

## ABSTRACT

Soil morphology can tell the user of the soil resource a lot about the history of the conditions under which the soils developed. When fully understood, soil morphology can be used to predict how the soil will react to a multitude of land uses over the long term. The objectives of this study are to (i) correlate soil profile descriptions, particularly redoximorphic features, with the actual zones of saturation found to occur on site through strategically placed instrumentation, measuring water pressure piezometric/gravitational head and (ii) to develop a landscape model for a representative hillslope within a much larger geographical area, that could be applied to other similar landscapes in the region. The model is that of a 3 dimensional schematic that displays the actual stratigraphy of the materials encountered on site.

In this study, soil profile descriptions were written from deep soil cores for a 20 ha sub-watershed within Major Land Resource Area 105 (LRA 105). This MLRA is defined by the United States Department of Agriculture (USDA) Handbook 296, 2006, as the Northern Mississippi Valley Loess Hills. The soil morphology was used to estimate the depth of seasonal saturation. Careful attention was placed on making certain that enough descriptions were made to be able to predict and interpolate, with confidence, the area between each soil pedon description thereby better defining the entire hillslope. The hydrologic monitoring data collected during this research provides the opportunity to link how water flows within this hillslope to the soil morphology and stratigraphy.

Upon completion and analysis of the soil morphology, select representative hillslope positions on which to install instrumentation were selected and scientific instrumentation was installed on the site. An entire field season was monitored utilizing a nested set of piezometers with data loggers set to record hydrostatic pressure on five locations on the hillslope. In addition to the piezometers, two sets of thermocouples were installed at select locations on the hillslope designed to record soil temperatures from near the surface to a depth of 1 m. Rainfall amounts were recorded every two minutes throughout the course of this study.

At the end of the field season, a 3-dimensional landscape model was developed utilizing ArcMap GIS and ArcScene. GIS technology proved invaluable in the development of the 3D model. The 3-dimensional model of the subsurface terrain is useful for understanding how the water moves through the landscape.