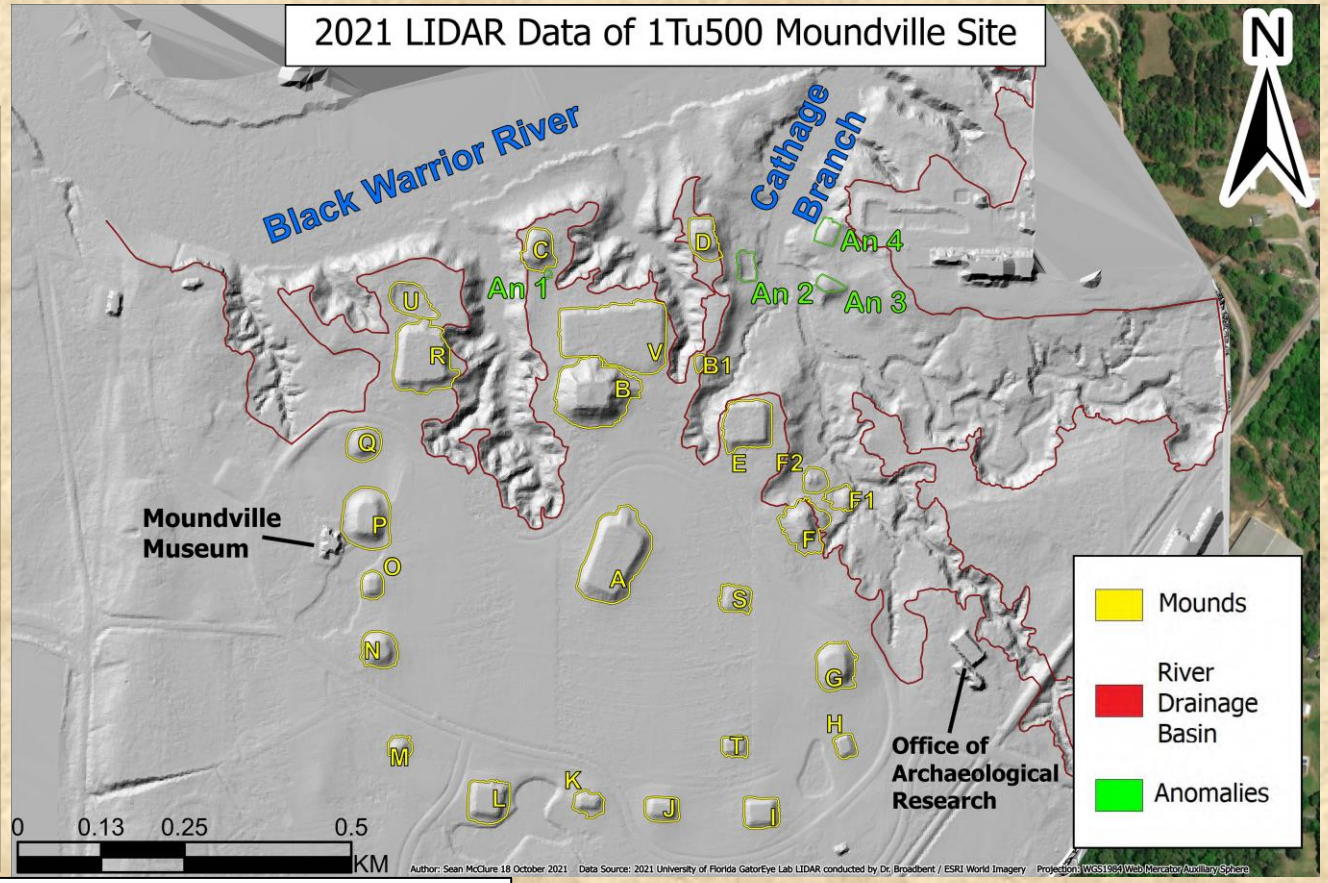
Environmental and Archaeological Analysis of LIDAR Data Collected from Site 1TU500 Moundville in 2021

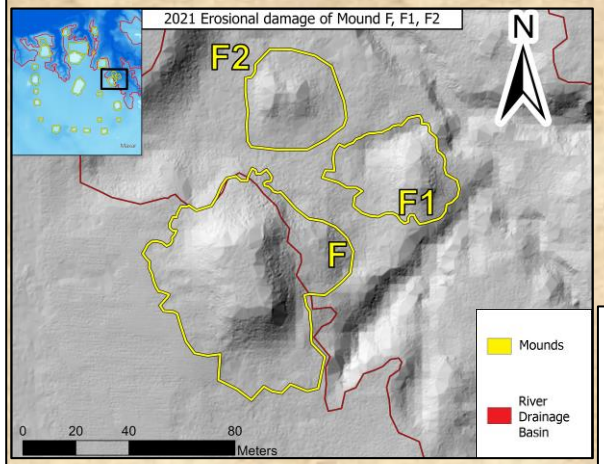
Abstract:
The Moundville site (1Tu500) is the central site of a prehistoric culture that occupies a portion of the drainage basin of the Black Warrior River approximately 65 kilometers down stream of the William Bacon Oliver Lock and Dam. The Site is positioned southwest of the juncture where the Carthage Branch tributary empties into the Hemphill river bend of the Black Warrior River. The Moundville site was inhabited from approximately 1000 to 1650 CE by the original Native American occupants and is comprised of twenty-five known earthwork structure. Since the abandonment of the site, the mounds have undergone continuous geological deflation due to lack of routine structural maintains, historic agriculture that has taken place on the site, and natural erosional processes. After their discovery, Mound B, E, G, R, M, and F have since received reconstruction work to imitate the projected original dimensions of the mounds (Knight 2010). On the 19th of February 2021, LIDAR data of the Moundville site was collected by staff from the University of Florida. The portion of the site surveyed encompassed an approximate area of 2 km by 2.5 km (Broadbent 2021). The analysis conducted during this project will be utilizing this recently collected LIDAR datasets to highlight certain Mound Structure that are experiencing significant erosional damage. Any topographic anomalies that do not correspond with previously recorded archaeological structures will be highlighted as potential undiscovered anthropogenic deposits. The erosional factors that will be focused on are the expanding southern extent of the Hemphill River Bend Drainage Basin and the post-occupational secondary depositing of soil from the surface of the Mound structures due to natural fluvial processes.



Results:
The Hillshade and DEM raster files of the 2021 LIDAR data showed the encroaching nature of the Hemphill river bend drainage basin. The boundaries of the tributaries on the southern edge of the drainage basin appear to be expanding further south. This expanding erosional terrain is most noticeable at the northern to the eastern portions of site 1Tu500. According to the DEM and Hillshade raster files, it appears that nine of the twenty-five known earthworks structures are undergoing active erosion due to expanding tributaries (Mound F, F1, F2, E, B1, D, V, C, R). Mound F1 and F2 have been engulf into the eastern tributary. Mound F, E, B1, D V, C, and R have sustained foundational erosion as the tributaries have expanding into the parameter of these earthwork structures. The peninsula Mound D is positioned on appears to be on the verge of eroding into an island. The mound structures that are positioned in the central portions of the site have sustained geological deflation that has change their original dimensions.

Discussion:
The 2021 LIDAR data provided the most up-to-date topographic data of site 1Tu500 (Broadbent 2021). With this recently collected data, a more modern understanding of the geological state of the mound site is illustrate. Erosional damage to these mound structures has been consistent since the site abonnement by the original occupants. The rate of erosion on these earthworks is a subject to be further examined. The 2021 LIDAR data utilized for this analysis could be compared against LIDAR data collected from an early data to formulate a probable rate of erosion of this area. In the analysis done with the 2021 LIDAR data, it was shown that the expanding boundaries of the drainage basin has and will continue to erode at and encroach on these mound structures.

Methods:
1. The 2021 LIDAR LAS dataset was used as the input to generate a Raster file. The sampling value was set at 0.25 cell size. This geoprocessing function produced a Digital Elevation Model.
2. The 2021 LIDAR DEM was used as the input for a Hillshade geoprocessing function. The Hillshade raster produced is the main file used to illustrate the topographic changes in the surveyed area of the 1Tu500 site.
3. Using the DEM and Hillshade of the 2021 LIDAR data as visual reference, the southern boundary of the Hemphill bend drainage basin was drawn with a polyline feature class. The intended position of this boundary line was meant to correspond with the highest elevation points just before the terrain transitioned into the descending sloped topography of the tributaries. The 2021 Drainage Basin polyline was drawn by referencing the transition from homogenous topographic points into anomalous unclassified points in the DEM and Hillshade raster files. These unclassified points were presumed to be the unlevel descending terrain of the tributaries.
4. A similar approach was utilized to create the polyline illustrating the boundaries of the mound structures included the displaced post-occupation deposits which expand past the original parameter of these earthworks.
5. This same method use to determine topographic transitions was also applied in creating the polylines that denote subsurface anomalies with archaeological potential discovered during visual analysis of the DEM and Hillshade raster files.



References:
Broadbent, Eben. University of Florida, 2021, Alabama Moundville Final Product (ver. GatorEye_SubjectTerm_final_height_z_merged (published 20210219)), accessed November 8, 2021, at URL http://www.speclab.org/gatoreye-data-access.html

Knight, Vernon J. 2010_Mound Excavations at Moundville: Architecture, Elites, and Social Order. University of Alabama Press, Tuscaloosa.