Integration of shallow geophysics, archaeology and archival photographs to reveal the past buried at Ingleside Plantation, Piedmont North Carolina (USA)

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Abstract

Ground penetrating radar supported by electrical resistivity tomography and gradiometer surveys were used to map buildings and infrastructure documenting sequential property use by three generations of the Jacob Forney family who began as farmers in the backcountry of North Carolina and rose to prominence in government and industry within the Southeastern United States. At Ingleside, the antebellum plantation house has been preserved, and the adjacent property remains relatively undisturbed. Context for the geophysical surveys was provided by archival photographs, written accounts including monographs and newspaper articles, and an archaeological excavation of the stone hearth within the plantation’s summer kitchen. The location of an early log home with a stone-lined cellar with ties to the Piedmont Campaign of the American Revolution (in 1781) was newly discovered. In addition, a historic road, kitchen garden, and the postholes from an early post-in-the-ground building were imaged within the subsurface. The external summer kitchen and privy are associated with the plantation house constructed in 1817. Several cesspool vaults of potential privies are ingrown with trees. The results of the geophysical surveys document the evolving land use within one family in the American South and can be connected to a specific event in history, a goal of historical archaeology.

KEYWORDS
antebellum plantation, electrical resistivity tomography, gradiometer, ground-penetrating radar, Revolutionary War, southeastern archaeology

1 | INTRODUCTION

The brick mansion at Ingleside Plantation, Iron Station was placed on the National Register of Historic Places as one of the finest antebellum Federal-style houses in North Carolina (Wells, 1971). Built in 1817 for Daniel Munroe Forney, it originally included 867 acres of rolling hills in eastern Lincoln County (35°27′49″N, 81°02′39″W) in the North Carolina Piedmont. The two-story brick mansion had four additional private owners over its history. In 1951, the 584-acre plantation was purchased by the David Clark family who preserved and maintained the remaining structures including the plantation house, smoke house, barns and a hand-hewn log cabin. The house was updated and continuously occupied until the summer of 2018 when Caroline Clark donated the plantation house along with 5.75 acres to
Preservation North Carolina to ensure its historic conservation (Howard, 2018). During this transition in ownership, the Lincoln County Historical Association (LCHA) partnered with the Department of Geological and Environmental Sciences at Appalachian State University to conduct non-invasive shallow geophysical surveys to assess the location and presence of outbuildings and infrastructure buried within the boundaries of the property.

Geophysical prospecting is challenging at historical sites because small subsurface features may produce a weak signal relative to noise caused by local environmental disturbance (Bevan, 2006; Piro, 2009). Several studies at historical sites have attempted to overcome this disadvantage by using more than one geophysical method (Bevan, 2006; Clay, 2001; Garrison, 1996; Kvaanme, 2003; Lulewicz et al., 2019; Rizzo et al., 2018; Turner et al., 2018). In this study, we first used ground penetrating radar (GPR) and later added direct-current electrical resistivity tomography (ERT) and magnetic gradiometer surveys to image contrasting subsurface characteristics.

2 | HISTORICAL BACKGROUND

The historical significance of this property pre-dates construction of the plantation house because the site was originally the homestead of Jacob Forney and his wife Maria Bergner who arrived in Tryon County, NC (now Lincoln County) by way of Philadelphia in 1754 (Avery, 1928). Jacob Forney distinguished himself as a backcountry pioneer and a loyal patriot during the American Revolution (Abernethy, 1944). By the time of the Battle of Ramsour’s Mill in nearby Lincolnton (Figure 1) on 20 June 1780, he was 59 years old and considered too old to join the army; however, his three sons served in the patriot army (Hunter, 1877). The Revolutionary War came to the Forney farmstead in January 1781 following the defeat of the British army at the Battle of Cowpens in South Carolina on 17 January. On 25 January at Ramsour’s Mill, Lord Cornwallis, commanding general of the British forces in the lower South, ordered his troops to burn all baggage and carriages except for what was absolutely necessary (Tarleton, 1781, p. 223). This strategy was intended to transform the British army from one encumbered by a large wagon train into a light force that could move rapidly through the rugged North Carolina backcountry in pursuit of the patriot general, Daniel Morgan. As a consequence of this action, the soldiers and officers, including Lord Cornwallis, were required to live off the land (Heaton, 2010). On 28 January, they marched to Beattie’s Ford on the Catawba River but found it swollen by heavy rains and impossible to cross. According to an account by C.L. Hunter in Sketches of Western North Carolina (1877, 255), a Tory supporter directed Cornwallis to the Forney plantation, about 5 miles from the Catawba River. Cornwallis remained at Inglewood for 3 days consuming all of Forney’s livestock including cattle, hogs, chickens, sheep, geese and 40 gallons of brandy. Three horses were stolen, and the family gold, silver and jewellery were dug up from their hiding place in the distillery. Cornwallis made his headquarters in the upper story of their log house, whereas Jacob and Maria were held captive in the cellar. By 1 February, the rain subsided, and Cornwallis and his army crossed the Catawba River at Cowan’s Ford (Figure 1). At this time, the river was estimated to be swollen to 4-ft deep and up to half a mile wide. The Battle of Cowan’s Ford at this crossing became the first significant battle of the Piedmont Campaign (Heaton, 2010).

In 1788, a state law granted 3000 acres of vacant land free of all taxes for 10 years to anyone who built an iron-works. It was stipulated that the land be unfit for cultivation and 5000 pounds of iron produced within 3 years (Williams & Williams, 2012). Peter Forney, Jacob’s second son was ‘granted’ the Big Iron Ore Bank, a ridge of iron ore running southwest to northeast, seven miles east of Lincolnton (Figure 1), and he became the first iron manufacturer in the western part of North Carolina (Avery, 1928). By 1823, there were 10 forges and 4 furnaces in Lincoln County (Williams & Williams, 2012).

In 1817, Daniel M. Forney’s enslaved population built the plantation house at Inglewood and local tradition suggests as a wedding present for his bride, Harriet Brevard on the family land given to him by his father, Peter (officially in 1824). The house was described as standing ‘just a few feet away from the original pioneer’s home of logs’ (Avery, 1928). Although the designer and architect of the mansion are not recorded (Lewis, 2007), it has been suggested that Benjamin Latrobe, the architect of the United States Capitol, contributed to the design (Avery, 1928). The plantation house was constructed of Flemish bond brick produced on the property by enslaved people, and the granite steps and window ledges were quarried locally (Avery, 1928). According to the census records, Daniel Forney owned 27 slaves in 1820 and 38 slaves in 1830. James Anderson, who owned the property from 1838 to 1873, owned 45 slaves in 1850 and 50 slaves in 1860. It has also been noted that there were six slave dwellings on the property in 1860. Daniel Forney
maintained an active agricultural plantation raising 7 children. In 1834, he moved to Alabama in search of greater wealth, and the 867-acre Ingleside Plantation was sold in 1838 (Avery, 1928).

The purpose of this study is to use shallow geophysical exploration, focused archaeological excavation and historical research to understand the past uses of the property and to connect the plantation to its Revolutionary War history. As in most historical and landscape archaeology, the major focus was on identification of buildings whose remains are buried in the subsurface (Bevan, 2006). A small area was excavated around a kitchen hearth by January Costa working for the LCHA in 2010 (31LN216) (Figure 2). Context for the identified buildings is provided by archived photographs and written accounts including monographs and newspaper articles.

3 | STUDY AREA

Extent outbuildings surrounding the plantation house were identified in their current locations on the earliest aerial photograph dated 1948; however, roads in the area have changed location several times based on photographs from 1950 and 1969 (USGS EarthExplorer, 2019). The front of the mansion was graded for a circular drive and shrubbery obscures its southeastern side. Therefore, the mowed lawns to the rear and to the northwest of the plantation house were targeted for geophysical surveys because they appear in these aerial photographs to have been minimally disturbed (Figure 2). We also surveyed a cleared area surrounding a cabin to the west of the mansion, but these data are not reported here.

The plantation house and grounds are positioned on the top of a northeast-southwest trending ridge, locally known as Forney Ridge between two small tributary streams. Soils within the relatively flat survey area are classified as Cecil sandy clay loam with 2–8% slopes (USDA, NRCS, 2019). Soils are well drained and developed in residual parent material consisting of granitic gneiss saprolite with an average depth to the water table of more than 2 m. These relatively sandy soils are favourable for penetration of GPR (Conyers, 2004).

4 | GEOPHYSICAL METHODS

4.1 | GPR

During our first visit in July 2018, we laid out 12 rectangular survey grids for collection of GPR data (Figure 2). The grid corners were marked with magnetic nails and surveyed with reference to existing structures with a Nikon Total Station. Unidirectional GPR data were collected as parallel transects at a 0.5-m spacing. We used a Geophysical Survey Systems, Inc (GSSI), 400-MHz antenna and a SIR-3000 Single Channel GPR data acquisition system with a calibrated survey wheel. This antenna imaged to an approximate depth of 3 m. Radan software (GSSI) was used to process individual transects across features of interest. GPR-SLICE (Woodland Hills, CA, USA) was used to create a 3-D model of the radar grid data and horizontal time slices (or depth slices) that image reflection patterns at different depths in the subsurface. GPR can effectively be used to identify buried features, but the method cannot identify the material composition (Bevan, 2006). Low-amplitude reflections or reflection-free areas on time slices (white to blue) are produced in soil with little contrast in dielectric properties (e.g., homogenous backfill). Higher amplitude reflections (green to yellow) are produced by subsurface materials with different dielectric properties, which could indicate buried features. Additional GPR data were collected in grid 13 and along 0.5-m transects using a GSSI UtilityScan with a 350-MHz hyperstacking antenna mounted on a three wheeled cart with a calibrated survey wheel (Figure 2). The hyperstacking antenna averages hundreds of
radar pulses using high speed interpolated sampling, which improves the signal to noise ratio, effectively producing a cleaner image of subsurface reflectors as well as extending the penetration depth. Data processing included adjusting time zero, completing a background removal and adjusting the time variable gain to enhance deep reflections. Hyperbola matching indicated a dielectric constant between 0.106–0.063 m/ns for soils at the site. A dielectric constant of 0.077 m/ns was used to estimate the depth of the GPR time slices and anomalies on the radar profiles.

4.2 | Direct-current ERT

Five ERT transects were collected with a 28-electrode AGI SuperSting R8 and a dipole–dipole extended roll-along array with 0.5-m electrode spacing. We use these data to investigate subsurface compositional changes coinciding with subsurface anomalies previously identified in GPR transects. The ‘extended’ array signifies that the array collected redundant data in order to minimize errors and produce a more robust subsurface model. The AGI EarthImager 2D software package was used to invert resistivity data into subsurface model cross sections, and several anomalous resistivity values were removed from each transect before inversion. The model uses an iterative solver that iterates until a satisfactory RMS error is achieved. While resistivity data, especially from dipole–dipole arrays, are often noisy, we were able to achieve RMS errors of less than 3% using 8 or less iterations. Experiments with removing different numbers of noisy data resulted in only minor differences in the final inverted subsurface model. Thus, the subsurface inverted models presented show robust features that are well-constrained by the data.

ERT uses a direct injected electric current between two electrodes implanted in the ground and measures the voltage change between two additional electrodes that do not carry a current. A saltwater solution was prepared in the field and poured on each electrode along the transect to reduce unwanted contact resistance between the electrodes and the near-surface material. Mineral grains within soils and rocks generally have relatively high electrical resistivity (i.e., low conductivity), so the overall bulk resistivity of a subsurface geologic material is often primarily controlled by the amount of pore water present combined with the parent material’s resistivity. Because disturbed soils are typically less compacted and thus more porous and permeable, disturbed soils typically present as low resistivity anomalies in ERT images. Differences in materials and soil disturbance are accompanied by differences in resistivity; therefore, ERT surveys can be useful in detecting bodies of anomalous materials and for estimating the depth to a buried surface (i.e., Tsokas et al., 2009). The electrode spacing of 0.5 m resulted in data collected to approximately 3-m depth. Unlike GPR, which requires accurate estimation of radar velocity to calibrate the depth scale on radar images, ERT has a known and well-defined depth scale (based on the electrode spacing). So, ERT combined with GPR can provide complementary data. Anomalies detected on the ERT profile were tested by probing into the subsurface with a steel rod.

4.3 | Magnetic gradiometer

Metallic nails marking the corners of 6 grids were located using a Schonstedt GA72 fluxgate magnetic locator, after which they wereried up and temporarily replaced with plastic flags, which is necessary before conducting a magnetometer survey (Kvamme, 2003). Additionally, several buried iron objects were discovered and removed prior to the survey (Figure 2). A GEM Systems GSM-19W Walking Overhauser gradiometer was used to collect magnetic data at 0.3-m transect spacing. These data were compiled in a spreadsheet, and shaded maps were drafted using Golden Software’s Surfer® modelling program. Magnetic gradiometer surveys detect the contrast in magnetic properties between archaeological features and surrounding soils; therefore, it is an effective method to identify ferrous debris or in situ burning of structures (Aspinall et al., 2008; Bevan, 2006). A 1-in diameter soil corer with a slide hammer and a steel probe were used to confirm the geophysical anomalies.

5 | RESULTS

5.1 | Structure 1

Structure 1 is identified by four circular reflection free anomalies, 1.25 m in diameter that appear on GPR depth slices from the surface to 0.5 m depth within grids 7 and 8. (Figure 3a). These circular features are also apparent as visual changes in grass composition within the lawn. The anomalies were cored with a soil probe and found to contain homogeneous fine-grained soil with charcoal at a depth of 0.5 m. These anomalies could represent postholes at the corners of a rectangular structure, approximately 4.5 × 9 m. The gradiometer data are noisy, but bipolar magnetic anomalies are observed at 3 of the 4 postholes (Figure 3b). The 4th corner was obscured by magnetic anomalies in the vicinity of the excavated hearth. Areas of low resistivity are observed on ERT-1 at two locations that correspond with postholes (Figure 3c). The depth extends between 0.5 and 1 m. GPR profiles across the two anomalies show truncated reflections along the edges and a change in reflection patterns within the anomaly. The apparent structure outlined by the postholes is not visible on aerial photographs or in archival photographs, nor are any building remnants detected in this location.

5.2 | Kitchen hearth excavations and Structure 2

5.2.1 | Archaeology

The predominant concentration of artefacts found through archaeological excavations was around the fallen stone chimney hearth area located to the west of the brick plantation house (Figure 4). A surface collection was completed between the hearth stones and around the surrounding perimeter prior to the initiation of formal excavations in October of 2010. The recovered artefacts include several colours of
bottle and container glass, window glass, milk glass, metal and a ceramic drawer handle (Figures 5a–d). In addition, there was distinct variety within the ceramics recovered including whiteware, pearlware (plain and red transfer print), Albany-Bristol glazed stoneware, green and grey salt glazed stoneware, Catawba Valley alkaline glazed stoneware and porcelain (Figure 5b,c). Also collected within the perimeter of the hearth area were two lithic pieces that are Native American artefacts, one being a quartz side scraper and the other a large rhyolite flake from tool manufacture.

A Phase I reconnaissance survey was used to develop the research design including subsurface testing through excavation units. The methodology used for the testing was based on many factors including time constraints, funding and specifications of the property owner at the time. The project layout was derived by archaeological requirements of the State of North Carolina for subsurface testing. The project boundary was designated by the placement of wooden and flagged stakes in the visible hearth area. An arbitrary datum point was established at the southeast stake for purposes of grid placement and to allow for more functional re-establishment of the datum in the future. The designation of 300N/300E was given to the datum point to allow for further testing and expansion of the grid into other areas of the property if needed.

A total of 5 (2 × 2 m) units excavated yielded an abundance of historic artefacts (Figure 2). The excavation units were placed in the areas directly adjacent and within the stone hearth area and are listed
as follows: 324N/297E, 324N/295E, 326N/295E, 326N/293E and 324N/297E. Examples of artefacts excavated include items such as animal bones, bone toothbrush fragments, glass (bottle, container, window), buttons (metal, porcelain, bone and shell), clay marbles, slate pencils, buckles, porcelain doll fragments and an abundance of historic ceramic types (Figure 5). The ceramics include pearlware (blue and green shell edged, mocha dipped wares, polychrome hand painted and blue transfer prints), stonewares (Catawba Valley alkaline glaze, salt glaze, Bristol glaze, Albany slip) and coarse earthenware redwares with lead glazes that resemble locally made examples in North Carolina. These vessels could stem from productions made in the Wachovia area outside Winston Salem or from the local Catawba Valley region, but more analysis with X-ray fluorescence spectroscopy is needed for a conclusion of clay origin. Another, specific ceramic type identified is Chinese export porcelain in the ‘Famille Rose’ category that dates 1720–1734 (Figure 5c). This is not indicative of actual occupation period because the type is considered ‘nice’ porcelain and is kept for extended periods of time. However, the artefacts recovered during the formal excavations suggest a former ‘summer kitchen’ structure built around the same time as the main brick plantation house, in the early nineteenth century. Further archaeological work is necessary in the vicinity of this particular area in order to further identify building function and time frame of use.

Other areas around the property were observed, and several artefacts were also surface collected around the pump house, such as Catawba Valley alkaline glazed stoneware, yellowware and hand painted whitewares.

5.2.2 | Geophysics

Structure 2 is located in grids G-1 and G-8, adjacent to the excavated kitchen hearth (Figure 6). There is no clearly visible foundation for the structure, but a linear pattern of low amplitude reflections adjacent to high amplitude reflections delineates the approximate eastern edge of the structure (outlined by the red dashed line on Figure 6). The southern outline of this apparent outbuilding is likely obscured by the presence of the modern septic tank and drain field, which is prominent on the GPR slices (Figure 6) and in magnetometer data (not shown). The anomalies produced by the concrete septic tank, drain field and buried powerlines are high amplitude reflections in the GPR data that mask the subtle variations associated with a relict building footprint. The gradiometer data were also affected by the septic system.

5.3 | Structure 3

Structure 3 was identified in all 3 geophysical data sets and is associated with a depression in the ground surface located 30 m to the
south of the plantation house. A rectangular outline approximately 5.5 × 12.5 m is shown on 0.2- to 0.3-m GPR depth slice imaged in G-3 and G-4 (Figure 7a). The eastern side of the footprint coincides with granite boulders that appear at the surface and on the 0.1- to 0.2-m depth slice. These foundation stones do not appear along the western side of the structure. GPR slice from 0.7–0.8 m in G-6 shows high amplitude reflectors that appear to be rubble below the depression on the east side of Structure 3 (Figure 7b). The magnetometer data show a strong irregular set of bipolar anomalies within the same area. An isolated bipolar magnetic anomaly coincides with a buried iron spike driven into bedrock a few metres southwest of the corner of Structure 3 (Figure 7c).

Two ERT profiles and corresponding GPR transects image a 5 × 5 m cellar that extends 1.5 m below the level ground surface within the depression (Figure 8a,b). A cross section of the cellar shows vertical walls beneath the surface cut into high resistivity material that is likely composed of weathered local granitic bedrock (Figure 8b). The edge of the cellar was probed along ERT-4, and rock was encountered just below the surface suggesting the presence of a rock wall (Figure 8a). The floor is horizontal, and the lack of high resistivity (red) material on ERT-5 indicates that it is likely composed of compacted earth above the saprolite (Figure 8b). The GPR profiles show numerous small hyperbolas within the cellar that might be produced by large rocks or metal objects buried within the soil that fills the cellar (Bevan et al., 1984; Conyers, 2004). This interpretation is supported by observations of magnetic anomalies (Figure 7c; Bevan, 1994).

5.4 | Geophysical identification of a privy, plow scars and road bed

In addition to the footprint of buildings, geophysical anomalies that appear to represent a privy, plow scars and a road bed were identified (Figures 9 and 10). A privy is identified by its size and rectangular shape in G-1 as a reflection-free rectangular region 3 × 2 m within the 0- to 0.2-m slice (Figure 9b). On the GPR profile, it has distinctive reflection characteristics including truncated reflections in the centre that extend to a metre deep (Figure 9c). The shallow portion of ERT-2 shows low resistivity material on the edges and higher resistivity material in the centre. In a portion of this footprint, the low resistivity material also extends to 1-m depth (Figure 9a). Within G-1, high amplitude reflections appear to alternate with weaker reflections that could be produced by focusing and scattering of radar energy from ridges and furrows plowed into the subsurface (red dashed rectangle on Figure 9b). This pattern is perpendicular to the direction that the transects were collected from across the asphalt driveway towards the fence (Figure 2). A 3-m-wide, 28-m-long linear GPR anomaly was identified in G-5 buried approximately 0.3 m beneath the ground surface (Figure 10). The GPR profiles show a high amplitude continuous reflector that may indicate a uniform compacted surface, suggesting a former road bed (Figure 10).
**FIGURE 8** ERT-4 (a) and ERT-5 (b) paired with corresponding ground penetrating radar (GPR) profiles. ERT-5 crosses through the centre of the depression and shows an excavation into higher resistivity weathered rock. ERT-4 crosses the north edge of the depression. GPR anomalies indicate that the excavation fill includes metal objects (see also Figure 7c) as well as lower resistivity soil and rocks with a slightly higher resistivity. The number of electrodes in each electrical resistivity tomography (ERT) transect is shown by the black squares at the top of the plot. [Colour figure can be viewed at wileyonlinelibrary.com]

**FIGURE 9** (a) ERT-2 with arrows corresponding to area of distinct subsurface reflection characteristics on ground penetrating radar (GPR) profile. (b) GPR slice from the surface to 0.2 m in G-1 showing evidence of a garden plot (furrows) and rectangular reflection-free (blue) anomaly. (c) GPR profile from Z-Z’ along T-5 shown on (b). The number of electrodes in the electrical resistivity tomography (ERT) transect is shown by the black squares at the top of the plot. [Colour figure can be viewed at wileyonlinelibrary.com]
DISCUSSION

We have successfully used a diverse and complementary set of independent near-surface geophysical surveys to identify the location of structures and features in the subsurface that document historical occupation from an initial pioneering farmstead beginning in 1754 (Figure 11a) to construction of the brick mansion in 1817 and operation of antebellum plantation at Ingleside (Figure 11b). Because these independent techniques returned similar and consistent results, we are able to describe much of the history of this site that is still preserved in the subsurface.

6.1 Original backcountry settlement

Two structures, a roadbed and a kitchen garden, are consistent with the earliest occupation of the site (Figure 11a). The buildings are arranged in close proximity to the road, which was in use during this period because it passes north of the log house but runs into the plantation house constructed later (Figure 11b).

Structure 3 is consistent with the size of the Jacob Forney house shown in an undated photograph published in 1944 (Abernethy, 1944, Figure 12a). The design and 5.5-m width was typical of the single pen log cabin construction that housed early settlers in the region (Kelso, 1984; Williams & Williams, 2012). Doors are cut in the front and rear walls, and there is a window or two with a chimney at one end. The cabin could have been expanded into a double pen cabin as the family size grew by building another cabin that shares the same wall (Fischer, 1989). As soon as nails became available and there was a sawmill nearby, the cabin was likely covered by siding (Williams & Williams, 2012). The iron spike driven into bedrock may be an anchor used in the construction of this log house. The light-coloured portion of the house (shown on the right in Figure 12a) was constructed above the cellar. The 1.2-m-deep cellar appears to have walls lined with fieldstone and an earthen floor. The construction is similar to excavated cellars at Bethabara (South, 1966), the contemporary Moravian settlement that Forney likely encountered on his trek south from Philadelphia.

Structure 1, with its large diameter postholes, is consistent with a post-in-the-ground building described as an ordinary beginner’s house constructed during the 17th century (Kelso, 1984). This building technique required little time and no special carpentry skills and produced postholes (4” square, 2” deep on average) dug by constructing holes that were subsequently backfilled around timbers about 11” in diameter (Kelso, 1984, p. 59). The presence of charcoal and magnetic anomalies associated with the post molds suggests that the structure may have burned. The size and type of construction are consistent with small farm houses in Virginia (Fischer, 1989) suggesting that it might have been the first dwelling constructed on the property. Its location is closer to the water supply, a spring at the base of the ridge further to the north. To the southwest of this building is a 25 x 15 m area where GPR shows uniform ridges and furrows within 20 cm of the surface suggesting the location of a kitchen garden. It is likely that this

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**FIGURE 10** Ground penetrating radar (GPR) profiles and depth slice from 0.3 to 0.5 m in G-5 showing the historic road bed [Colour figure can be viewed at wileyonlinelibrary.com]
area was surrounded by a garden fence (i.e., Kelso, 1984); however, postholes forming a fenceline were not detected probably because of overlap with the modern fence and the paved driveway. Although the age of the garden is unknown, it may have been associated with the early period of occupation because its location overlaps that of the privy that was used later (Figure 11a).

6.2 | Antebellum plantation

Jacob and his son Peter Forney suffered economic hardship, including the loss of all of their inherited wealth at the hands of Cornwallis during the raid in 1781 (Hunter, 1877). Diversification from agriculture into iron manufacturing in 1787 and the labour of enslaved people greatly enhanced the family’s wealth, providing for the construction of Ingleside Plantation for Daniel Forney. This affluent antebellum plantation, with its Federal-style mansion built on top of the ridge and the dependencies tucked in to the side and rear, follows the traditional formal spatial arrangement observed in southern plantations (Beck, 1998).

A detached summer kitchen that supported the plantation house was located approximately 35 m from its SW door (Figure 2). This is confirmed by excavation of the hearth within a building shown in a 1911 photograph. However, the geophysical footprint is obscured by the placement of the modern septic tank and drain field (Figure 6). This building was removed sometime before 1948 as indicated by the available aerial photographs. Jacob’s log house remained behind the plantation house (Figure 12a) until it was moved to a nearby location (Hunter, 1877). Its proximity to the mansion may have allowed its use as a dwelling for household slaves for some 50 years but was moved after slavery was abolished. The ruins of a stone chimney appear behind the plantation house in a photograph dated 1911 indicating that the structure was moved without its original chimney. GPR and magnetic anomalies indicate that the cellar is filled with boulders and metal objects.

One target of our geophysical surveys were the subsurface cesspool vaults of privies. We expected that there may be several within the survey area considering the number of buildings and length of occupation; however, they were difficult to image. Several locations lacking GPR reflectors within G-5, between the plantation house and Jacob’s log house, are potential candidates, but they are ingrown with trees (Figure 2). This is not surprising because fruit trees were often planted in the rich soil remaining after a privy was relocated.
(Harrison, 2002). We are confident in the geophysical signature of the privy we identified. The location ~15 m to the south of the kitchen is within the usual distance of 8–30 m behind the house along with other outbuildings such as the smoke house (Harrison, 2002). Historically privies are located on the edges of gardens (Olmert, 2009); however, the location within the centre of the kitchen garden (Figure 9) suggests that it was constructed during the later phase of occupation (Figure 11b). The location within the former garden area and adjacent to the modern septic system illustrates sequential use of the site.

7 | CONCLUSIONS

Diverse and high-quality geophysical data coupled with archaeological excavation extend our knowledge of sequential property use by three generations of the Fornay family who began as farmers in the backcountry of North Carolina and rose to prominence in government and industry within the Southeastern United States. GPR surveys located the site of the earliest dwelling, the original site of the Jacob Fornay house, a kitchen garden and road in use around the time of the Revolutionary War (Figure 11a). Contrasting soil disturbance preserved footprints of these features on the landscape. Gradiometer grids and ERT profiles provided additional compositional information. ERT transects clearly image the stone-lined, dirt-floored cellar and the rubble mixed with soil that fills it. The gradiometer detected a buried iron spike affixed to bedrock and metal objects within the cellar. The connection of Jacob Fornay’s son, Peter, to the early iron furnaces of Lincoln County, NC is of interest with regard to artefacts that may be buried within the cellar. Elevated magnetic anomalies around the post-in-the-ground building suggest that the structure was burned.

Our study identifies the specific location of the original house with a cellar that fits the description of the dwelling that Cornwalls occupied while at Ingleside in 1781, thus tying this site to a specific event in history, one of the goals of historical archaeology (i.e., South, 1966).

Our surveys also detected a privy and the footprint of a summer kitchen that supported the plantation house constructed in 1817. The geophysical record of the kitchen is obscured by modern utilities and is better known from archival photographs and ceramics and other artefacts excavated from the stone hearth. Our geophysical surveys have identified new targets for future excavations, including the cellar and the privy.

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CONFLICT OF INTEREST

There are no conflicts of interest to report.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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