Geoarchaeology and Geophysics at Feltus

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Part A: Geoarchaeology (by Sarah Sherwood) [Slide A-1]

Archaeological stratigraphy provides the framework for our interpretation of artifacts, but whether making observations in the field or through the microscope it is also clear that the sediments themselves and their arrangement allow for inferences about human activity and site formation that artifacts do not [Slide A-2]. Work at Mound A at the Shiloh site in the Lower Tennessee River Valley brought a new dimension to this geoarchaeological approach [Slide A-3]. It was here, working with David Anderson and John Cornelison, we realized that perhaps the mound layers were far more interesting than the pot sherds and animal bones – how these layers were collected and laid down went far beyond simple basket loads of dirt. These data can inform us about the knowledge and skills that allow these earthworks to be both expressive monuments (in both their size and often color symbolism) *and* engineering marvels (were these structures were literally groomed and maintained to say nothing of the sheer fact that they are still here today) [Slide A-4]. Considering earthworks from this perspective allows us to explore important anthropological questions like the organization of labor, technology, periodicity of use, and religious practices.

I visited Feltus shortly after the last SEAC at the kind invitation of Vin Steponaitis and John O'Hear to see how we might be able to apply geoarchaeological analyses to their various research questions [Slide A-5]. At the time they probably hadn't factored in the rock hammer in relation to their immaculate profiles. Preliminary results are promising and an excellent opportunity to explore pre-Mississippian mound construction. This type of geoarchaeological research is carried out across different scales – which I will refer to as regional, site and micro. In order to begin to determine the construction decisions made, we have to first know what types of resources or building materials were available. Not all dirt is alike, and in other earthwork studies folks are clearly demonstrating that in some cases they were mixing different sources to a desired color or physical property. So with the brief time I have here I will take a look across the scales and focus on a few of the smaller questions posed to me when I was on site [Slide A-6].

I begin with the regional geology and soils and continue to the site scale or archaeological stratigraphy and then down to the micro-scale which here is limited to the micromorphological analysis of intact soils and sediments in thin section. Feltus is located in the Lower Mississippi Valley on the interior edge of the Brown Loam, Thick Loess [Slide A-7]. Loess can be a curse and blessing in mound building. It has very specific engineering properties…when dry to damp this well sorted subangular medium silt can retain a steep or high angle of repose. But when saturated it essentially collapses. So to retain steep slopes on an earthen mound where loess is your primary local building material, we can assume an advanced set of geotechnical skills to create deposits to avoid catastrophic failures. The local loess, deposited episodically during the late Pleistocene is predominantly composed of quartz with lesser amounts of carbonate (some deposited with the loess and some precipitated deep within the profiles), and limited feldspar and a few trace resistant minerals [Slide A-8]. The loess deposits generally weather into inceptisols on the slopes and alfisols on the upland surfaces. The inceptisols locally consist of the Natchez series, deep silt loams that are well drained but weakly developed and leached of carbonates. The more stable alfisols contain well developed Bt horizons of silty clay loam.

Located a short walk off the bluff you are on the Mississippi river flood plain where additional mound building material can be easily acquired [Slide A-9]. These soils consist of fluvaquentic Inceptisols, Mollisols, Entisols, and Vertisols, nearly all composed of clay to silty clay, poorly drained and heavily gleyed. And my favorite taxonomic classification, a very-fine, smectitic, thermic, Chromic Epiaquert. We'll come back to these smectites shortly.

The importance of careful observations and descriptions of the stratigraphy in the field at the site-scale cannot be under emphasized [Slide A-10]. In the lab you can run all the samples you want on high tech instrumentation but if you are unable to contextualize those samples your results are useless. We need to use standardized terms to record color, texture, structure and boundaries. The nature of a stratigraphic boundary can reveal important details about depositional history, especially in a mound.

I will take a quick look at some interesting aspects of the Mound A stratigraphy observed in a long north-south trench extending obliquely along the eastern base of mound A [Slide A-11]: first the base of the profile [Slide A-12] -- 3 samples at the base of the apron are described at the site and micro-scales. A natural soil profile is revealed with a buried A horizon grading into the top of an E horizon. The upper portions of the buried A are enriched with anthropogenic sediments, but not significantly. In thin section there is a slight increase in organic material and charcoal and a few sand size fragments of bone relative to the lower A horizon [Slide A-13]. The microstructure is slightly more porous due to increased bioturbation. The contact with the initial mound fill is abrupt. The only mixing there is due to large infilled insect burrows along the contact visible in the scans in the middle. The yellow fill appears to be loess parent material, with fragments of clay coatings suggesting it was derived from at least 60-80 cm below the surface in the local subsoil. For comparison, the yellow box contains a photomicrograph of undisturbed Bt horizon material collected from outside of Feature 59 on the south end of the Plaza, approximately 130 cm below surface. You can see the secondary clay coating the voids, signatures of a strong Bt horizon.

Also of interest in this profile and something that I find a constant challenge in dealing with 3-D stratigraphy in mounds and in caves in 2-D excavation -- is this area here [Slide A-14], where the trench has cross-cut a feature of something sloping toward you. This could be a flank extending from an earlier mound stage that was covered by the apron or perhaps the lower edge of an embankment as identified in many more recent mounds that were often covered by later stages.

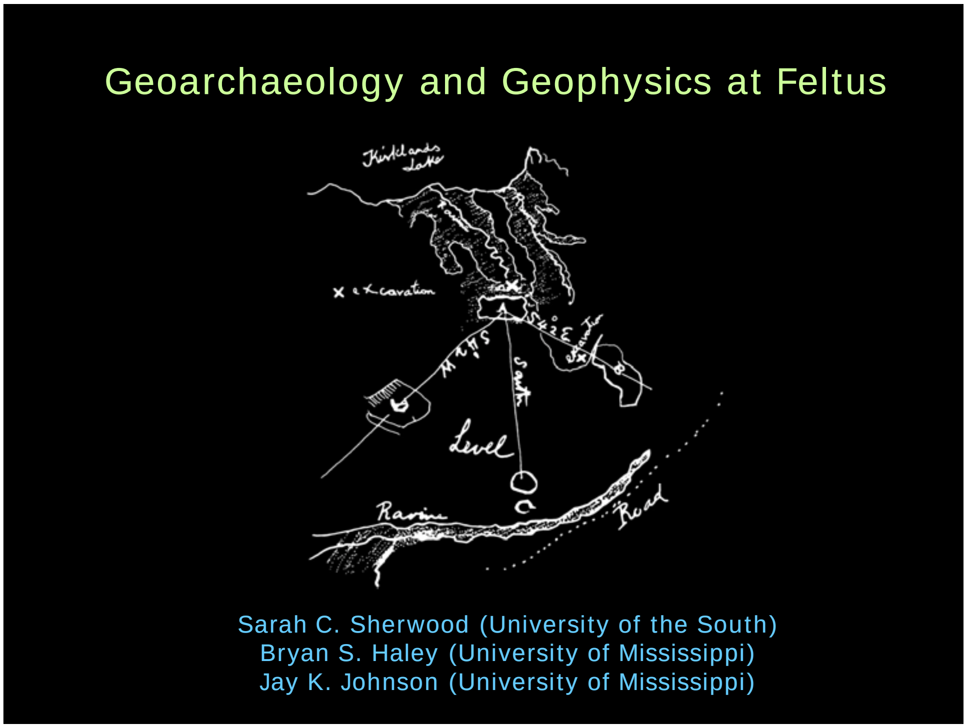
My final quick observation in Mound A deals with that of the "gumbo balls" [Slide A-

15]. These basketball-sized deposits intrigue everyone that sees them and in the next talk Garrett Cummings will look at potential ritual explanations. I will simply look at them for their physical characteristics. They are reportedly described in all three mounds explored in this project. I only got the chance to see them in Mound A. Shown here these appear in the field as heavily gleyed grey clay to silty clay with clear redoximorphic features in the form of oxidized concretions and concentrations. Interestingly when you dig into these they smelled strongly of sulfur or rotting organics. Here is a sample in thin section [Slide A-16]. Note both the dense clay matrix and the bright striations. These highly birefringent streaks indicate pressure and movement in the clays, fairly typical of smectites especially in vertisols.

Smectite clays are common on the floodplain and I suspect that is what we are seeing here based on the evidence for pressure in thin section. Smectite is a 2:1 layer clay with shrink-swell properties. When wet they would be very sticky and highly plastic. What I don't see evidence for, however, is a source area underwater. Coming from the bottom of standing water such as a local slough I would expect these to be loaded with diatoms, unicellular algae with distinct silica bodies observed in thin section at high magnifications. Their absence suggests to me that these are derived from floodplain subsoils. Why this material is brought to the mound is open for discussion.

In Mound B I sampled several portions of this trench cut into the western side of the mound [Slide A-17]. These profiles indicate a complex series of deposits with prepared floors, variable fills including probable sod block, etc. In an effort to identify primary vs. secondary deposits one of the questions the excavators wanted to address here was the nature of the midden material in these low areas. Were these redeposited by slope wash, representing activities that occurred higher on the stage surface or nearby or were they in situ? In thin section this material lacked any evidence of water deposition [Slide A-18]. Even when areas have been trampled or bioturbated after fluvial transport at the very least sand-size fragments of graded bedding remain. Mixed charcoal, organic matter and various sizes and types of bone fragments suggest that these deposits are in their original context. In addition the absence of root disturbance suggests it was relatively quickly buried by additional mound construction.

In sum, there is tremendous potential for geoarchaeological analyses to illuminate details about this early mound complex [Slide A-19]. And if you are looking for an exciting dissertation topic … I have just the one.



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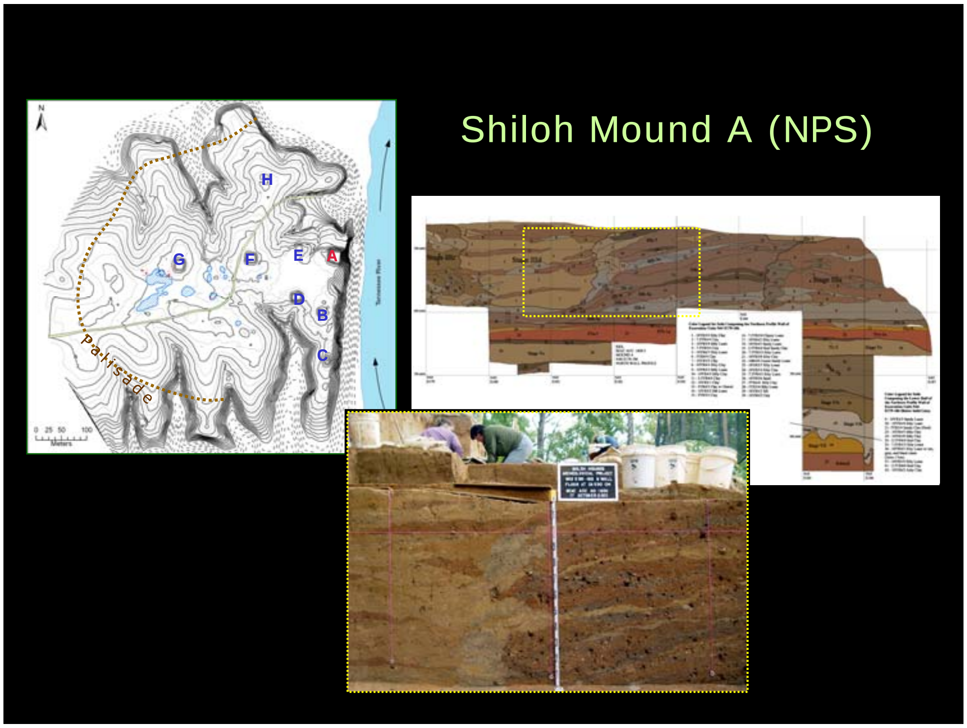

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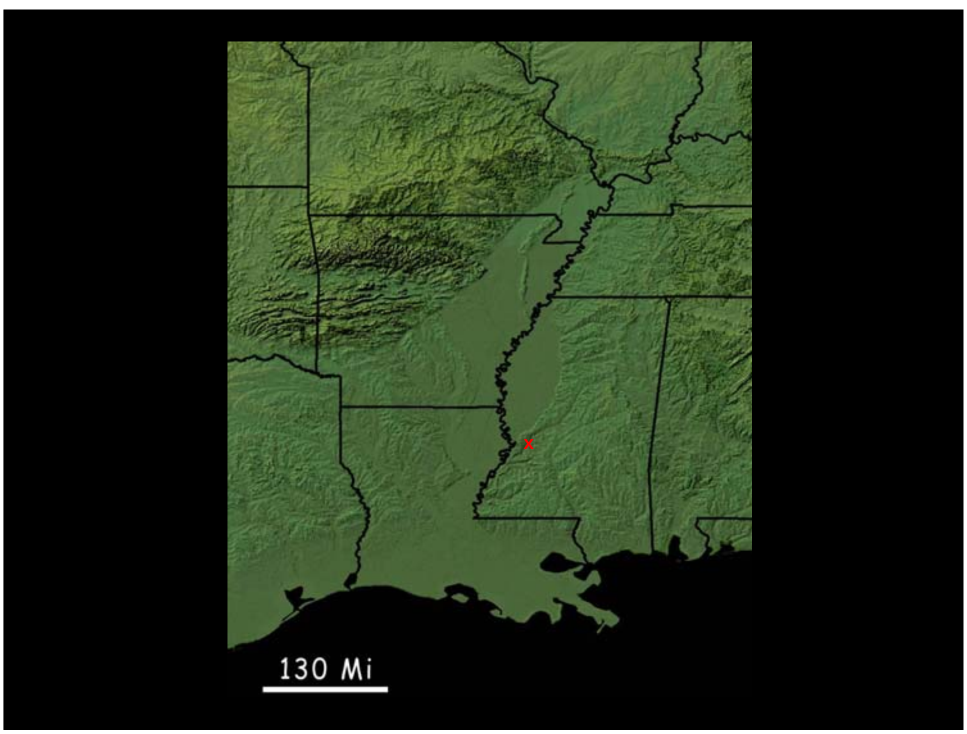

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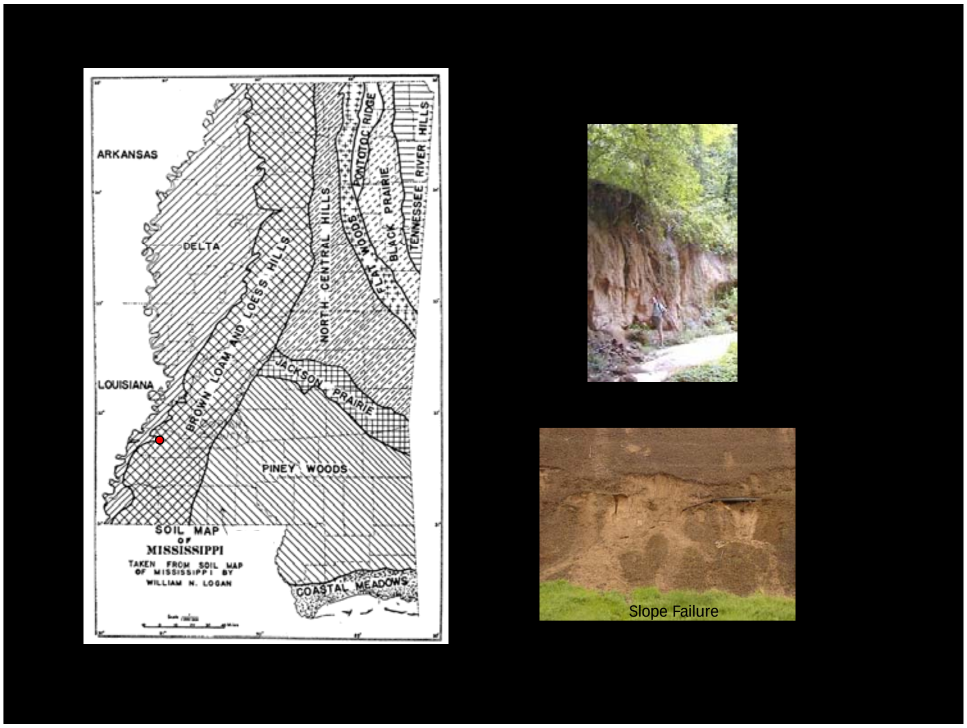

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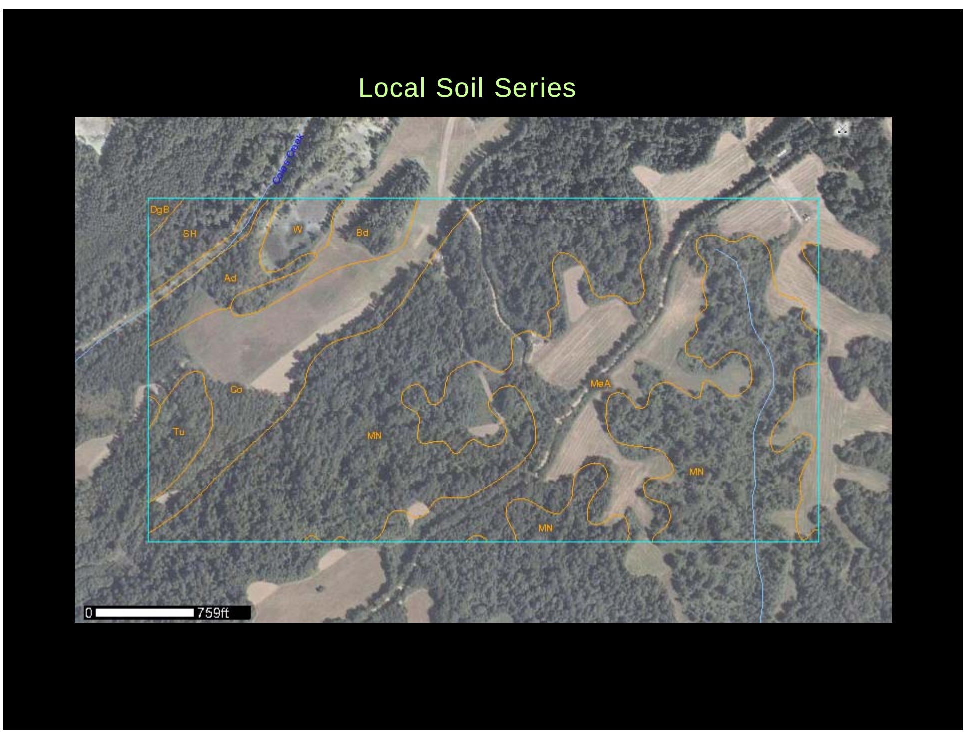

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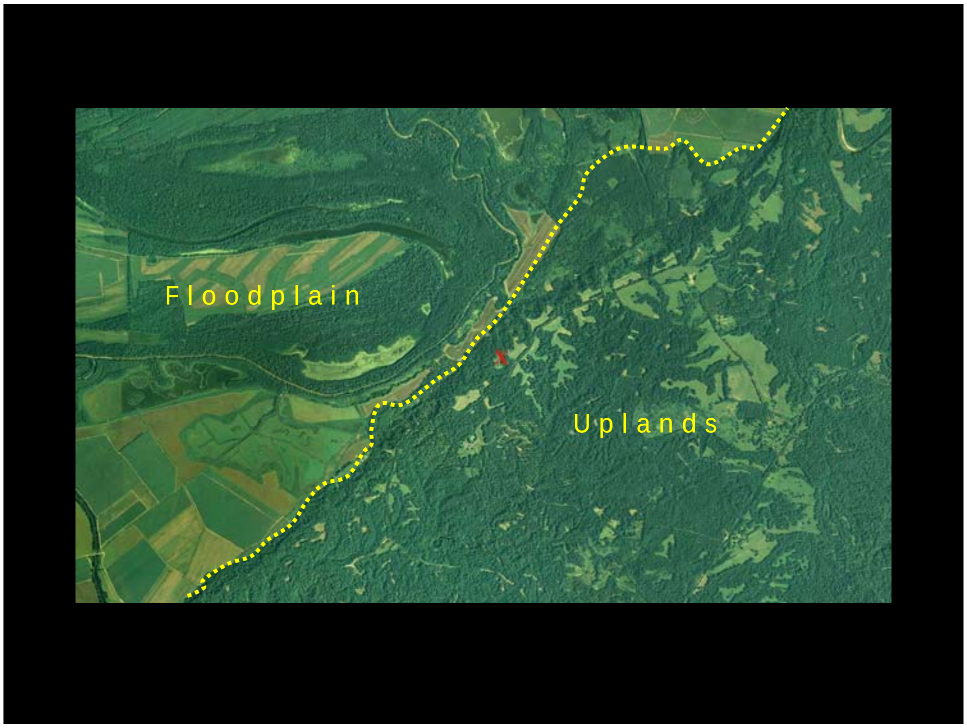

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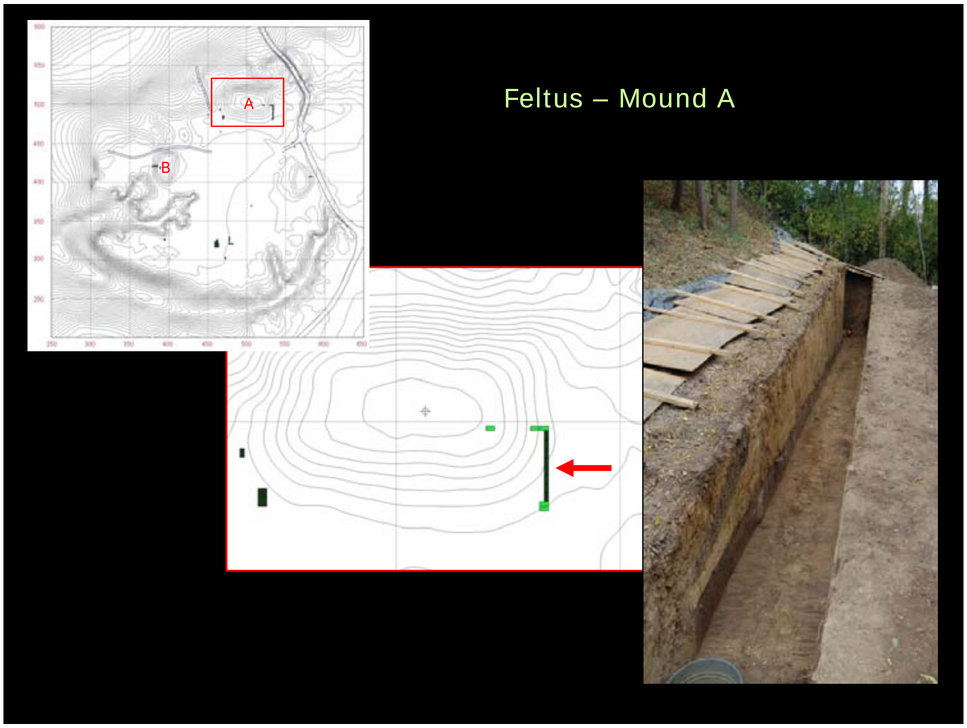

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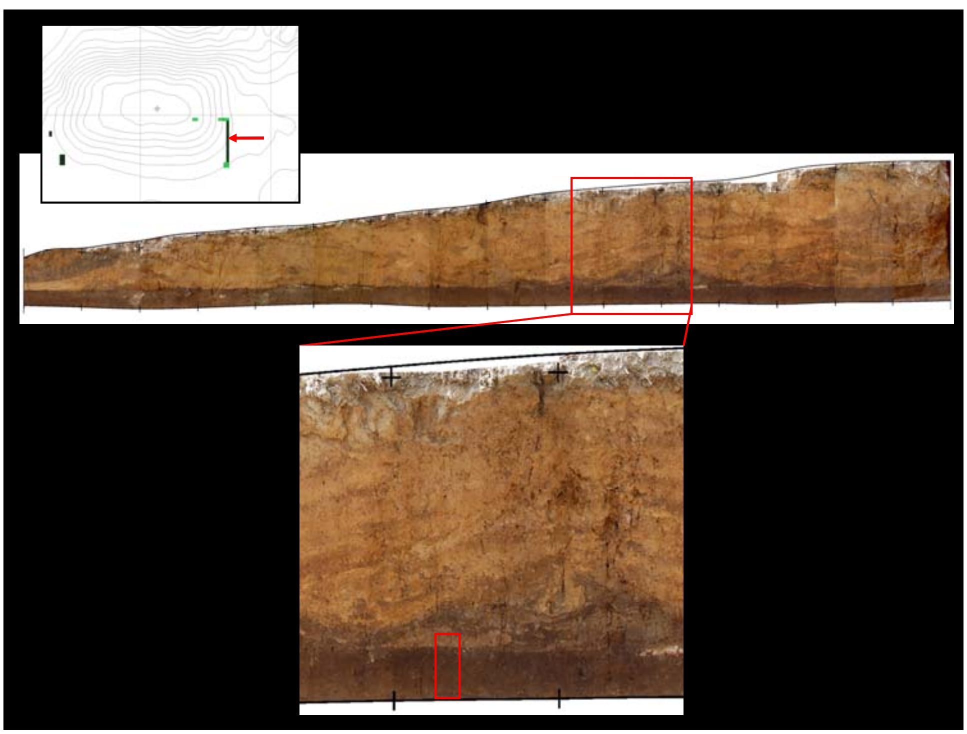

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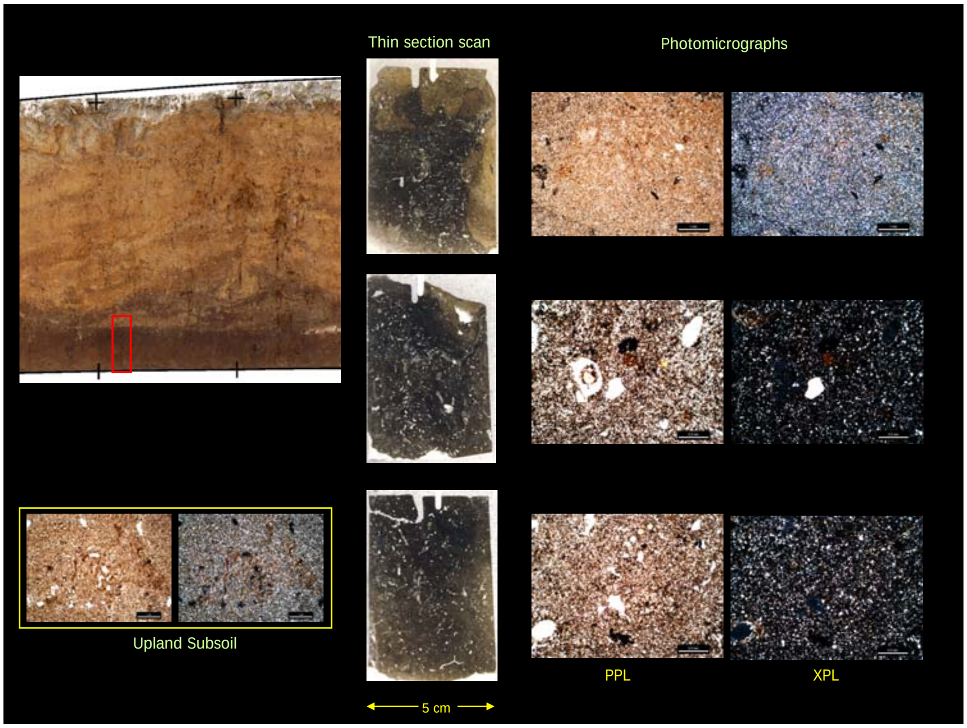

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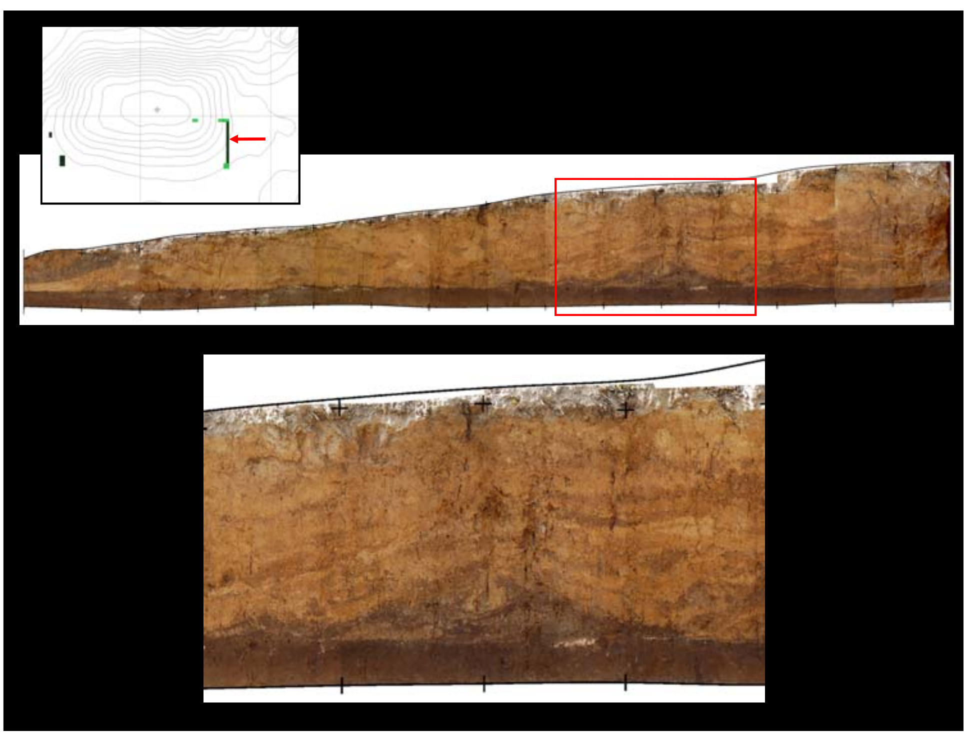

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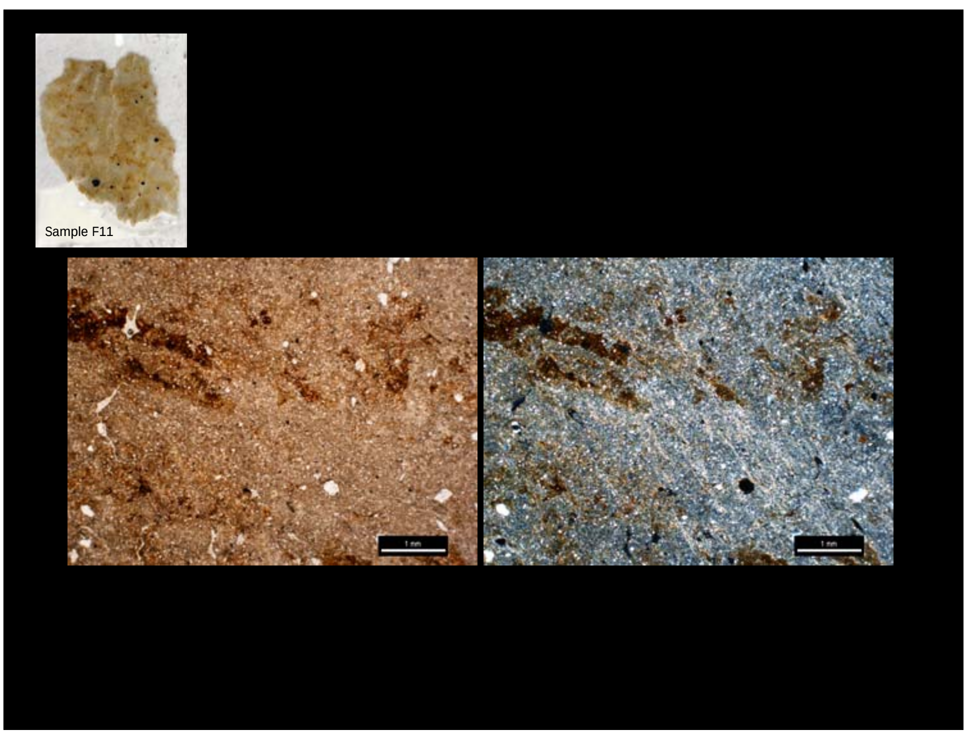

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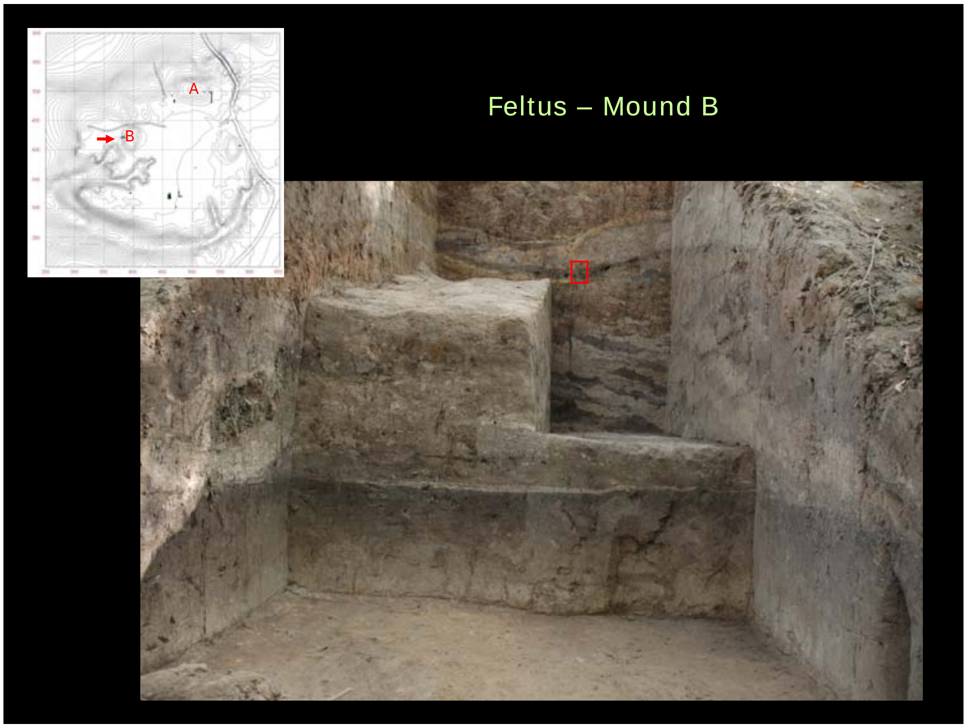

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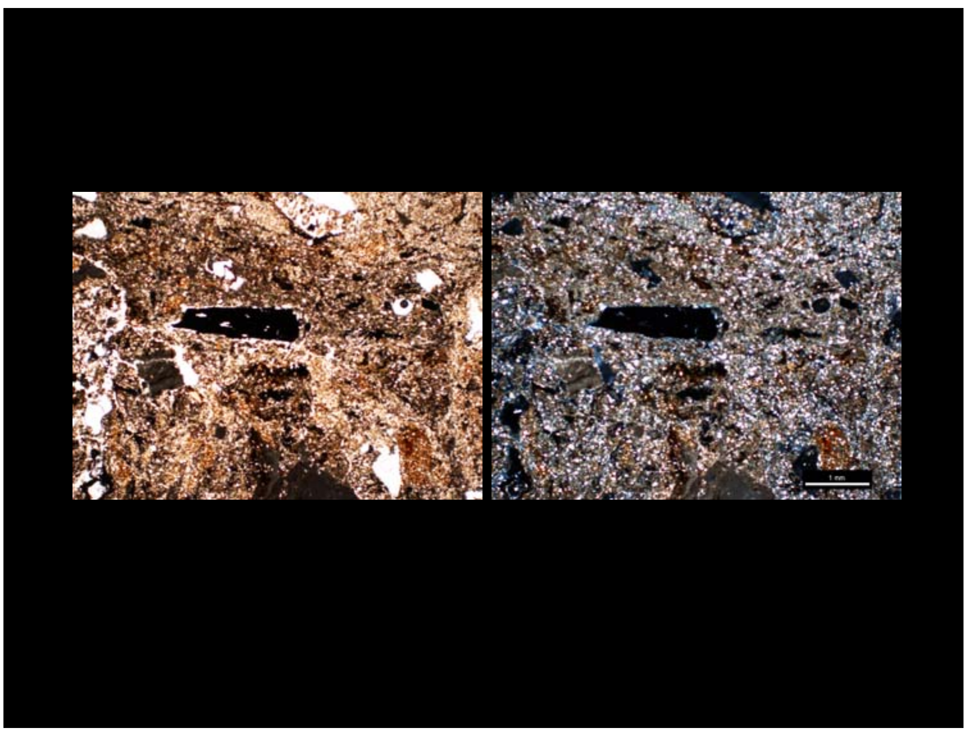

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