Preventative Maintenance at The Mammoth Site: Excavation and Stabilization Methods for an Active In-situ Bonebed

Abstract

The Mammoth Site (The M) of Hot Springs has been undergoing near constant investigation since 1979. Excavations continue today with both summer interagency participants as well as on-site volunteer-based programs. Most new discoveries of mammoth and other Pleistocene taxa by ongoing investigations are left in situ for observation by visiting scholars, scientists, and the public. From initial discovery to present, excavation practices and excavators have played a key role in direct outreach to the public, as well as significantly contributing to the long term stability and management objectives for in-situ excavation.

Excavation methods have varied from year to year as research goals have changed along with the physical conditions of The M. Methodology in the system was shaped through focusing on exposing and recovering fossils prior to backfilling between field seasons. Moving transition to an in situ excavations in the mid 2000’s, The M continues to effectively act as an outreach, open science, natural preservation laboratory and collections archive. Current excavation techniques are slower and geared towards promoting stability of exposed specimens in a dynamic environment. This means that excavation methods have shifted to a finer scale and require attention to detail in order to preserve quality display items for the visiting public. Excavators observe and react to changing sedimentary patterns through their tools and techniques as they approach potential objects in the matrix, reducing the chance for large discovery losses. Small fractures result from the erosion through digging and wheelying of clays until an area where excavators may preemptively apply appropriate consolidation and support structures. These techniques help prevent damage and present a more realistic view of the site and matrix.

Existing in-situ bones are always affected by nearby excavation in some way; however, careful methods of digging can be applied to minimize destabilization of supporting matrix. Careful observation of support pedestals allows for selective excavation of destabilized sediments preventing ‘point-away’ destruction of fossils. Where needed, in-situ specimens may be fitted with clay-support structures maintaining specimens integrity until the eventual removal of the fossil. These preplanning and reactive steps is turn lead to increased longevity of important specimens maintained in The M in-situ collection.

The Sediment

In situ fossils at The M are predominantly fine-grained sands, silt, and clay (18%). some coarse sands and gravels exist near the edge of the workspace. The layered host exists in more closely packed, wavy layers. These strata are subtly deterrined by other factors in the boodied, including both pisolitic processes, such as settling, slumping, silt, and ochre (18%), but also tangents through the movement and root extention.

Case Study 1 - Eastern Edge

Arctic camel specimens discovered in 2019 CS. (M2019-034) was carefully prepared to sit in situ by author Wrobel. This work included cleaning, wood carving tools, and small wooden sculpting tools. However, other bone and mammals specimens were found that required significant excavation. (M2019-030, M2019-032, M2019-036, M2019-037, M2019-038, M2019-039). By following detailed amlmentation, the excavators also were able to uncover a nearly completely articulated dental corpus and remains with original damage. Note that if the specimen is not moved at all, it will remain in place. After major blocks are removed, the sediments are fully exposed. (54, 44). Note that these steps are not always followed as potential obstacles to finding more yet unknown fossils. The treatment of in-situ sites is critical to the integrity of these fossils.

Case Study 2 - Central West End

This area of the bonebed is rich in specimens. With the removal of a single large block, the majority of the excavated material was uncovered. The caudal vertebrae (PM1-PM2) was discovered in 2019 CS. (M2019-035). The removal of this vertebra allowed for the discovery of an additional four articulated mandibles (M2019-031, M2019-032, M2019-036, M2019-038). This removal allowed for the discovery of the remaining articulated remains. Removal of the sediments of the peduncle by excavator B. Bowling (and later K. Claxton) allowed for the discovery of the mandible. The mandible was uncovered at the time of excavation and the remaining mandible was uncovered at the time of excavation. By following detailed ammentation, the excavators were able to uncover a nearly completely articulated dental corpus and remains with original damage. Note that if the specimen is not moved at all, it will remain in place. After major blocks are removed, the sediments are fully exposed. (54, 44). Note that these steps are not always followed as potential obstacles to finding more yet unknown fossils. The treatment of in-situ sites is critical to the integrity of these fossils.

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