Using Electrical Resistivity Surveys to Determine Subsurface Connectivity in a Karst Terrain, Fort Hood Military Installation, Texas

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EXTENDED ABSTRACT

The Fort Hood Military Installation is a karst landscape located within the Lampasas Cut Plain, a sub-region of the Edwards Plateau. The installation is characterized by dissected mesa-type topography with Lower Cretaceous Trinity and Fredericksburg Group carbonates that outcrop in areas of high relief, namely escarpments and incised valleys. The Fredericksburg Group units are prevalent throughout the topographic highs of the Lampasas Cut Plain, and the Trinity Group, namely the Glen Rose Formation, outcrop only where overlying sediments have been eroded by stream incision in the western portion of the installation (Nelson, 1973). There are two stratigraphic units of importance to this study: the Comanche Peak Formation, a nodular limestone with interbedded marl sequences and the Edwards limestone, a series of massive to thinly bedded limestones, dolostones and argillaceous limestones.

The majority of karst at Fort Hood developed within the Edwards limestone and along permeability boundaries where the Comanche Peak and Edwards are interbedded. Surface mapping and spatial analyses have identified numerous karst features including caves, sinks, springs, and shelters (Fig. 1). All of the known karst features that occur at across the installation are coupled to the surface and heavily overprinted by epigenic processes and many exhibit solutional widening as a result of the interaction between surface and groundwater. Many of the subsurface features are fracture controlled, associated with local and regional trends.

Traditional karst surveys at Fort Hood have produced mixed results; the multifunctional land use of the training areas and thick vegetation across the plateaus prohibits extensive grid and site discoveries of karst manifestations. Known features are mapped as discrete entities, and the use of invasive techniques to determine communication between proximal features has been relatively unsuccessful. Two sections in western Fort Hood, Shell Mountain and Manning Mountain training areas, were selected as potential study site to employ remote sensing and electrical resistivity surveys to characterize subsurface karst features and potentially model connectivity between existing surface karst manifestations.

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