C:\Documents and Settings\Administrator\Desktop\v483\Davis.fm printed: 2 November 2006

AUTHOR'S PROOF
Please check carefully in red and return with original manuscript as soon as possible

RADIOCARBON, Vol 48, Nr 3, 2006, p 1–#

RESPONSE TO MOSS ET AL. "AN EARLY HOLOCENE/LATE PLEISTOCENE ARCHAEOLOGICAL SITE ON THE OREGON COAST? COMMENTS ON HALL ET AL. (2005)"

Loren G Davis[1,2] • Roberta A Hall[1] • Samuel C Willis[3]

Moss et al. (2006) provided comments and criticisms of our recent paper in this journal (Hall et al. 2005). We can appreciate the need for promoting vigorous dialog among those interested in the research of early sites along the New World Pacific margin and thus welcome their intervention; however, we are compelled to respond because they raise several points that require clarification and introduce a critical error that must be corrected.

The comments of Moss et al. (2006) present several criticisms that are intended to reveal weaknesses in our claim for an early human occupation at 35CS9: only 1 pre-Middle Holocene-age ^{14}C age is present from the site, no artifacts were found in stratigraphic association with the reported Late Pleistocene-age charcoal sample, and the chronometric ages of the artifacts found between the stratigraphic positions of Middle Holocene and Late Pleistocene ^{14}C-dated charcoal samples are not clear. Truly, these are important points worthy of mention in the evaluation of site 35CS9's antiquity, which is why we originally stated them in our paper. Most of the points advanced by Moss et al. (2006) are restatements of admissions originally presented in Hall et al. (2005). We urge the reader to review our original paper in reference to the issues outlined above.

Beyond their recapitulation, Moss et al. (2006) also offer their own arguments that question the veracity of the archaeological and geoarchaeological records we present. Here, we will show that their arguments indicate misunderstandings and misrepresentations of the site formation processes associated with site 35CS9.

Moss et al. consider the presence of sand as a constituent of stratigraphic units at 35CS9 as a source of problems for interpreting its archaeological record. In an attempt to discredit the 11,000 ^{14}C yr BP date we obtained on wood charcoal as wind-redeposited materials, Moss et al. (2006:237) state: "the sand-rich sediment in which the charcoal was found indicates a period of aeolian deposition." Clearly, sand may be deposited in a number of ways in a coastal setting and does not automatically represent wind-blown sediment when seen in a stratigraphic sequence. A careful review of the sediment granulometry data associated with the Late Pleistocene-age ^{14}C date shows relatively poorly sorted deposits that are indicative of alluvium, not aeolian sediments.

Moss et al. (2006:238) also state: "The composition of the underlying stratum 2Bwb1 is nearly identical (40% silt, 38% sand, 22% clay) to that of stratum 2Ab2, albeit a bit lighter in Munsell soil color. Again, this stratum would appear to have accumulated at a time of some soil development." This statement is problematic since sediments, not soils, accumulate in geologic contexts. The presence of pedogenic features, such as an A and B horizon in this case, clearly indicates an extended period of surficial stability, during which soil formation produced the observed horizons. It is important to conceptually separate lithostratigraphy and pedostratigraphy in the evaluation of site formation histories—a conceptual separation that we, in context, rigorously observed.

[1]Oregon State University, Department of Anthropology, 238 Waldo Hall, Corvallis, Oregon 97331, USA.
[2]Corresponding author. Email: loren.davis@oregonstate.edu.
[3]Archaeological and Historical Services, Eastern Washington University, 201 Isle Hall, Cheney, Washington 99004, USA.

If we are to believe, as Moss et al. (2006) argue, that vertical displacement of significant portions of the site's artifacts are to blame for the deeper presence of cultural materials at 35CS9, then we should also be surprised to find such a well-stratified lithostratigraphic and pedostratigraphic sequence as we observed. It is impossible to have it both ways: not only are processes of bioturbation able to vertically displace artifacts, they mix sedimentary deposits, disrupt pedogenic horizonation, and blur stratigraphic boundaries. Given the arguments advanced by Moss et al. (2006), we should expect to see this vertical mixing revealed in the geologic evidence as well. This simply is not the case at 35CS9, which retains a well-stratified, clearly demarcated sequence of sediments and soil horizons that is consistently expressed in the profiles we exposed.

We disagree with Moss et al. that the archaeological integrity of 35CS9 should be suspect due to its sandy sedimentary component. Moss et al. (2006:238) argue that simply due to the presence of a sandy matrix "there may have been considerable post-depositional movement of lithic artifacts through the sediments"—a job attributed to the supposed effects of burrowing rodents. Without a doubt, rodents can play a role as agents of bioturbation in many sites; however, like other indicators of site formation process, rodent burrowing commonly leaves behind telltale traces of infilled tunnels, homogenization of stratigraphic variability, or significant changes in sediment consolidation. Because site 35CS9 is well stratified, it is ideal for observing the effects of tunneling animals, which should appear as burrows filled with sediments of contrasting color or consolidation. In the units we excavated, we observed evidence of 2 rodent burrows; the first extended horizontally over 25 cm at a depth of 160–165 cm in the south wall of Unit A, and a second smaller burrow was found in Unit A during excavation of level 16 (185–195 cm). In both cases, excavators carefully removed and separately screened the loosely consolidated burrow matrix, which revealed no artifacts. We also observed traces of large root casts, which penetrated downward from the bottom of the 3Bwb2 horizon into the basal horizons. Our careful investigations at the site did not reveal the bioturbation Moss et al. (2006) argue might explain the presence of artifacts in the 3Bwb2 horizon.

In an attempt to cast doubt on the stratigraphic integrity of site 35CS9, Moss et al. (2006:238) state: "…in soils such as these, bioturbation can be a significant factor (Erlandson 1984). On this stretch of Oregon coast, burrowing by pocket gophers, mountain beavers, and other rodents…is a common occurrence." If this line of reasoning was to be accepted as a universal truth, there would be no point in excavating sites on the Oregon coast because the stratigraphic integrity of all archaeological data would be useless. We respectfully disagree that the presence of sand as a sedimentary component of site stratigraphy is tantamount to inevitable faunalturbation by rodents and the disruption of archaeological records, here or anywhere. While rodents are undoubtedly effective agents of site disturbance, we reject their invocation of bioturbation as a mechanism of site formation in the absence of its empirical indicators in the stratigraphic record. A better plan is to look for evidence of bioturbation and segregate the sediments infilling those traces from the undisturbed site matrix, which is precisely what we did.

In a similar vein, Moss et al. (2006:238) state, "In such sandy deposits, erosion, deflation, and pedoturbation are some of the site formation processes at work." While they are correct that such processes *may* occur in coastal sites, these processes also leave observable, empirical indicators. We were careful to note the presence of such indicators during our investigation as reflected in our description of an erosional unconformity in the site, indicated by the 2Bwb1-3Bwb2 horizon sequence (Hall et al. 2005:389, Table 2). Otherwise, we did not see evidence of the kinds of site formation processes Moss et al. describe.

Moss et al. dislike the presence of 2 lithic tools—a cobble core and a bifacial preform—and 22 pieces of debitage in the deeper 3Bwb2 horizon as evidence of an early occupation. Instead, they argue that the artifacts arrived in the 3Bwb2 horizon through some sort of vertical movement through the site's sandy matrix. In the absence of clear indicators of widespread post-depositional sedimentary disruption, it is hard to imagine large artifacts such as these making their way downward unaided by large organisms or robust physical processes (e.g. cryoturbation, liquefaction) through the site's matrix, ultimately coming to rest within the remnants of a sandy clay loam paleosol. The authors also suggest that a possible hearth feature found in the 3Bwb2 horizon at a depth of 175 cm may have been moved downward from upper horizons. This explanation is quite implausible, as the feature consists of fire-cracked rock and charcoal in direct association with an oxidized patch of orange clay measuring 14 cm long, 15 cm wide, and 7 cm deep, and is more likely the in situ remains of a small hearth. We require empirical evidence of such processes in order to give them due consideration in our interpretation of site formation: the fact that these site formation processes could happen does not mean that they did happen.

In their attempt to provide a summary figure of the stratigraphic information we present in Hall et al. (2005), Moss et al. (2006: Figure 1) unfortunately introduce an error into the literature. In their Figure 1, Moss et al. (2006) incorrectly label the 167–245 cm stratigraphic interval as 2Bwb2, which should read "3Bwb2". Because we clearly explain how the 2Bwb1–3Bwb2 transition indicates the presence of a lithological discontinuity (Hall et al. 2005:389), we are confused as to the reason for this error. Instead, in the correct stratigraphic sequence, the shift from the 2Bwb1 horizon to the 3Bwb2 horizon indicates the presence of a partially eroded paleosol at 167–244 cm depth. We favor a hypothesis that considers the presence of the buried artifact bearing paleosol stratigraphically positioned below Middle Holocene-age ^{14}C dates as evidence for the presence of an early human occupation at 35CS9.

In conclusion, we would like to discuss an important issue central to the matter at hand. Moss et al. begin their critique of our work by summarizing the history of archaeological interactions with 35CS9 that we presented, and include a 2004 resurvey of the site performed after our excavation (Tasa et al. 2004). If we are to locate and study evidence of the earliest occupation of the Oregon coast, we must do much more than resurvey known coastal sites over and over again. Instead, we should be coordinating geoarchaeological and archaeological research to identify high potential landforms as a precursor to the discovery of early coastal sites. As our investigations at 35CS9 and in other areas of the southern Oregon coast clearly show (Davis et al. 2004; Davis 2006), some coastal landforms still hold evidence of well-stratified terrestrial deposits and early archaeological components. The kind of archaeological and geoarchaeological research that we present is most dearly needed at sites like 35CS9 if we are to understand the timing of human arrival to the New World coastal margin. In our reading of their comments, it seems that Moss et al. misunderstand the geoarchaeological implications and research potential of our discovery of a Late Pleistocene-age ^{14}C-dated charcoal sample in terrestrial deposits along the Oregon coast. Sadly, this means we have failed to reach them with our central message: if we are to find early evidence of human occupation along the coastal margin, we must first seek out those Late Pleistocene-age geomorphic and stratigraphic contexts that offer high probability situations for archaeological discovery. Acquiring ^{14}C-dated samples from terrestrial deposits preserved in portions of the modern New World coastline, with or without associated archaeological materials, will continue to be fundamental to this effort.

REFERENCES

Davis LG. 2006. Geoarchaeological insights from Indian Sands, a Late Pleistocene site on the southern Northwest coast, USA. *Geoarchaeology* 21(4):351–61.

Davis LG, Punke ML, Hall RL, Fillmore M, Willis SC. 2004. A Late Pleistocene occupation on the southern coast of Oregon. *Journal of Field Archaeology* 29(1):7–16.

Erlandson JM. 1984. A case study in faunalturbation: delineating the effects of the burrowing pocket gopher on the distribution of archaeological materials. *American Antiquity* 49:785–90.

Hall R, Davis LG, Willis S, Fillmore M. 2005. Radiocarbon, soil, and artifact chronologies for an early southern Oregon coastal site. *Radiocarbon* 47(3):383–94.

Moss ML, Connolly TJ, Erlandson JM, Tasa GL. 2006. An Early Holocene/Late Pleistocene archaeological site on the Oregon coast? Comments on Hall et al. (2005). *Radiocarbon* 48(2):237–40.

Tasa GL, Knowles JA, Peterson J. 2004. Archaeological resource evaluation of Areas 1 and 4, Oregon State Parks, 2003/2004 Surveys, OSMA Report 2004-7. Eugene: University of Oregon State Museum of Anthropology.