conjunction with an internet web site (e.g., Terraserver.com; Topozone.com) that provides contour maps and aerial photo coverage of the region. The sites along the profile in Figure 2, which are mostly from the Central Valley, serve as reference points as interested readers move around the valleys using the mentioned web sites.

In the Central Valley this seawater level extended north up the Sacramento River valley to just beyond the Shasta Dam. The shoreline and lakebed are well-defined in the area at Summit City, Project City and Mountain Gate where they occur at roughly the 1040 foot (317m) elevation. From here the shore profile rises or tilts up to the southwest. The impact of this seawater incursion is vividly etched in this area along the valley's western flank (i.e., the foothills of the Coastal Mountains west of Redding) where a large incised system of 'badlands' developed. This contrasts with the eastern side of the valley where pre-defined circuitous, incised valley profiles were straightened and the valley sides rounded by this and subsequent lower inundations. Its southern extent in the Central Valley was to South Taft where it occurs at roughly the 1355 foot (413m) level. It is also traceable from the Gulf of California up the Colorado River to Hoover Dam where the shoreline disappears under the highest level of the Lake Mead reservoir. This level also extended into the Mojave Desert to the northeast corner of the Marine Corps Air Ground Control Center just west of Amboy. Water from a number of lakes in the Owens River-Death Valley drainage system passed over a sill at Ash Hill between Ludlow and Klondike to flow downstream a short distance where it entered the sea near Siberia. In my view the Early Holocene incursion of seawater into this area effectively separates the younger, lower Sonoran Desert from the older, higher Mojave Desert in this area. One would expect a transitional life zone or ecotone that exhibits increased diversity along the boundary. In the Amboy area there are now a series of remnant dry lake beds (e.g., Bristol Lake) whose saline nature is related to later lower periodic incursions that can be traced down-slope to the present Gulf of California coast. Regardless of the speed of the shift, the incursion into the Coachella Valley would have rapidly filled what is now the Salton Sea basin given that it is 235 feet (72m) below sea level. The incursion into this valley got beyond Palm Springs to the Desert Hot Springs area and Fingal at the mouth of the San Gorgonio Pass.

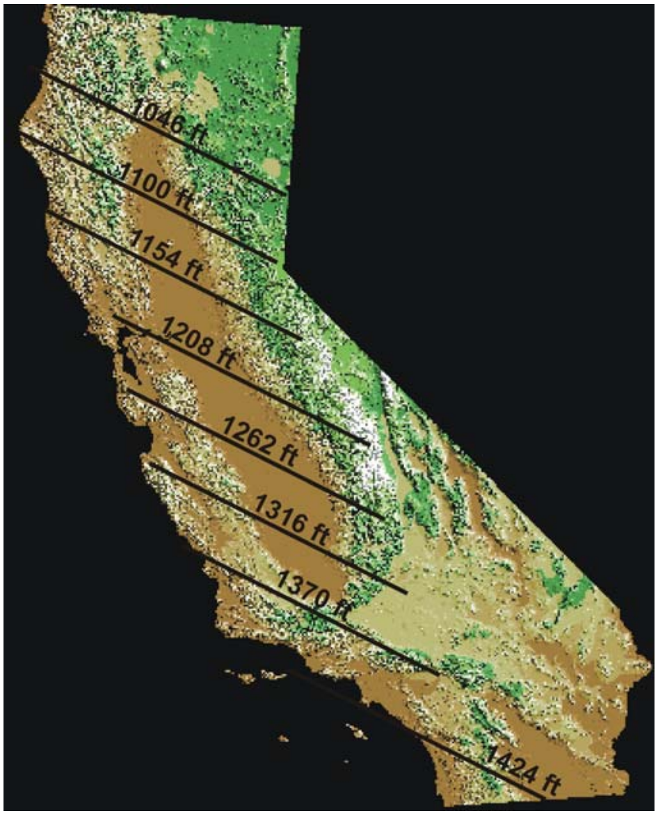

Figure 1. California's Central Valley is aptly defined in this U.S. Geological Survey image as are other coastal lowlands. Superimposed on the image are some isolines showing the respective heights in feet reached by the ocean level that is postulated in this paper to have submerged portions of the State about 10000 BP. The descending elevations from south to north reflect the modern-day tilt of the shoreline profile. This figure and Figure 2 below can be used in conjunction with internet map sites (e.g., Terraserve.com; Topozone.com) to follow the shoreline from Oregon to the Mexican border.

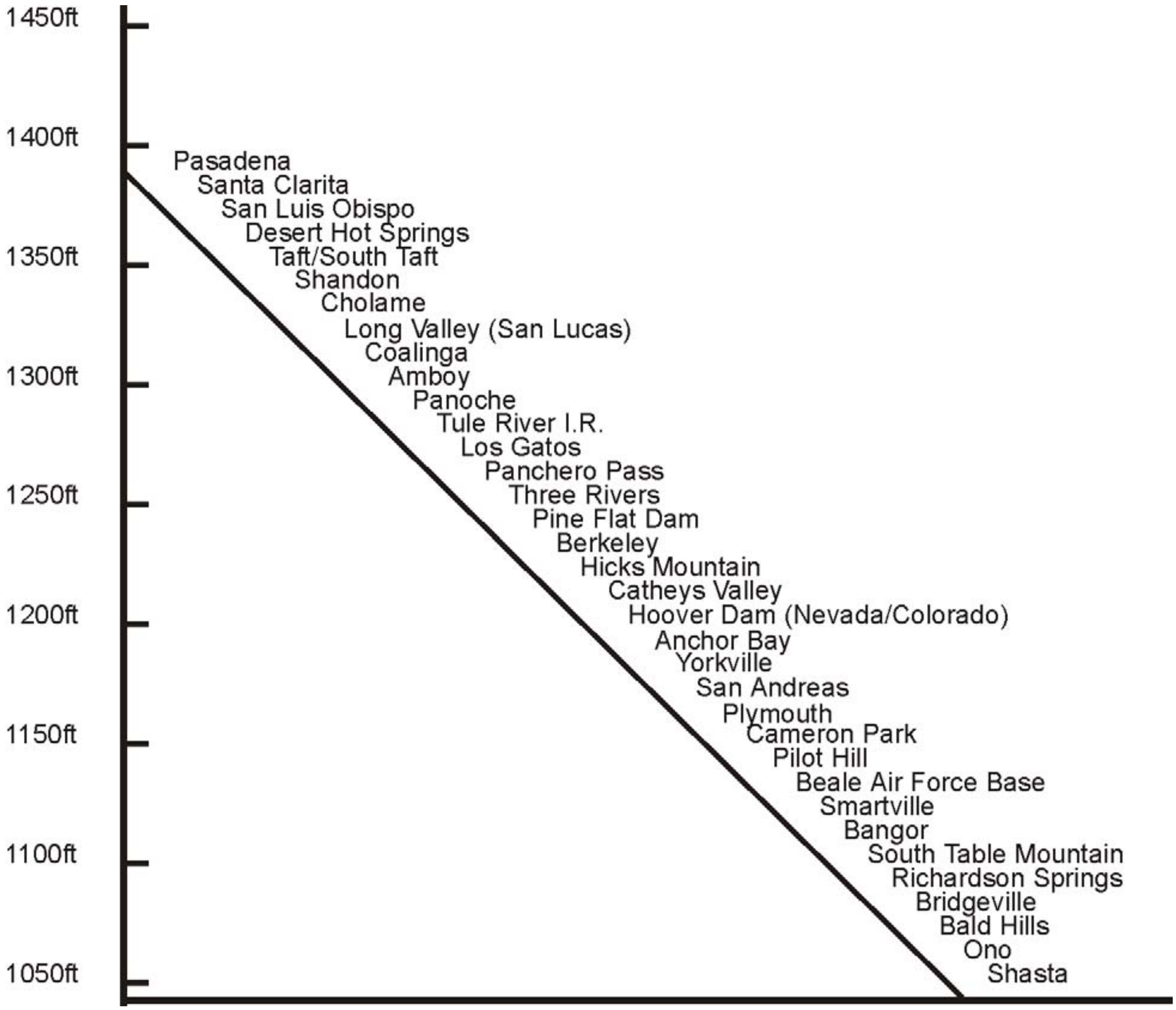

Figure 2. A partial shoreline profile (ratio 1:1) in feet of the water body postulated in this paper to have submerged the California coast roughly 10000 years ago. The site locations roughly represent ten foot increments along the profile, which can be seen to drop from south to north (i.e., left to right). All of the locations are from California, with the exception of the Lake Mead/Hoover Dam location, which is used to show how far this water level got up the Colorado River valley.

Discussion

The shoreline of this water body is not difficult to follow except where younger alluvial material issuing from foothill valleys or eolian sands and silts have buried or modified it. The shoreline falls in elevation as one moves north up the California coast. It crosses into Oregon at about 990 feet (302m). Beyond here it is traceable up the Columbia River valley past Wallula Gap where it inundated the Pasco Basin (Noble, 2004d). Further north it can be found in the British Columbia community of North Vancouver at roughly 500 feet (152m) where it is traceable for some distance up the Fraser River valley.

In tilting down to the north it cuts older shorelines that tilt up to the north. There is also a sequence of lower shorelines below this one that represent later transgressions. This suite of shorelines exhibits a cycle interval of roughly 900 years. The postulated existence of the 10000 BP water body contradicts the literature's portrayal of events at this time. As described in my other internet papers (see references) this event may be in response to the earth's equatorial axis shifting in relation to its orbital axis around the sun. The presence of shoreline sequences that tilt in opposite directions may be evidence that the Earth's land mass and its water do not move in tandem but independently of one another in the manner of a gyroscope. I have also ignored isostatic rebound as causing the tilt. The shoreline's rather contiguous nature also negates tectonics as a major factor during the Holocene. Other physical evidence includes: buried paleosoils; erosional unconformities between sediment layers; buried clay sediments representing deep water deposition; buried channel fills; sculptured valleys; faulting of older buried sediment layers due to the weight of overlying seawater; emerging pro-grading deltas moving downslope that alternate with submerged deltas building upslope; and the subsequent deposition of later alluvial materials on top of deltaic material. In the axial shift model portrayed here, San Francisco Bay and its attendant valleys and offshore continental slope are juxtaposed against what I call the Hudson Bay Slope. When the one area is emergent the other is submerged. Although there are subtle differences, San Francisco Bay, with its gap at the Golden Gate, is similar to the Mediterranean Sea and its associated seas.

The San Francisco area has moved spatially in response to global shifts both prior to and after the 10000 BP event (one of the better places to observe the shoreline in the Bay area is at the back end of the University of California's Berkeley Campus). This specific shoreline, however, marks the furthest south that the area reached in relation to the orbital axis in the last 10000 years. The lower shorelines in the sequence mark oscillations within a renewed shift northward (i.e., smaller cycles within a larger cycle). The termination of the cycle, as reflected by the 10000 BP shoreline, represents a drastic change in sea level with accordant impacts on global earth and life science systems. Given their systemic or integrated nature, these infrastructure elements would collapse in a 'domino' effect. Regardless of the speed of the shift (e.g., days, weeks, months, years, centuries) there would be a dramatic change in climate (the shift would be rapid if spawned by a cyclical celestial event). Species at lower elevations would either be drowned, buried or forced to migrate and, in some cases, given the ocean barrier or island effect, ultimately die off. Reduction in habitat or changes in habitat in response to climate change would play an important role in reducing species numbers and the extirpation of species from certain areas and, in some cases, the extinction of species (e.g., Mammoths). Hybridization would be prevalent (e.g., the Salmonids) as well as the isolation of species (e.g., endemics). Marine species might become land-locked in what would first be brackish water that would ultimately become freshwater lakes. These cycles would induce habit changes (e.g., the development of anadromous fish species). Human cultures or traditions would disappear only to be replaced by different ones in response to a later cycle. Where they didn't disappear there would be life style changes related to these emergent-submergent cycles (e.g., the abandonment of hunting for fishing; the re-occupation of caves, etc.). Gene pools would also be impacted (e.g., inbreeding or the re-introduction of species into the gene pool after long periods of separation). Quite simply, if the portrayal of the shoreline described here is correct, it has significant implications for all life on the planet.

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