Seramur & Associates, PC
165 Knoll Drive
Boone, NC 28607

July 25, 2023

Ms. Mary Bohlen
North Carolina Heritage Trail, Inc.
126 West Church Street
Mocksville, NC 27028

Re: Geophysical survey of the Beaver Creek house site of Daniel Boone
in Wilkes County, NC

Dear Ms. Bohlen:

Seramur & Associates, PC (Keith Seramur and Joey Anderson) and Appalachian State University, Department of Geological and Environmental Sciences (Dr. Ellen Cowan and students Benjamin Mapes and Michael Medlin) conducted a Ground Penetrating Radar (GPR) and Magnetometer survey to locate anomalies possibly associated with cultural features at the reported Beaver Creek house site of Daniel Boone in Wilkes County, NC (Figure 1). The cabin was reportedly located on the southeastern edge of a the T1 terrace of Beaver Creek. A tributary stream valley borders the southeastern edge of the study area. The T1 terrace of the tributary stream is 6-8 feet below the T1 terrace of Beaver Creek.

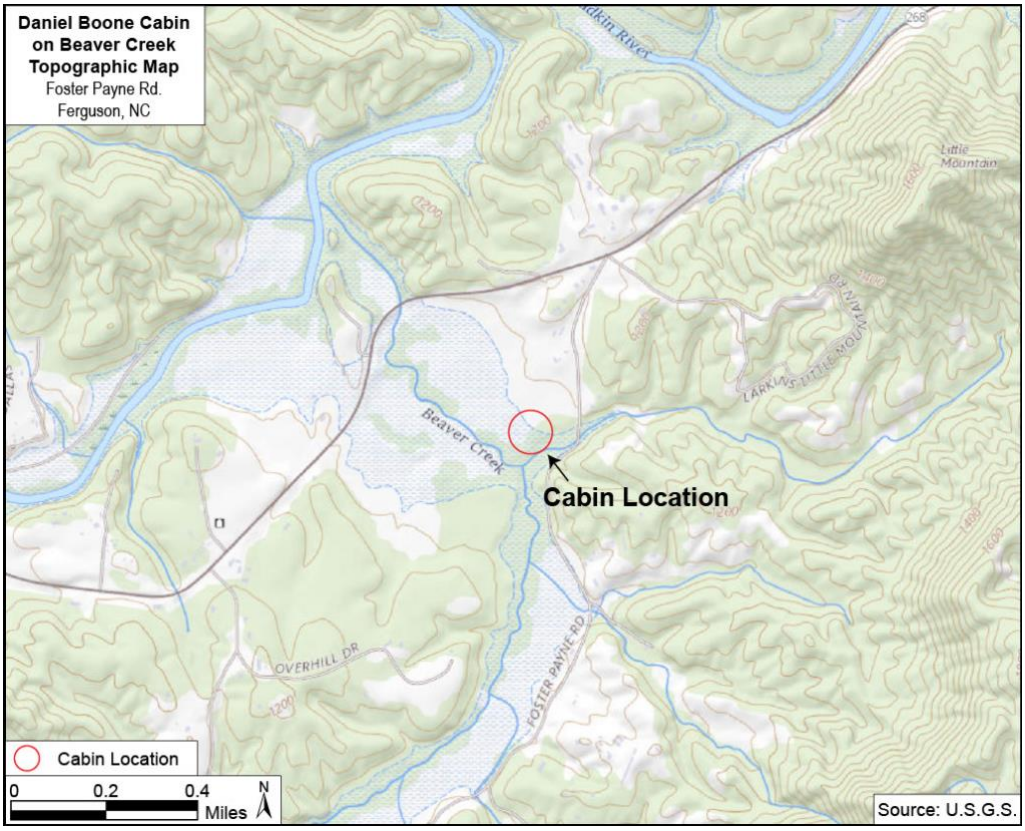

Figure 1. Topographic map showing the location of the house site.

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Methods

A 100 foot by 60 foot rectangular survey grid was established for the collection of GPR and Magnetometer data (Figure 2). Fiberglass tape measures and the Pythagorean theorem were used to lay out the grid over the reported location of the former cabin. The grid corners were located with a Juniper Systems Geode submeter GPS receiver. Seven additional transects of GPR data were collected to the north and south of the GPR grid (Figure 2)

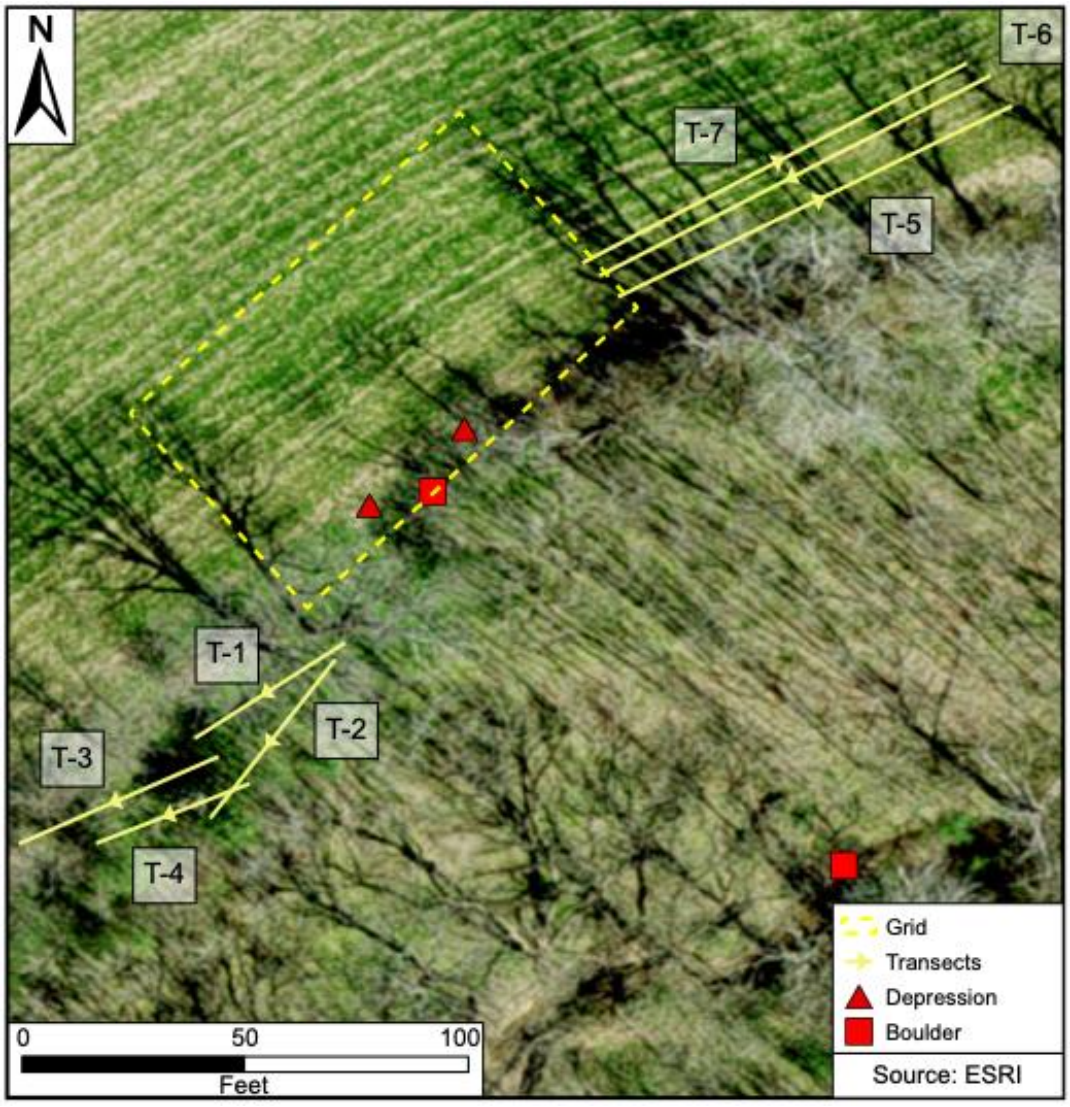

Figure 2. Grid and transect layout across the study area.

A Geophysical Survey Systems, Inc. UtilityScan GPR System with a 350 MHz hyperstacking antenna was used to collect the GPR data. This GPR system is equipped with a calibrated survey wheel to record the antenna location along each transect. The GPR system sends pulses of electromagnetic energy or radar into the earth through a transmitter. The radar waves propagate through the subsurface and are partially reflected back to the receiver when materials with different dielectric properties (conductivity) are encountered below the surface. Remnant structural features (e.g. cellars, privies, walls or foundations) and other areas of soil disturbance have different

dielectric properties than the surrounding undisturbed soil. The GPR system detects these changes and shows them as reflections or anomalies on the radar profiles.

GPR Slice© software is used to produce a 3-dimensional (3-D) model of the geophysical data. Processing steps included selecting time zero and applying an automatic gain control. A background filter was applied to the radargrams (radar profiles) to remove horizontal banding from the profile images. We limit our data processing to avoid filtering out features and avoid producing artifacts (false anomalies) as a result of the processing methods.

Horizontal depth slices across the 3-D model are reviewed at different depths in order to observe possible anomalies related to the historic use of the property. These horizontal slices show the radar reflections returned over a particular thickness of the 3-D model. The GPR slices show high amplitude reflections as green and yellow areas and low amplitude reflections or reflection-free areas as white and blue. The radar profiles are also reviewed to identify and locate areas of soil disturbance related to possible cultural features.

The Magnetometer survey was completed with a GEM Systems GSM-19W Walking Overhauser Magnetometer. Magnetometer data was compiled in an Excel spreadsheet and a shaded relief map was drafted using Golden Software's Surfer® modeling program.

Findings

A LiDAR map showing landforms in the vicinity of the former cabin was produced. The LiDAR map shows the confluence of an unnamed tributary stream and Beaver Creek south of the reported cabin location (Figure 3). The slope from the T1 terrace of Beaver Creek down to the tributary stream terrace is visible immediately southeast of the cabin site. Historic aerial photographs were reviewed for possible evidence of a former cabin, but the area appears as a cleared field without any distinct features (Figure 4).

Historic photographs provided by the North Carolina Heritage Trail, Inc. show a rock pile at what was reported to be the location of this former cabin. Two depressions were observed in the edge of the field where the cabin would have been located. These depression could have been produced when the cabin corner foundation stones were removed. A rectangular rock slab was found to be buried just below the ground surface along the edge of the field between these two depression. There reportedly is a well known spring on the southeast side of the tributary valley (Figure 3).

The USDA Soil Survey have mapped soils in the vicinity of the former cabin as the Danripple sandy clay loam (Figure 5). This soil unit is described as a sandy clay loam over a clay loam that developed in alluvial (river) sediment. The Codorus loam is mapped on the adjacent tributary stream terrace. This soil is finer grained as it is described as a loam over a silt loam and silty clay loam.

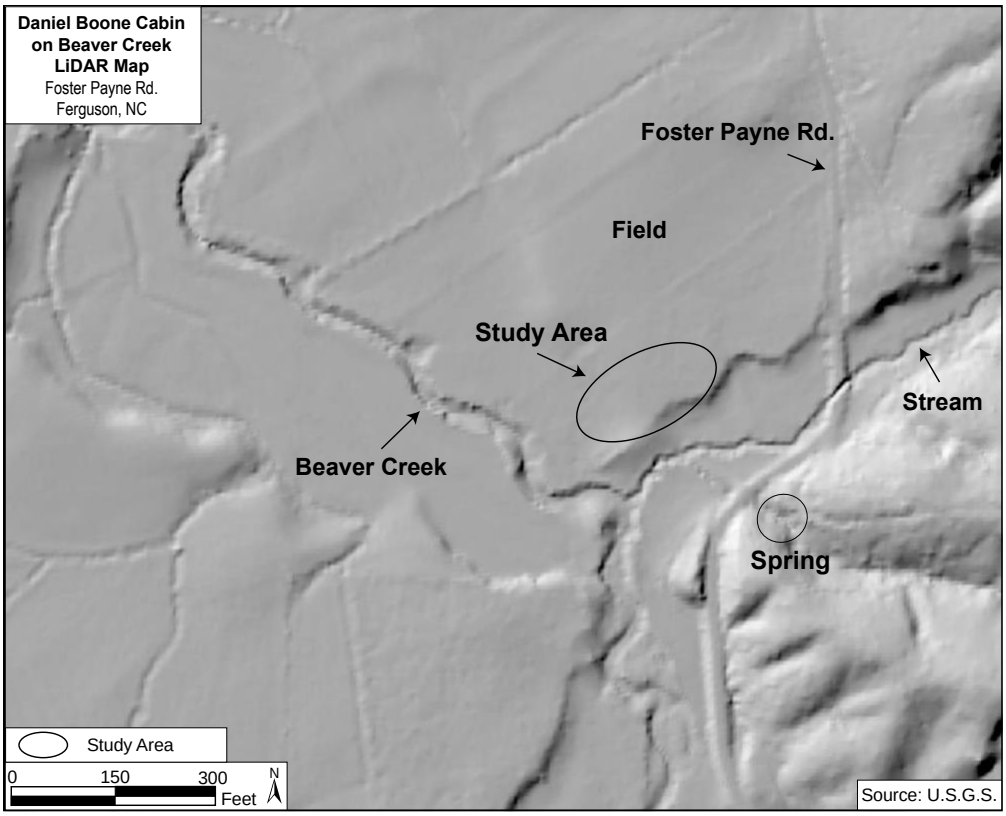

Figure 3. Large scale LiDAR image of the house site and surrounding features.

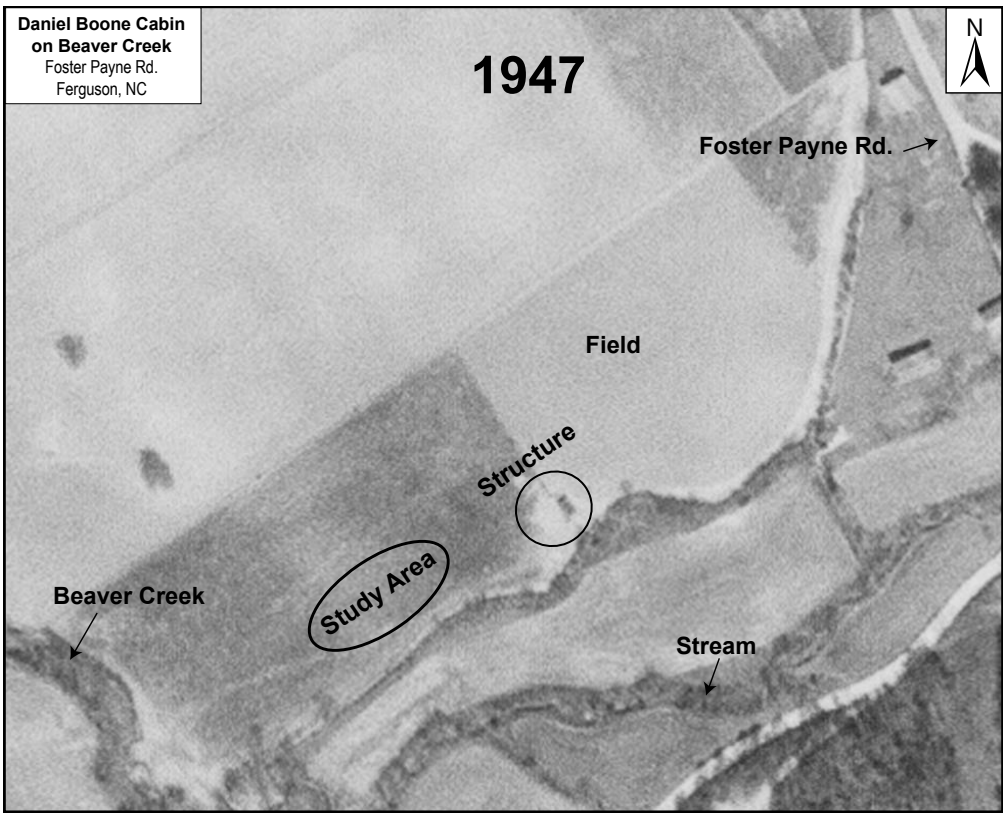

Figure 4. Historical aerial photograph.

The field was reportedly used to raise hogs for a period of time in the 20th century. The 1947 aerial photograph shows a barn or some other type of structure between the two fields that was most likely associated with this hog farming operation (Figure 4). A similar structure was observed on the 1962 aerial photograph. Sand and gravel were mined from Beaver Creek southeast of the study area for a period of time. An access road to the sand and gravel operation extended across the study area. The dredge for this mining operation still remains next to Beaver Creek. The study area has been cropland since the later 1900s. Aerial photographs show a plowed field since the 1980s.

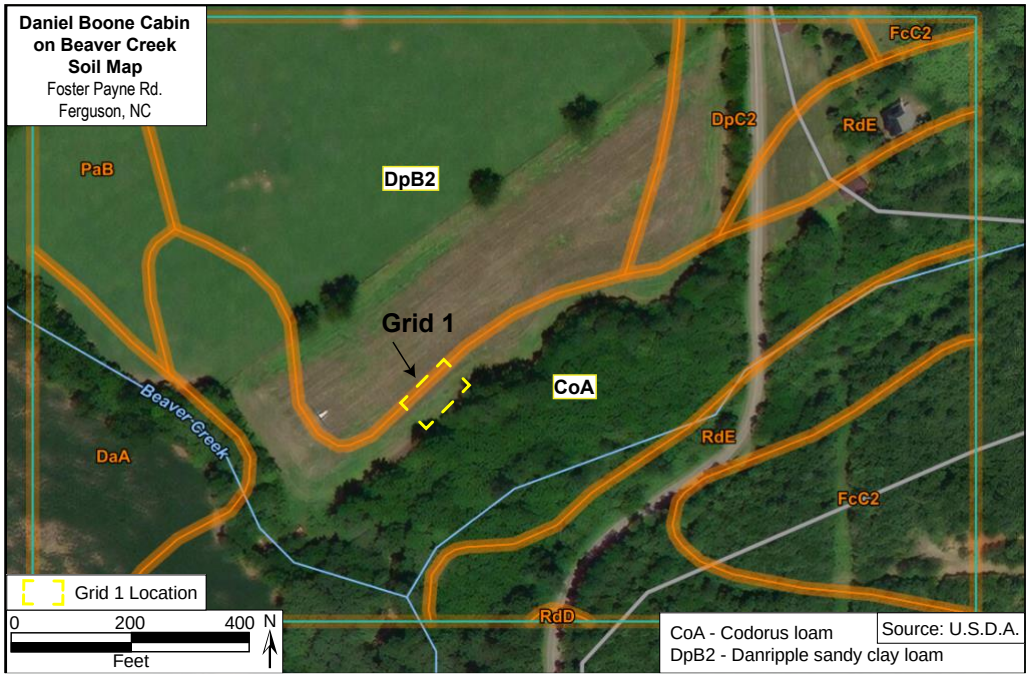

Figure 5. Soil map.

The shallow 0.0-0.3 foot depth slice shows a similar pattern of linear reflections produced by plow scars across most of the grid (Figure 6). Two sets of high amplitude reflections are observed in the vicinity of the former cabin location along the southeast edge of the grid. These reflections are in the vicinity of the two depressions observed along the edge of the field. These reflections could be related to changes in soil materials in the vicinity of the former cabin. The outline of a single pen cabin with a 10 foot addition is overlaid on the interpreted GPR depth slice on Figure 6a. The outline for a single pen cabin (20 feet x 20 feet) is smaller than the distance between the two sets of high amplitude reflections and the depressions observed in the edge of the field. The cabin dimensions would extend between the GPR anomalies and the depressions with a 10-foot addition is added to the side of the cabin (as shown on Figure 6a). It was common to construct an addition onto the side of an original single pen cabins.

The 0.2-0.5 foot depth slice shows similar linear reflections along the plow scars (Figure 7). The high amplitude reflections near the two depressions are also present. Two linear, medium amplitude (white) sets reflections appear to outline the access road for the dredging operation (Figures 7 and 7a). These linear reflections cut across the footprint of the cabin (black dashed lines on Figure 7a).

The 1.8-2.1 foot depth slice shows two edges of a small possibly rectangular reflection-free anomaly northeast of the possible cabin location. The 1.4 to 1.7 GPR depth slice also shows a rectangular reflection-free (blue) anomaly to the northeast of the reported cabin location (Figure 9). A review of the GPR profile at this location show some type of pit or excavation extending to a depth of at least 3 feet (Figure 9a). The size and depth of this anomaly could indicate a former privy.

The magnetometer data was quite noisy and required applying a running mean to the data to smooth out changes in background magnetic readings, possibly related to the plow scars. This smoothed data did not show evidence of magnetic anomalies at the possible cabin location. A rectangular magnetic anomaly was observed in the shaded relief map in the southwestern portion of the grid (Figures 10 and 10a). This anomaly was not observed in the GPR data. The size of the anomaly is about 10 x 10 feet.

Discussion

Physical evidence of the location of the former Boone cabin includes two depressions where corner foundation stones could have been removed. The GPR depth slices and profiles show high amplitude reflections in the vicinity of the two depressions. A large rock is also present along the southeastern edge of the possible building footprint. The plowing and access road appear to obscure the other edges of the structure. The depressions and GPR anomalies would define two corners of a 20-foot by 20-foot cabin with a 10-foot addition.

A rectangular set of GPR reflections was observed northeast of the possible cabin footprint on the 1.4-1.7 foot and 1.8-2.1 foot depth slices. This anomaly along with a GPR profile showing subsurface disturbance could be related to a possible privy.

The magnetometer data was affected by the plow scars. Iron-rich soil from the B-horizon is brought up to the surface in the plow scars. This produced striping in the data that had to be suppressed to observe other features. A rectangular magnetic anomaly was imaged northwest of the possible cabin footprint and could be related to a former outbuilding. Magnetic anomalies can be produced in the soil when a structure is burned down.

The geophysical survey detected anomalies indicative of a former pioneer homestead. Anomalies in the geophysical data could indicate the location of a cabin, privy and outbuilding at the homestead (Figure 11). These observations are supported by identification of two depressions and a large rectangular slab of local metamorphic rock at the possible cabin location. The rectangular rock slab was buried 6 inches below the ground surface (Figure 12a). It is large enough to be used as a foundation or chimney stone. A large boulder was also observed in the tributary stream near the homestead (Figure 12b). The source of this boulder is not known, but it is not a natural deposit. It likely has something to do with the past use of the property.

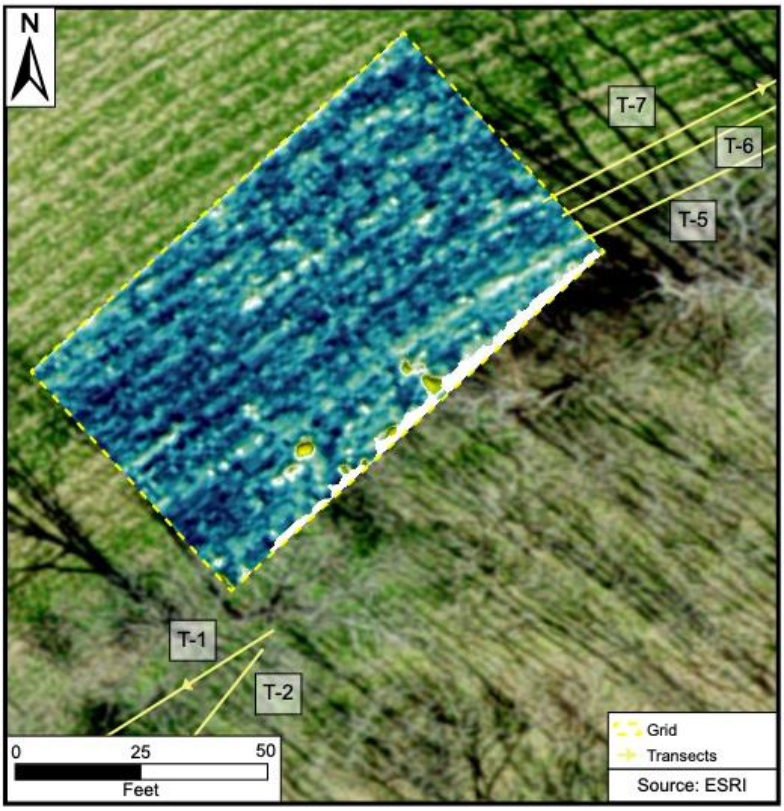

Figure 6. 0.0-0.3 foot GPR depth slice.

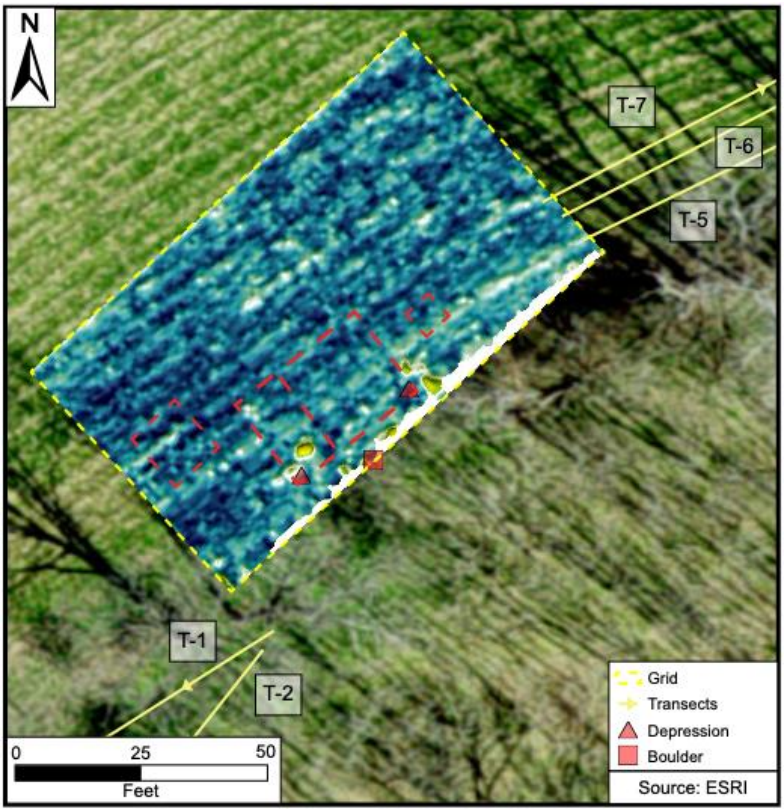

Figure 6a. 0.0-0.3 foot GPR depth slice with outline of cabin and other features.

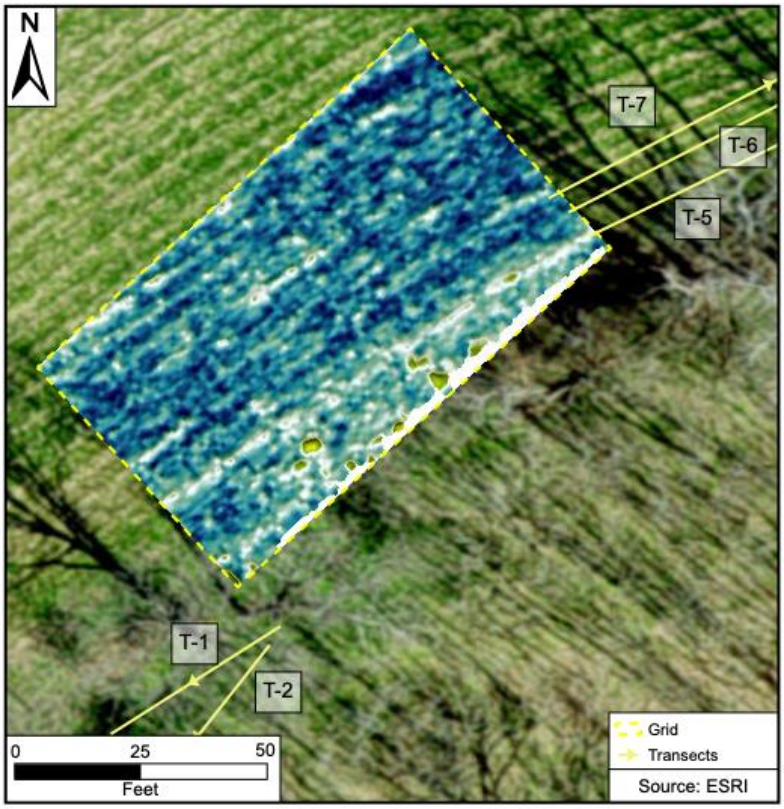

Figure 7. 0.2-0.5 foot GPR depth slice.

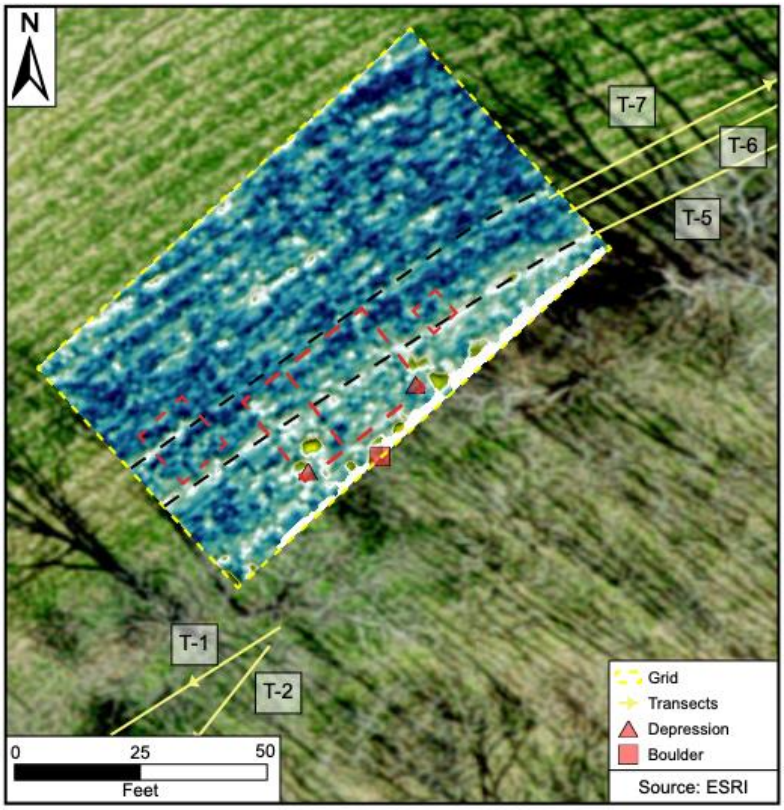

Figure 7a. 0.2-0.5 foot GPR depth slice with outline of cabin and other features.

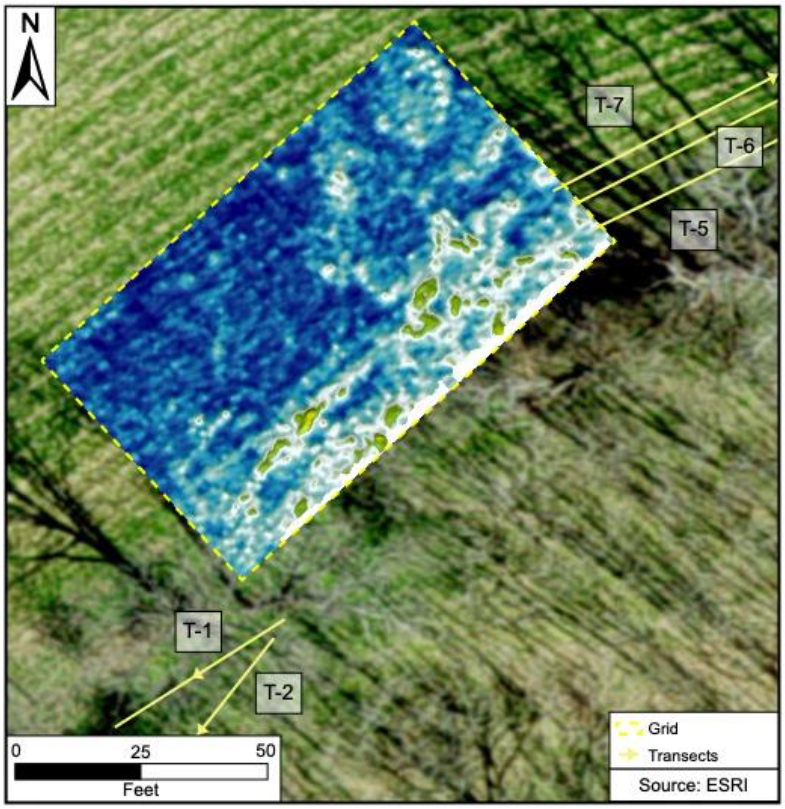

Figure 8. 1.8-2.1 foot GPR depth slice.

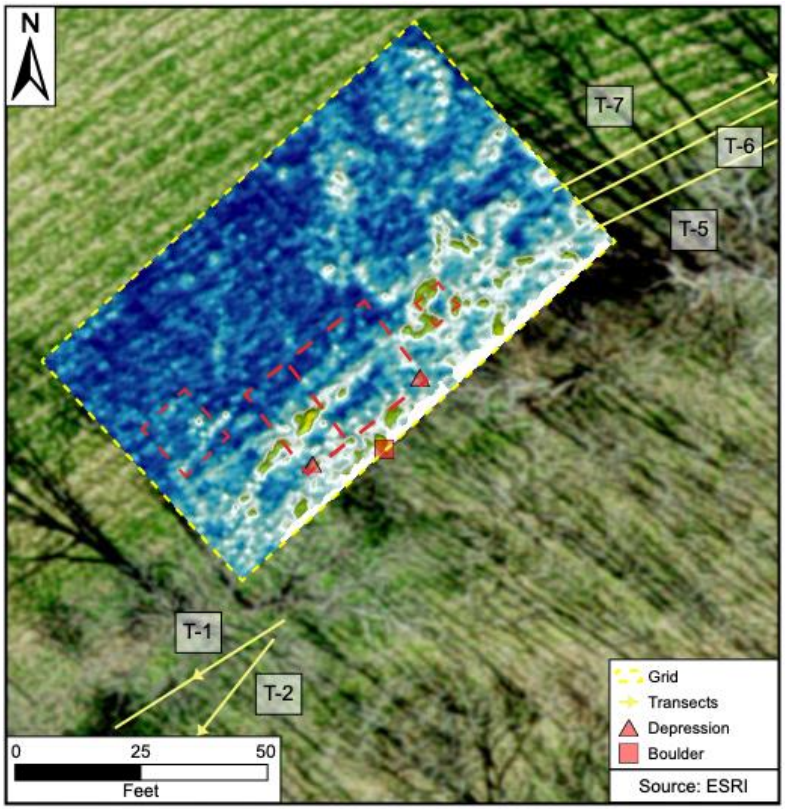

Figure 8a. 1.8-2.1 foot GPR depth slice with outline of the cabin and other features.

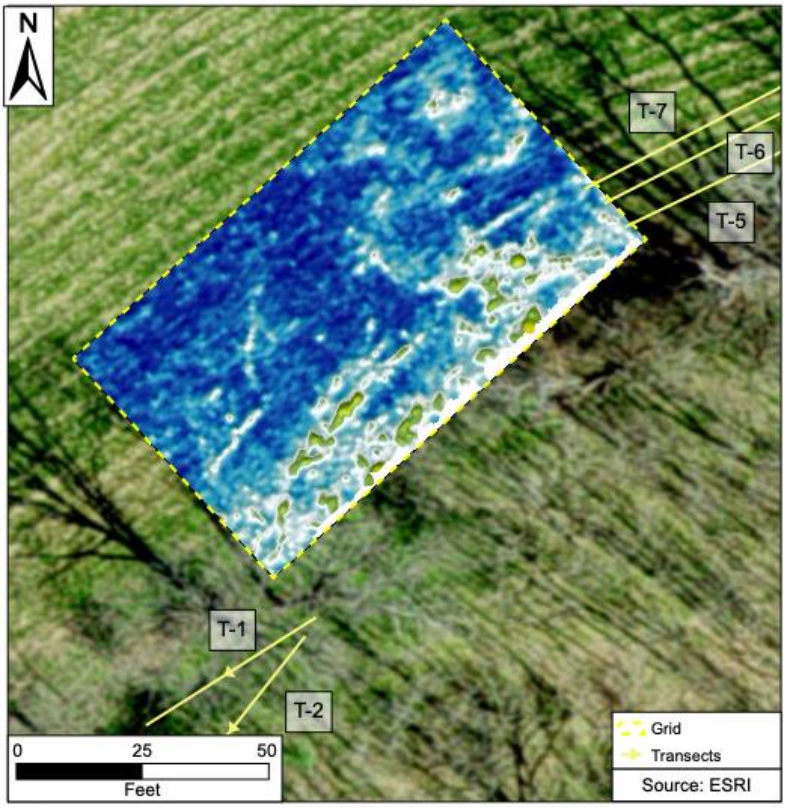

Figure 9. 1.8-1.7 foot GPR depth slice.

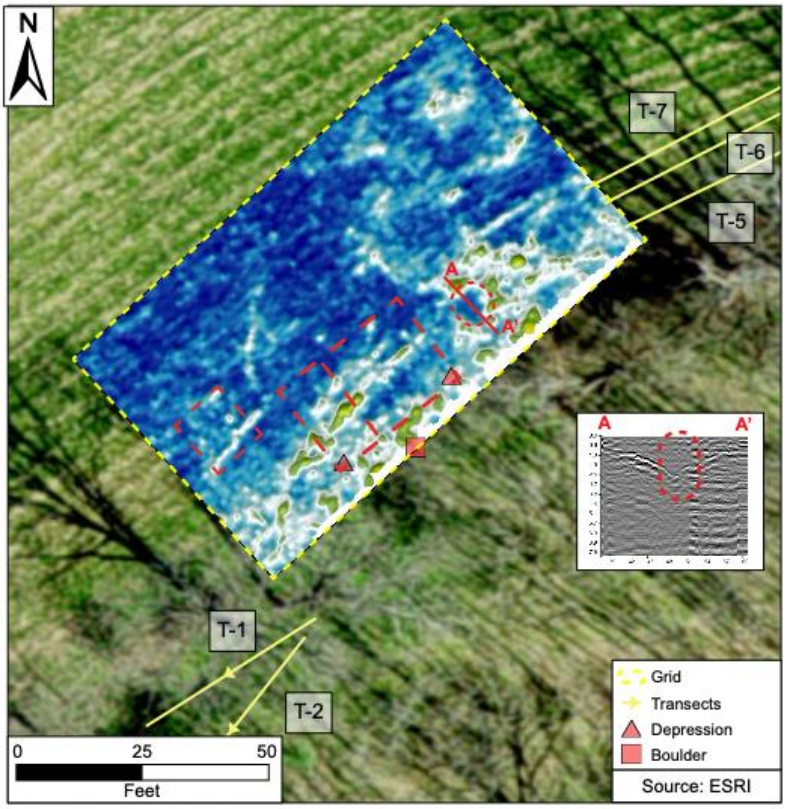

Figure 9. 1.8-1.7 foot GPR depth slice with outline of cabin and reflection-free anomaly is shown by red dashed circle. Cross-section A-A' shows some type of excavation or pit across this anomaly.

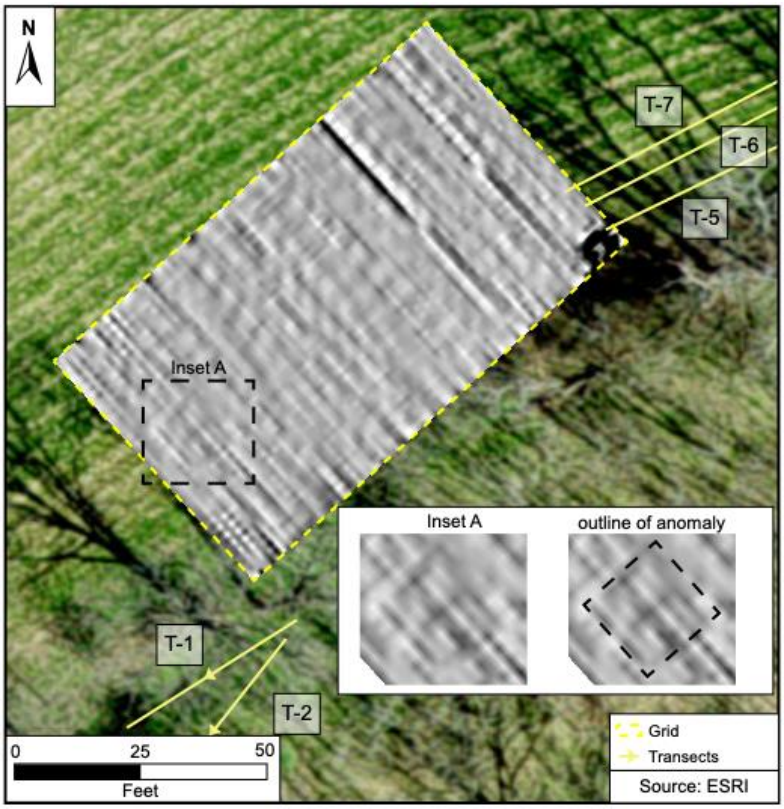

Figure 10. Magnetometer shaded relief map.

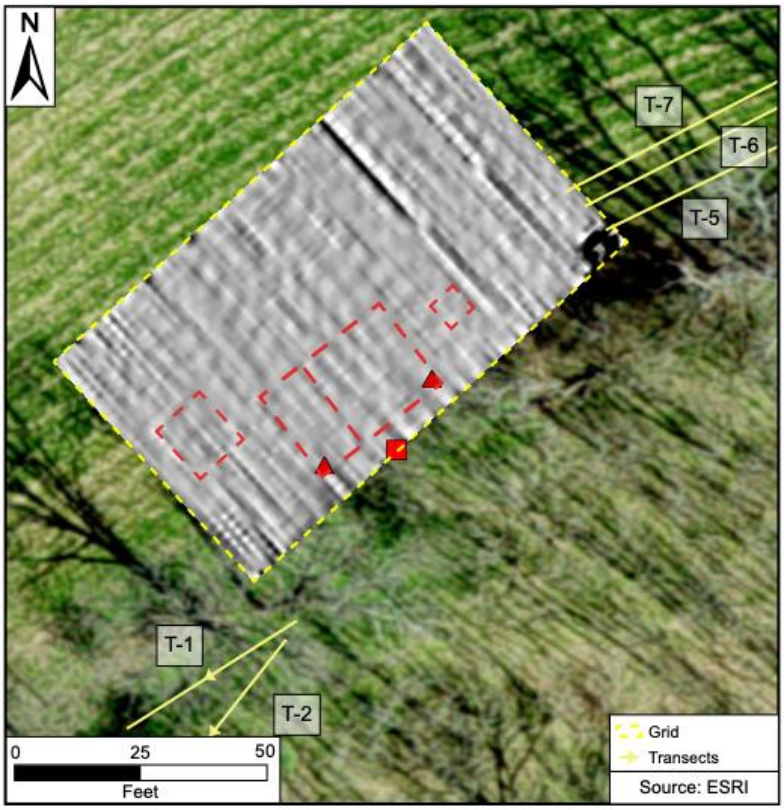

Figure 10. Magnetometer shaded relief map with outline of the cabin and other features.

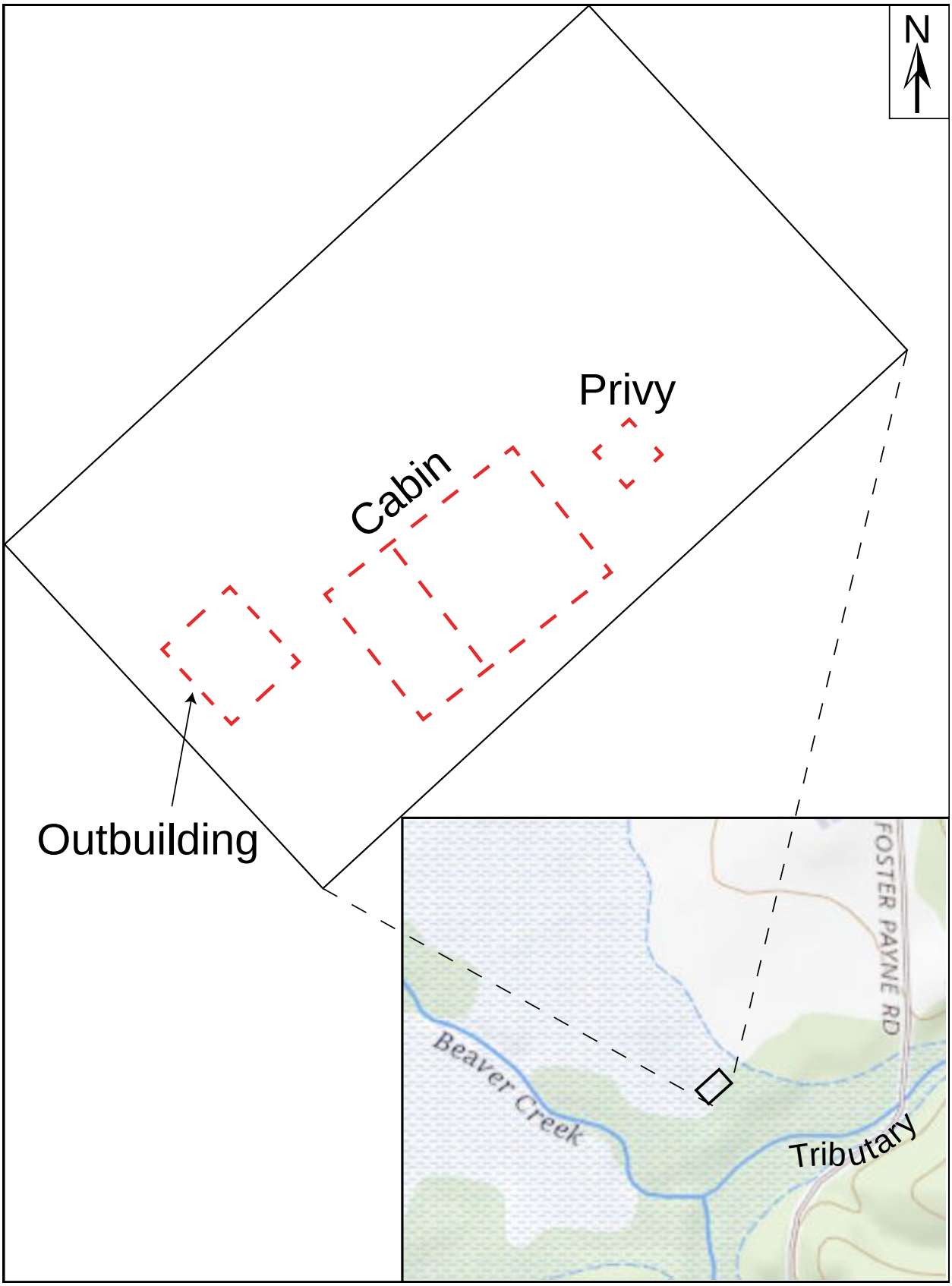

Figure 11. Map of the possible cabin location relative to a possible privy and outbuilding.

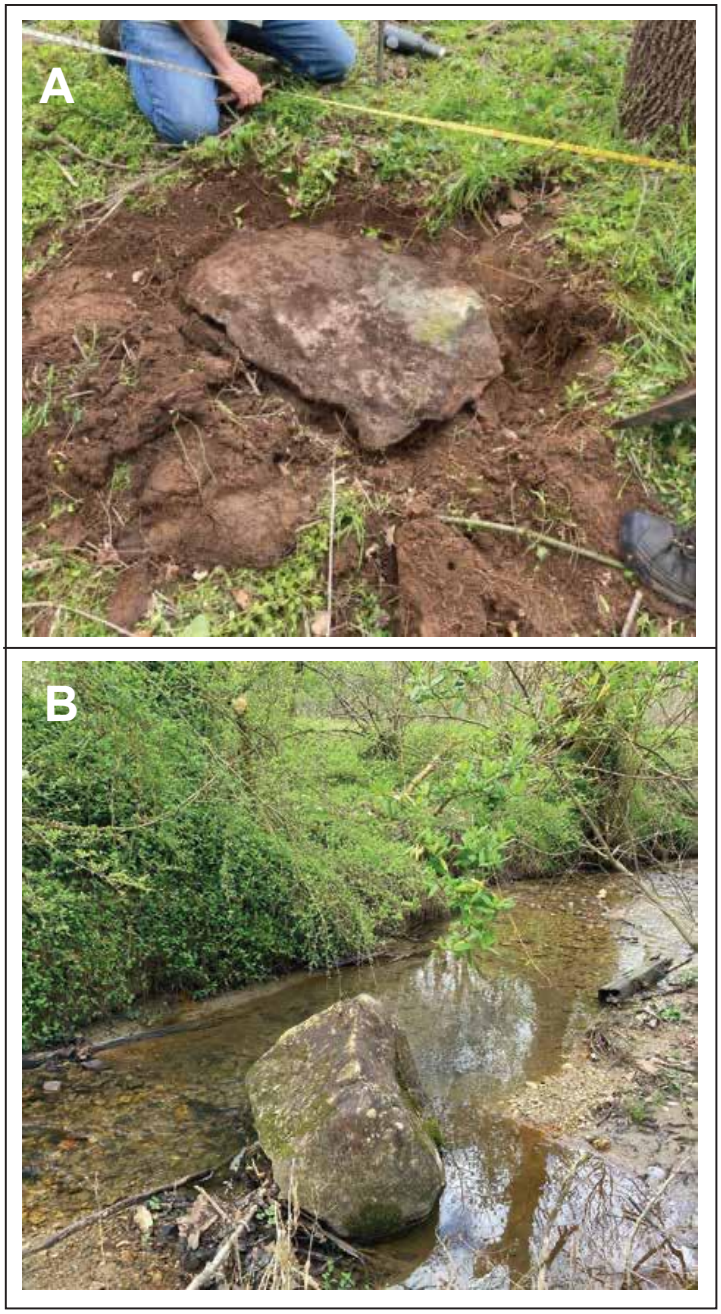

Figure 12. Rectangular rock slab identified adjacent to the possible footprint of the cabin (a). Large boulder in tributary stream near the cabin location.