The 1806 Greenhouse at Gore Place, Waltham, Massachusetts

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Cultural Resource Management Study No. 66

December 2014

Abstract

The Fiske Center for Archaeological Research at UMass Boston carried out excavations and geophysical surveys, which utilized ground penetrating radar, magnetometry, and electromagnetic conductivity, at the site of the 1806 greenhouse at Gore Place in Waltham, Massachusetts. Early 19th-century maps indicated that the greenhouse was located just north of the entrance drive for the estate, and east of the original location of the 1793 carriage house. Preliminary investigations took place in 2004, and in 2008 a portion of the western end of the greenhouse was excavated. That part of the building was a brick extension that likely acted as a storage space for the greenhouse and probably contained a furnace or stove for heating the structure. In 2012, the Fiske Center returned to the site to excavate the main body of the structure, situated east of the brick extension, and to investigate the yard around the building.

During the project 24 test units (primarily 2 x 2 m), grouped into trenches, were opened across the greenhouse site. Unit locations were based on the results of the 2004 and 2008 excavations, the results of the geophysical surveys, and historic maps of the estate.

Excavations uncovered dense deposits of architectural material within the footprint of the greenhouse as well as the in situ remnants of parts of the north and east foundations for the building. No south foundation was found, although the abrupt southern boundary of the greenhouse rubble deposits provide an approximate location. The limited amount of in situ architectural material makes determining the historic appearance of the greenhouse difficult, and there are no historic documents depicting the structure in any detail. However, archaeological and comparative data allow for several inferences to be made about the structure. The overall dimensions were 57 feet long by 14 feet wide, and the structure was probably 14 feet tall. The main body of the building was 47 feet long by 14 feet wide, while the brick extension was 10 feet wide by 10 feet long. The building was a formal space intended to grow and display exotic plants, although it may have also been involved in the processing of bone for soil enrichment. The presence of a specialized building, such as a heated greenhouse, as well as planting pots in a wide range of sizes, window glass in multiple colors, tools and other artifacts from the site indicate that the Gores were involved in intensive and scientific horticultural endeavors at the estate. Numerous locks and keys indicate that the building and plants were valuable and secured. One unusual artifacts, an apparently worked tumbler base, was also discovered.

Many of the features uncovered in the greenhouse yard appear to have been contemporary with the structure, which stood from 1806 until sometime after 1841. These features, including a semicircular wall, circular and radial gravel paths, and a cobble surface, would have served to distinguish the greenhouse area from the surrounding, working farm. These features also provided spaces to display potted plants from the building, and indicate that the greenhouse was part of a larger system of horticulture and display at Gore Place.

The greenhouse was constructed by the Gores during a period of intense interest in agricultural experimentation by members of the Massachusetts commercial and political elite. Scholars have argued that these men used the positive associations of agriculture to offset some of the contemporary negative connotations of commerce. This report examines the greenhouse and its yard as spaces for the growth and display of exotic plants in the context of this scientific agricultural movement.

Acknowledgements

The authors would like to thank the Gore Place Society for their commitment to using archaeology to assist the interpretation of their historic structures and landscape and for their support of this project. Additional thanks go to David Landon who co-directed the fieldwork, John Schoenfelder for reestablishing the site grid, and to Brian Damiata and John Steinberg for collecting and analyzing geophysical data from the site. Melody Henkel and John Schoenfelder also photographed artifacts and features from the site. Kellie Bowers, Courtney Williams, Casey Layne, Heidi Krofft, Susan Jacobucci and Dennis Piechota for contributed research and analysis. We would also like to acknowledge the hard work of the students who enrolled in the Gore Place field school and the UMass Boston students and staff who volunteered their time to contribute to the excavations at the site. The field crew for this project included Danielle Cathcart, Heather Trigg, Leith Smith, Julia Ashton, Cassandra Bates, Caitlin Connick, Phil Cook, Trevor Donohughe, Elizabeth Krueger, Nadia Kline, Julie Powers, Meagan Ratini, Benjamin Wetherbee, .Allison Conner, Kyle Edwards, Paul Rufledt, Laura Ng, Drew Webster, Eric Fahey, Meredith Luze, Alex Flick, James Carter, Aileen Balasalle, and Jerry Warner.

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Chapter 1: Background Information

Introduction

Gore Place is a historic estate, farm, and National Historic Landmark located at 52 Gore Street in Waltham, Massachusetts (Figs. 1.1, 1.2). The site earned its Historic Landmark status due to its connection to a number of important historical figures and its value as a contemporary depiction of an early American country estate. Christopher Gore and his wife Rebecca owned the property from 1791 until 1834, and in 1806 they built the large, Federal-style mansion (Fig. 1.3) that forms the centerpiece of the property (Pinkney 1969). Noted French architect Jacques-Guillame Legrand helped the Gores design the mansion, which is one of two historic structures still standing on the property; the other is a carriage house dating to 1793 (Beranek et al. 2011). Both Gores were members of the New England elite, and Christopher had a distinguished political career, serving as a District Attorney, Massachusetts Governor, and as a U.S. Senator (Pinkney 1969). From 1825 to 1827 the Gores also employed Robert Roberts at their estate. Roberts is famous as one of the earliest published African American authors, penning The House Servant's Directory, a treatise on household management, in 1827 (Gore Place Society 2012b).

Today, the property is owned and administered by the Gore Place Society, whose mission is "to preserve and promote the 1806 estate of Christopher and Rebecca Gore as a unique educational

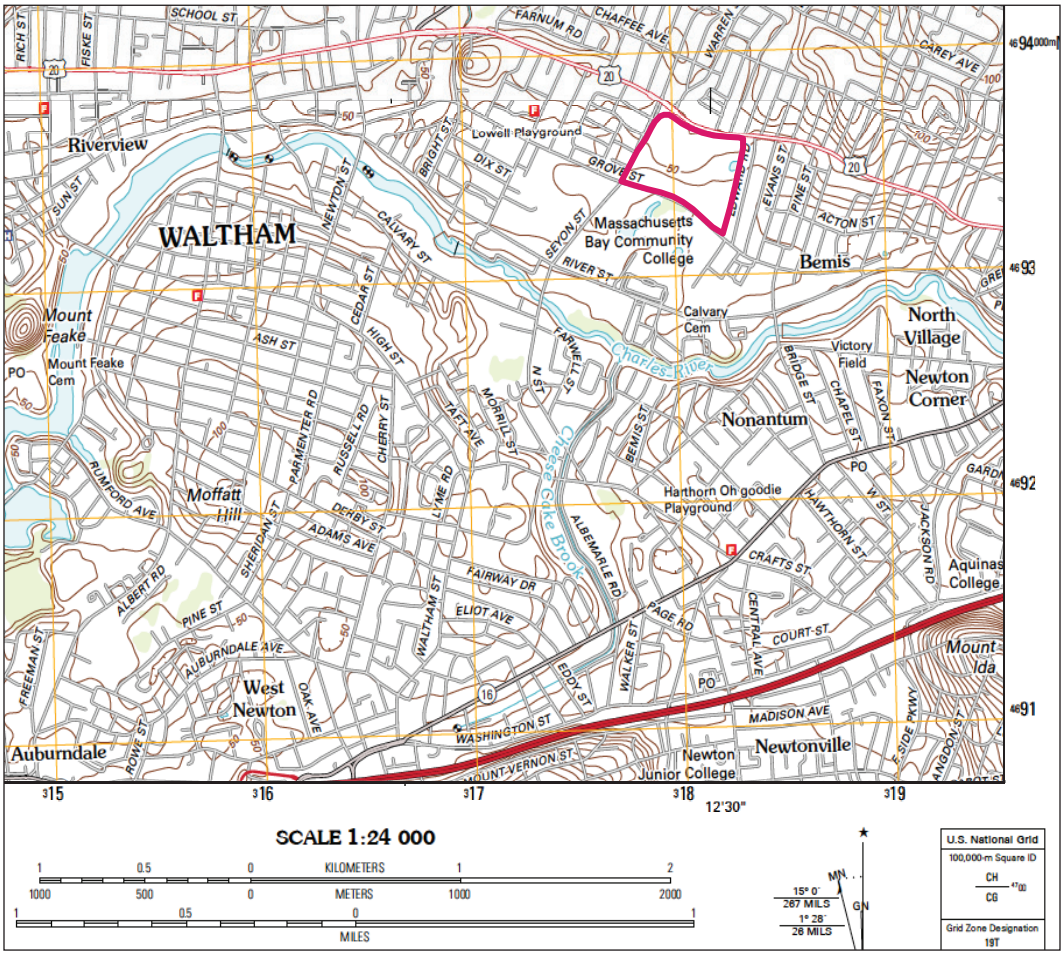

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Figure 1.3. The Federal-style mansion built by Christopher and Rebecca Gore in 1805-1806 as it looks today. View from the south..

resource to inspire an appreciation of early 19th century America" (Gore Place Society 2012a). The Society has owned Gore Place since 1935, and in 2000 hired landscape architects Halvorson Design Partnership, Inc. to create a landscape master plan for the property (Brockway 2001). The impetus behind this new landscape plan is a desire to return the estate to its early 19th-century appearance.

In order to accurately reconstruct the 19th-century iteration of the estate, the master plan called for extensive research to be done into the history of Gore Place. To that end, a detailed landscape history was composed by Lucinda Brockway (2001), architectural analyses were carried out on the mansion (Baker et al. 2001, 2002; Kutrubes 2000), and Katheryn Viens (2010) performed a study of farming practices at Gore Place in the late 18th and early 19th centuries. Concurrently, the Fiske Center for Archaeological Research was contracted to undertake a series of archaeological investigations at Gore Place.

The first of these projects took place in 2001 and consisted of an archaeological examination of three areas in the cellar of the Gore Place mansion (Smith 2001). Testing of the grounds began in 2004 (Fig. 1.4), with a test pit survey focusing on identifying the locations of six features: the original entrance drive, the vegetable and flower gardens, the original carriage house foundations, the grapery complex, and a greenhouse. Historic maps showed the approximate areas of these features, and the 2004 survey was able to determine the exact locations for all except the vegetable garden (Smith and Dubell 2006). A subsequent excavation examined the 19th-century home of gardener Robert Murray and uncovered the foundations for the house as well as several nearby features (Smith 2007). Another survey was carried out in the summer of 2008 (Figs. 1.4) to identify areas on the property that had been farmed during the time the Gores lived at the estate, as well as features associ-

ated with agricultural activities (Smith et al. 2010). A geographic information system (GIS) data storage and mapping component was included in the 2008 project in order to accurately document the location of archaeological and natural features at Gore Place and facilitate implementation of the landscape master plan.

In the fall of 2008, the Fiske Center returned to Gore Place for the data recovery excavations of two featured discovered in the 2004 survey: the original carriage house foundations and the greenhouse (Fig. 1.5). In addition to expanding the GIS system from the 2008 test pit survey, this project incorporated a ground penetrating radar (GPR) survey in order to predict the locations of subsurface archaeological features prior to excavation. Between GPR, mechanical, and hand excavations, the Fiske Center was able to uncover portions of both the carriage house and greenhouse. In the case of the former, archaeologists were able to examine portions of the north foundation and the carriage house's cellar. For the greenhouse, the Fiske Center exposed a small, brick-floored extension off the west end of the main body of the structure, as well as numerous nearby features. The results of the 2008 project suggested that the greenhouse stood from 1806 until the mid 19th century, and that both it and the carriage house were important parts of the larger horticultural and agricultural landscape at Gore Place (Beranek et al. 2011). Following the 2008 excavations, the Gore Place Society asked the Fiske Center to further investigate the greenhouse. Excavations in the summer and fall of 2012 uncovered features of the main body of the greenhouse and the yard space around it and are reported on here.

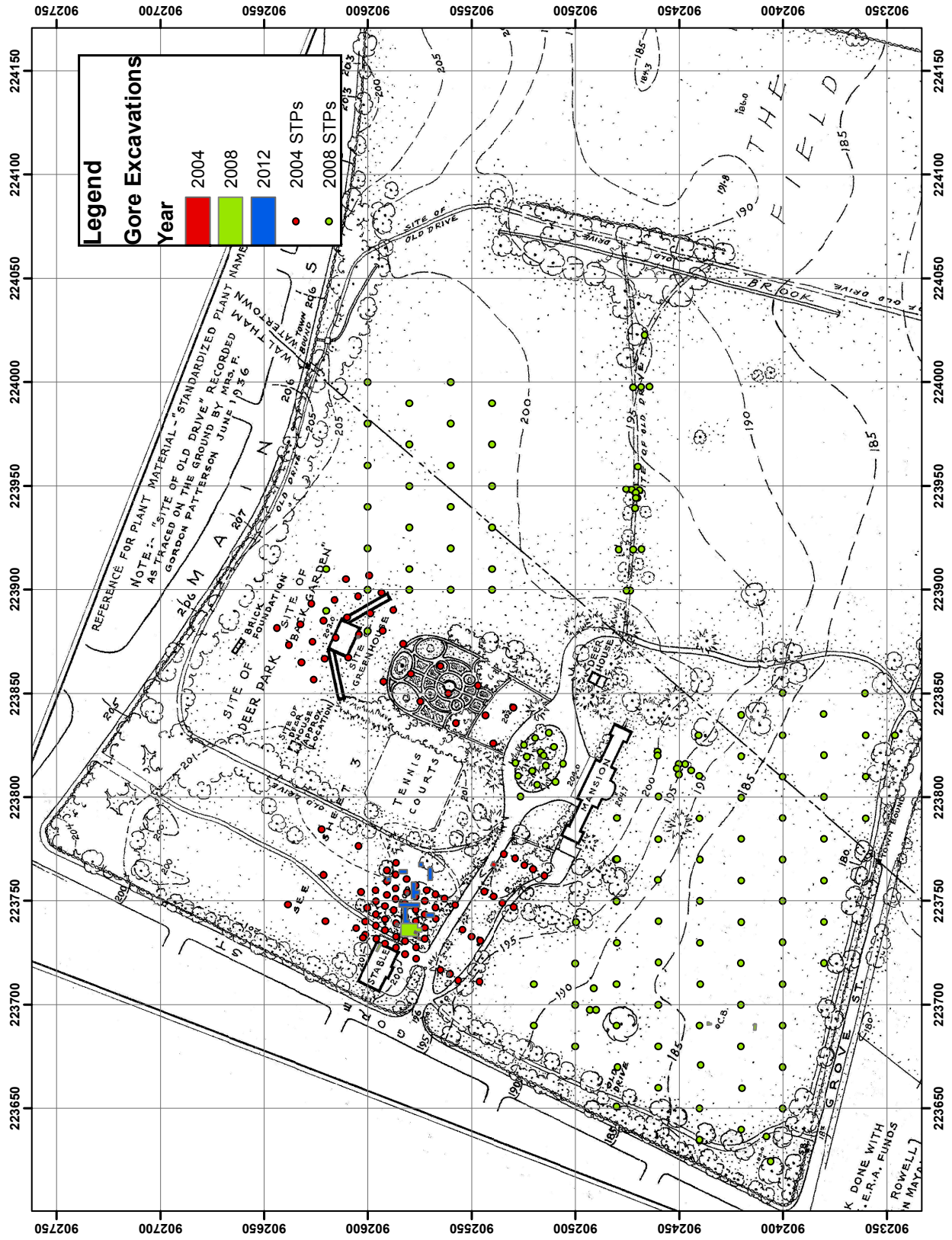
Project Location and Environmental Context

Gore Place is a 45-acre estate in Middlesex County situated on the boundary between the towns of Waltham, to the west, and Watertown, to the east. It is bordered by Main Street (Route 20) on the north, Grove Street on the south and Gore Street on the west. The estate is approximately 800 m (2600 ft) north of the Charles River and lies at the geographic boundary between the upper Charles River flood plain and northern upland. The entire parcel slopes gently southward toward the river. The eastern portion of the property contains a small north-south stream that originates north of Main Street. Although its banks have been altered by 20th-century fill, its general course appears to have been little changed.

Soils in the project area are composed of two types that correspond to the site's topography. The lower Charles River floodplain consists of Hinckley loamy sand with 3-5% slopes (USDA 1995). The Hinckley series ranges from a friable and gravelly or very gravelly sandy loam to a loamy coarse sand, both of which have rapid permeability making them excessively drained. The substratum at 30-76 cm (12-30 in) consists of stratified sands and gravels. These soils form on gravelly and cobbly, coarse textured glacial outwash plains, terraces, kames, and eskers. Soils that make up the upland portion of the property consist of Canton fine sandy loam with 3-8% slopes. The Canton series soils are characterized as friable fine sandy loam with moderately rapid permeability. The substratum between 49 cm and 91 cm (18-36 in) is a loamy, coarse sand. Canton soils form on well-drained upland glacial till and are typically stony, but this characteristic is generally absent from the northwestern upland portion of the property.

Scope of Work

This report covers the archaeological data recovery of the 1806 Gore Place greenhouse as well as the area immediately surrounding the building, located north of the entrance drive, east of the parking lot and south of the tall hedge (Figs. 1.5-1.6). This project took place during the summer and fall of 2012. Previous excavations undertaken by the Fiske Center for Archaeological Research identified the location of the 1806 greenhouse and exposed a small room at its westernmost end, as well as numerous nearby features. However, those earlier projects did not yield enough information about the greenhouse and the surrounding landscape to facilitate their reconstruction by the Gore Place Society. Those excavations were also unable to provide information on the degree of preservation of the main body of the greenhouse, or to indicate how any preserved archaeological remains would be affected by construction on the site.



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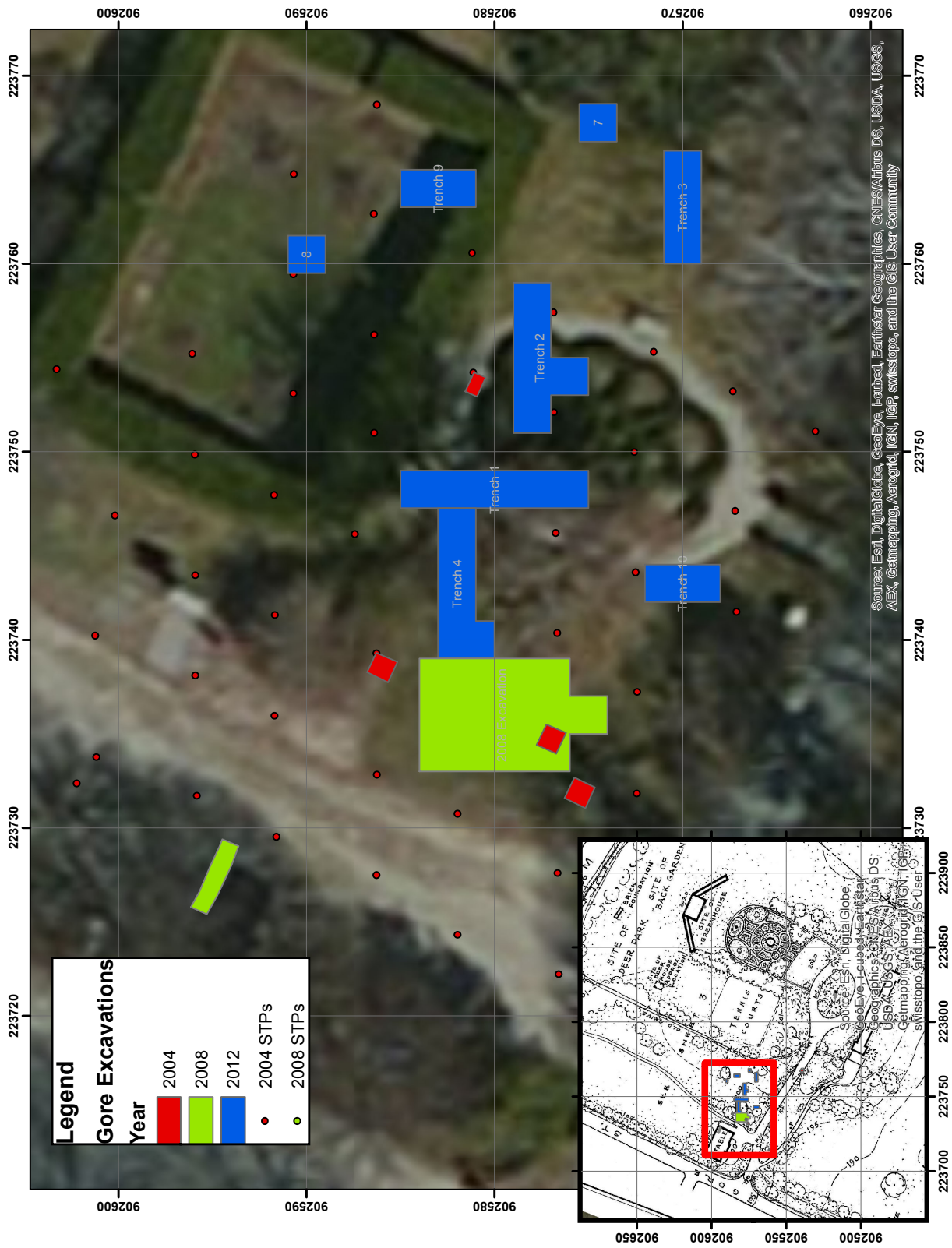

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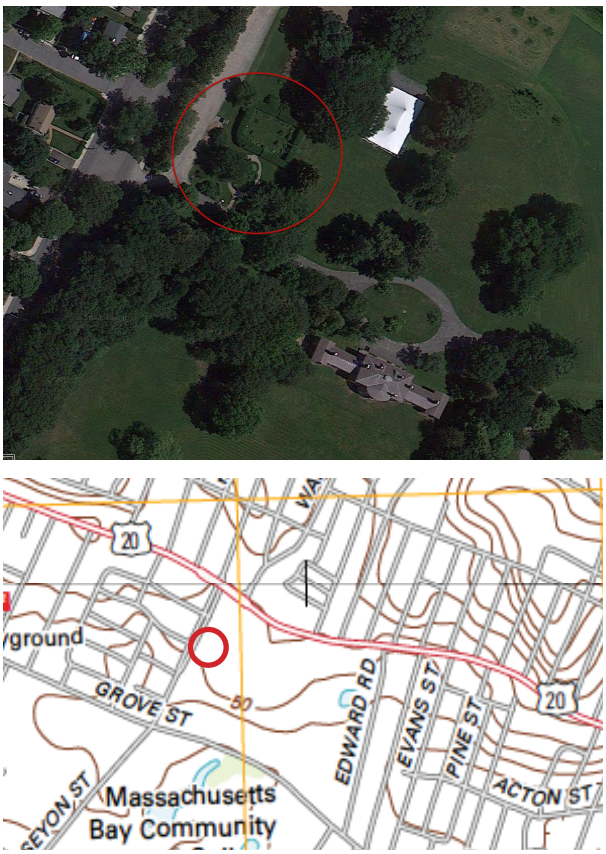

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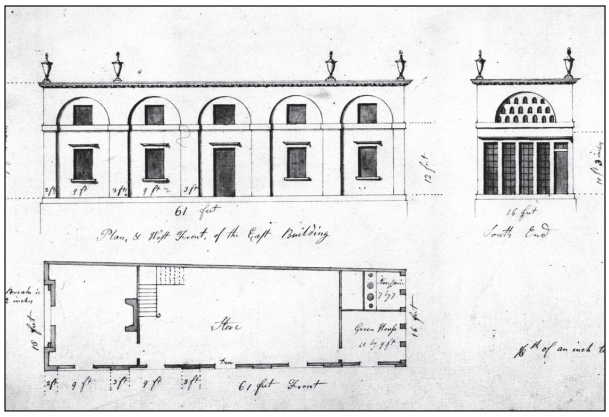

Figure 1.7. Samuel McIntire's drawing of the late 18th-century Derby greenhouse in Salem, Massachusetts, an example of a conservatory style greenhouse, with large front windows set into a masonry or wood wall (Woods and Warren 1988:85).

Figure 1.8. The lean-to style greenhouse at the Vale in Waltham. This example has a short front knee wall and a substantial back wall which support a south façade and roof made almost entirely of glass.

As a result, the 2012 data recovery project was designed to excavate a sufficient amount of the greenhouse and the area around the building in order to: examine the state of preservation of the greenhouse and neighboring features; determine the size and appearance of the greenhouse structure; and to assess the impact any new construction would have on preserved features. In order to achieve these goals, this project included three geophysical surveys of the greenhouse area as well as the hand excavation of 24 excavation units in and around the building. This project was performed in two phases. The first phase took place from May 18 to June 29, 2012, and included ground penetrating radar (GPR), magnetometry, and electromagnetic conductivity surveys, as well as excavations by a UMass Boston field school. The second phase took place from October 21 to November 16, 2012, and consisted of further excavation of the greenhouse and surrounding area by a UMass Boston field crew. Both phases were supervised by Drs. Christa Beranek, David Landon, and John Steinberg of the Fiske Center for Archaeological Research.

Research Questions

In addition to examining the extent and state of preservation of the greenhouse and nearby features, this project attempted to address an array of research questions. The first was to determine the structural attributes of the greenhouse. Late

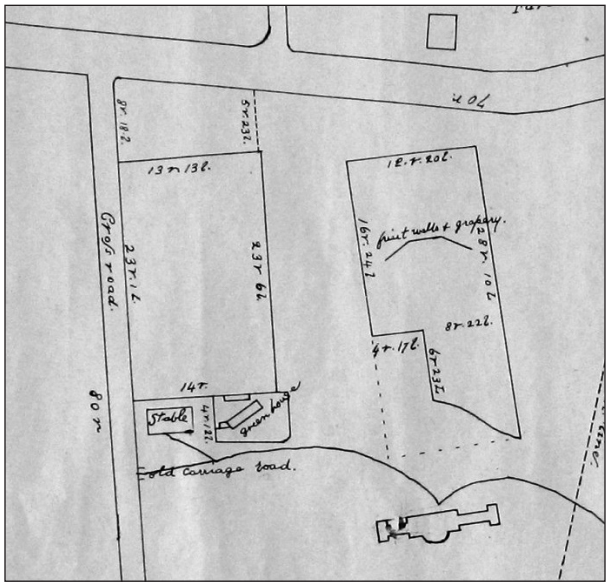

Figure 1.9. Detail of a plan of Gore Place drawn when the estate was sold to Theodore Lyman Jr., ca. 1834. The mansion is in the lower right corner, while the second greenhouse can be seen just above the entrance drive in the lower left of the map. Original on file at Gore Place.

18th and early 19th century greenhouses in the northeastern United States tended to be built in two forms. Both styles had rectangular plans, but they differed in profile and appearance. The earlier of the two forms had a rectangular profile, and allowed light into the building via tall sash windows on the front of the greenhouse (Fig. 1.7). The other greenhouse style was a relatively recent innovation during the Gore-era, and had a triangular or trapezoidal profile, with a sloping roof and a front composed primarily of glass (Fig. 1.8) (Chesney 2005; Pogue 2009). Although the names for these styles vary in both historic and modern texts, this report will, for simplicity, refer to the earlier form as the "conservatory" style, and the later one as the "lean-to" style.

Understanding the overarching form of the greenhouse is important for any potential reconstruction of it, as is ascertaining its internal design. A major research goal of this project was to determine how the building was finished and organized, in addition to identifying the system in place for heating the building. During the 2008 project, excavators uncovered marble tiles similar to those used in the Gore Place mansion, suggesting that the two buildings may have shared design elements. The very large numbers of planting pots unearthed during that project showed that much of the flora grown in the greenhouse was likely potted, but without further excavation it was impossible to know if the building also contained planting beds (Beranek et al. 2011). Gore-era horticultural manuals offer advice on the construction and maintenance of greenhouses and propos a variety of schemes for heating the buildings (Abercrombie 1789; Loudon 1805, 1817, 1824; M'Mahon 1806; Hibbert and Buist 1834). Excavation of the main body of the greenhouse was determined to be the most direct method to ascertain the form and layout of the interior of the building.

Another research goal was to examine the interaction between the greenhouse and the area surrounding it. The 2008 project uncovered several irrigation and drainage features, including a fieldstone drain and well. However, as only a small portion of the greenhouse yard was excavated, the full extent of the water management system around the building, and its interaction with the greenhouse, was unknown. Besides examining the water management system of the greenhouse, another research goal was to better understand the greenhouse yard as a whole. Historic maps of the greenhouse show that the yard around the building was bordered by an unspecified feature, but do not indicate much else about the area (Fig. 1.9). Determining how, if at all, the greenhouse yard was set off from the rest of the property and what activities may have taken place there had the potential to provide a broader context for the building at Gore Place.

Finally, this project sought to determine the social significance of the second Gore Place greenhouse. Greenhouses were both practical and ornamental structures, and thus could have many functions on an estate (Woods and Warren 1988; Hix 2005). The presence of artifacts similar to those in the mansion house suggested that the greenhouse may have been a formal space intended for visitors, and that the plants grown there were viewed as both luxury items and foodstuffs. On the other hand, Christopher Gore practiced scientific farming at his estate, and the greenhouse could have been a place to continue his agricultur-

Figure 1.10. Areas excavated in 2008 and 2012. All of the areas identified as trenches were excavated in 2012.

al experiments (Thornton 1989). Considering that greenhouses were occasionally female-controlled spaces, it is possible that the building was managed more by Rebecca than Christopher. Rebecca may have helped design the Gore Place mansion, and her influence on the estate could have extended to the greenhouse as well (Field 1999). The other research goals discussed here are primarily intended to aid in reconstructing the area, but questions of the ownership and purpose of the greenhouse at Gore Place are key to interpreting the building.

Field and Laboratory Methods

Prior to the investigation of the greenhouse and surrounding area, a grid system was established for the site. This same system was used during the 2008 test pit survey and data recovery excavations at Gore Place (Smith et al. 2010; Beranek et al. 2011). The Fiske Center established a metric Massachusetts Mainland State Plane grid using the North American Datum of 1983 (NAD83). This grid system is also used by all MASSGIS products (http://www.mass.gov/mgis/massgis.htm). All geophysical transects and excavation units on the site are accurately located within this projected grid and coordinates are visible in the margins of many of the figures. To establish this grid at Gore Place, the Fiske Center first obtained the global positioning system (GPS) coordinates of nearby features from the Town of Waltham. These points were located on the manhole covers at Winsom and Gore Streets and Whitman Road and Main Street. The Center

Figure 1.11. Drs. John Steinberg and Brian Damiata performing a GPR survey at Gore Place using a Måla X3M system..

then corrected these points with a Trimble Geo XH with antenna that yielded fairly accurate sub-foot post-processed accuracy. These points were then used to establish an initial location at Gore Place for a Topcon GPT-9005A robotic total station. Archaeologists from the Fiske Center then shot in multiple secondary benchmarks around the estate on durable points such as window wells, manhole covers, and drainage grates. The secondary benchmarks were used by Fiske Center archaeologists to establish the position of the total station at any location on the property and to replicate the grid over excavation areas.

Prior to the commencement of this project, a decorative hedge, called the Knot Garden, was removed from the site by the Gore Place staff. Subsurface investigations began immediately following the performance of GPR, magnetometry, and electromagnetic conductivity surveys across the project area. A total of 24 hand-excavated units were opened in and around the greenhouse during this project, with a total excavated area of 94 square meters. With the exception of a single 1 × 2 m unit, all of the units measured 2 × 2 m. These units were spread across eight trenches, which held between one and five units apiece. Units within these trenches were contiguous, although the trenches were not necessarily contiguous with one another (Fig. 1.10). The trenches were placed based on the results from the geophysical surveys and previously excavated units.

Within individual units, each distinct deposit or soil layer was given a unique context number. Identical contexts present in multiple units were grouped together as lots. Descriptions of the various lots identified during this project can be found in Tables 3.1 and 3.3 in Chapter 3. Lot designations were assigned as they facilitated rapid analysis of soil deposition patterns at the site. Excavation proceeded into the upper portion of the sterile B-horizon or C-horizon except where intact architectural features, such as the cobble surface east of the greenhouse, were present.

All excavated soil was screened through ¼ inch mesh hardware cloth to retrieve cultural material. Artifacts were placed in ziplock bags labeled with appropriate provenience information. Bagged artifacts were removed to the Fiske Center's archaeological laboratory at the University of Massachusetts Boston, where they were washed, dried, catalogued and rebagged for long-term storage. The artifacts were cataloged in a FileMaker Pro relational database; this catalog can be found in Appendix A. Artifacts are being curated at the Fiske Center at UMass Boston while the site is being interpreted, but will be returned to Gore Place for permanent curation.

Archaeogeophysics

Archaeogeophysics is the interpretation of buried archaeological sites based on the results of non-destructive shallow geophysical investigations. Archaeological features, important subsurface geology, and sometimes artifacts and ecofacts can be located and partially analyzed using remote sensing techniques. A component of the 2012 greenhouse excavations at Gore Place was the performance of several geophysical surveys at the estate (Fig. 1.11). These surveys, which utilized ground penetrating radar (GPR), electromagnetic conductivity, and magnetometry, were carried out and interpreted by Dr. John Steinberg of the Fiske Center and Dr. Brian Damiata of UCLA. These types of surveys have been identified as particular-

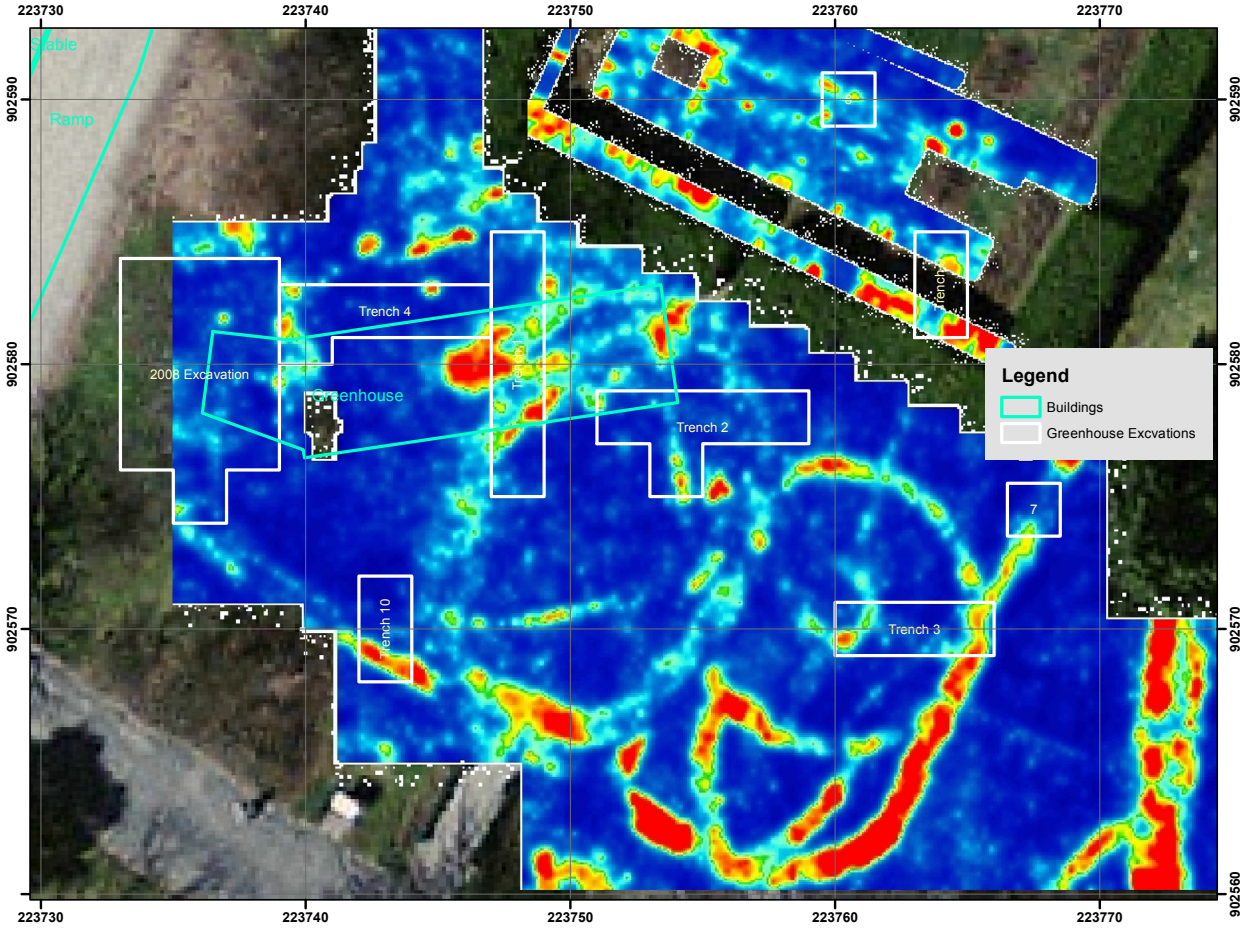

Figure 1.12. A GPR slice that shows the historic circular garden pathways (right circle) and enclosure with a rounded corner, both composed of gravel. The faint oval in the center is the outline of the recent path enclosing the boxwood hedge.

ly useful in understanding landscape features such as gardens that cover a large area and cannot be completely excavated (Yentsch and Kratzer 1994). This was particularly true during this project for the circular feature east of the greenhouse.

The geophysical techniques used by the Fiske Center identify subsurface features based on detecting variations in the geophysical properties of surveyed areas. Any area that exhibits significantly different geophysical properties from its surrounding environment is termed a 'geophysical anomaly.' Anomalies can be natural (such as a glacial erratic) or artificial (such as a wall). Determining which anomalies are natural and which reflect buried archaeological features can be difficult. This is complicated by the fact that small differences in the environment (e.g., soil moisture, surface cover, changes in ambient temperature) can alter the geophysical properties of surfaces and soil layers, potentially changing the natures and shapes of geophysical anomalies.

How archaeogeophysical surveys are carried out can also affect the reliability of identifying archaeological and geological features. The choice of equipment, technique, transect direction, transect spacing, and area covered can have as much or more effect on the detection of geophysical anomalies as the local environment can. This potential for variation can be offset, however, by experimenting with the parameters of archaeogeophysical surveys in order to find the most accurate system for a particular site. As a result, most archeogeophysical surveys are performed multiple times with slightly different parameters in order to

obtain the best results. Due to the non-destructive nature of geophysical surveys, they can be repeated without harming archaeological remains.

In general, interpretations based on archaeogeophysical data are dramatically more accurate when made in the context of archaeological excavations. Even the excavation of only a few anomalies can show a researcher exactly what archaeological and geological features are being detected by the geophysical methods used at a site, and allow the identification of their geophysical signatures. Along the same lines, using archaeogeophysical evidence as a guide for archaeological investigations makes these excavations considerably more efficient. The excavation of geophysical anomalies provides a key to interpreting geophysical signatures, which in turn can be used to more accurately identify areas of interest on a site and to locate future excavations. When archaeological investigations are in a feedback loop with geophysical surveys the former become more efficient, while the latter become more accurate, and more information about a site overall is generated. This project used archaeogeophysics and excavation reflexively.

Still, there are many important archaeological features that do not exhibit strong enough geophysical contrasts to be identified, and it is common for important archaeological deposits to be discovered in areas without significant anomalies. To mitigate this problem, the Fiske Center generally uses multiple geophysical methods to identify different types of anomalies. In some cases, anomalies that show up with one technique may not show up in another. Sometimes more accurate geophysical interpretations can be made when an anomaly only manifests itself with one geophysical technique. However, anomalies that manifest themselves in multiple methods are usually substantial. For this project, the Fiske Center surveyed the site using multiple types of remote sensing techniques, which are described below.

In the area of the 1806 greenhouse and in the area of the grapery complex, GPR, magnetometry, and EM surveys were performed. Only GPR was employed inside the tall hedge to the north of the 1806 greenhouse. In this area the geophysical survey grid transects were very uneven, not on the State Plane grid, and worked around ornamental vegetation. South of the tall hedge, over the main body of the greenhouse, we employed a staggered grid about 50 m wide (east-west) and 10 to 20 m long (north-south) (Fig. 1.10). Transects for geophysical data collection were spaced 25 cm apart and were walked both N-S and E-W. During the 2012 season we employed a Malå Ground Penetrating Radar X3M system with 800 and 500 MHz antennas, a Geometrics G-858 cesium gradiometer (magnetometer), a Geonics EM-31 conductivity meter, and a Geonics EM-38 conductivity meter. Specifically, at the 1806 greenhouse we used the 800 and 500 MHz antennas, the magnetometer, and the EM-38.

All of the methods and techniques employed during the 2012 archaeological geophysical survey yielded useful results about the underlying archaeology. At the 1806 greenhouse, the most useful method seems to be GPR and the most efficacious technique seems to be the 500 MHz with transects running N-S. The images presented in the report are "slices" of the GPR data, representing maps of the strengths of the reflected radar waves at different depths below the surface (Fig. 1.12). Red and yellow areas are strong reflectors; light blue is a weaker reflector; and dark blue indicates that no radar waves were reflected back at that depth and location.

Geophysical surveying during this project was carried out prior to the commencement of excavation in the surveyed areas. Drs. John Steinberg and Brian Damiata carried out all geophysical testing, with the aid of students and staff from UMass Boston. The results of these tests were used to identify areas of interest for excavation and the size and scope of some subsurface features.

Occupation History of Gore Place

A summary history of Gore Place is provided here for general understanding of the estate's historic context. More detailed information is available in Brockway (2001), Smith and Dubell (2006), Dubell (2007), and Smith (2007).

Native American Occupation prior to ca. 1630

No direct evidence for Native American occupation of the land today known as Gore Place

has been found to date. However, there are several Native American archaeological sites in Waltham and Watertown, including two within 2 km (1.25 mi) of Gore Place. These and other sites in the Waltham-Watertown region date from the Middle Archaic to Late Woodland periods (ca. 8,000-1,000 B.P.). Native American groups during those time periods may have had a presence at Gore Place, but the lack of any archaeologically recovered indigenous material culture at the estate leaves this possibility as merely conjectural.

English and American Occupation from ca. 1630 to 1786

Gore Place is located in one of the original land grants given to the Massachusetts Bay Colony in 1630. The specific grant was for the town of Watertown, and it encompassed the modern-day towns of Waltham, Weston, Cambridge and Belmont. Initial settlement in the area was small, and the local economy focused primarily on agriculture.

From the 1630s until 1651, the future Gore Place was part of a tract of land owned by the Reverend George Phillips and his heirs. Phillips is famous as one of the co-founders of Watertown. After 1651, the land that makes up Gore Place passed through several hands, and it was eventually sold to James Davenport in 1744. By this time the property had acquired a mansion house and barn and was actively farmed. Davenport built a tavern on the land; this structure was located on the southeast corner of Main and Gore (originally Cross) Streets. The widening of Gore Street in the late 1960s likely impacted much of the tavern site.

After Davenport sold it in 1752, the land was owned successively by John Gould, Thomas Wellington Jr., Jonathan Brewer and Aaron Dexter. Few alterations appear to have been made to the property during this time, and it was sold to the Gores in 1786.

Gore Occupation ca. 1786-1834

The history of the Gore family in Waltham begins in 1786 when Christopher and Rebecca Gore purchased 50 acres of land from Aaron Dexter. This initial purchase was split into two lots: the 33-acre "mansion house lot" which held a mansion, barn, and other outbuildings, and an unimproved 18-acre parcel to the east known as the "Harrington lot." This was the first of several purchases, and by 1791 the Gores had acquired two more parcels: the 34-acre "homestead" or "forty acre lot" to the north of the "mansion house lot" and the 75-acre "Ward farm" that bordered the Charles River to the south. At the time of Rebecca Gore's death in 1834, Gore Place had grown to 197 acres.

The Gore family owned the estate for nearly fifty years, and they made several changes to the property during that time. William Payne, Rebecca Gores's brother, is known to have planted trees and established many of the pathways across the estate. It is unclear if the Gores continued to use the mansion that came with the property in 1786, but by 1793 they are known to have owned a central-block house with flanking wings and a greenhouse attached to the east end. This same year the Gores built a large carriage house at the western end of the estate, just off the entrance drive. This carriage house remains standing and in use today.

The Gores' mansion burned down in 1799, when a fire started in the greenhouse and left only the west wing of the building still standing. Construction of a replacement home took place in 1805-1806, and resulted in the estate's famous Federal-style mansion. Both the earlier mansion and its Federal-style replacement were built on the same spot: a crest of the upper flood plain terrace of the Charles River.

At the same time they built a new home, the Gores also constructed a second greenhouse, situated just east of the 1793 carriage house. By this time Gore Place boasted several other improvements, including a vegetable garden north of the carriage house and greenhouse, a grapery located approximately 130 m (427 ft) north of the mansion, an ice house, and several other buildings. The Gores also owned and maintained a flower garden, although it is not known exactly when it was planted (Smith and Dubell 2006:25-28).

Christopher Gore was a charter member of the Massachusetts Society for Promoting Agriculture (MSPA) and the family managed their estate as a working farm. The MSPA, which was founded in 1792, encouraged the practicing of scientific

agriculture, and Christopher Gore experimented with a variety of different plants and agricultural techniques on his farm. The core of the agricultural operations was located on the "homestead" lot, across Main Street to the north of the "mansion house lot." However, farming and animal husbandry activities were not limited to a single area, and took place across the property. The "mansion house lot" itself held cropland and functioned both as a component of the agricultural endeavors at Gore Place and as a comfortable pleasure ground for the Gores.

Actual occupation of the property by the Gores was intermittent between 1783 and 1834. Christopher worked as a lawyer and statesman in Boston for many years, and the family maintained a residence in that city for much of their lives. From 1796 to 1804 the Gores moved overseas, living primarily in London while Christopher served as an American diplomat to England. During this time period the family was also afforded the chance to live in Paris for a short time. While they were away, William Payne managed the affairs of Gore Place.

Upon their return to the United States, Christopher continued his political career, serving as a Senator and Governor of Massachusetts, and Gore Place was kept primarily as a seasonal residence. It was not until 1816 that the Federal-style mansion was winterized so it could be used year-round. Even after that, the family continued to split time between Waltham and Boston (Pinkney 1969:139). Besides the Gores, other potential occupants of the property include servants, gardeners, and farm managers. Occupation by Rebecca after the death of Christopher in 1827 is unclear, but by the time of her death in 1834, Judge Charles Jackson was renting the property.

Lyman Occupation ca. 1834-1838

The parcel containing the "mansion house, stable, vinery, and sheds" was purchased by Theodore Lyman Jr. following Rebecca Gore's death in 1834. Lyman's father, Theodore Lyman Sr., owned The Vale, an estate situated only a short distance from Gore Place in Waltham. The Gores and the Lymans were well-acquainted, and both moved in the same wealthy, powerful circles. The Lymans were originally from Maine, but moved to the Boston area in the late 1700s, where the elder Theodore established himself as a successful trader. The family purchased The Vale in 1793, where they began practicing the scientific agriculture espoused by the MSPA. The greenhouses and peach wall built by Theodore Lyman Sr. still stand at The Vale today (Parson 2009:97-107).

Theodore Lyman Jr. was similar to Christopher Gore in several respects: he was politically active, serving as mayor of Boston from 1834-1835, and a member of the MSPA and the Massachusetts elite. Both Lyman Jr. and his wife Mary were keenly interested in scientific agriculture as well, and after they purchased Gore Place they began improving the estate. Some of the changes they made include painting the mansion white and redesigning the formal flower garden north of the house to better match contemporary European fashions. The family also purchased a small, 4-acre parcel of land just south of the "mansion house lot" in 1836. This property, called the "Cookson lot," was eventually home to Scottish gardener Robert Murray, who was employed at Gore Place until at least 1856 (Smith 2007:14-15). The Lymans may have also improved the greenhouse and grapery during their tenure.

Unlike the Gores, the Lymans only owned the estate for a short time. This was due to a pair of deaths in the family: Lyman Jr.'s oldest daughter died in 1835, and his wife Mary passed in 1836. These tragedies prompted Theodore Lyman Jr. to put the property up for auction and relocate to Brookline (Parson 2009:136).

Greene Occupation ca. 1838-1856

John Singleton Copley Greene purchased the estate in 1838 and continued to employ a gardener and farm manager who maintained the pleasure garden character of the property. John came from a family with a strong tradition of horticulture: his father, Gardiner Greene, was well-known for his Tremont Street home and its terraced gardens and greenhouse. With the aid of gardener Robert Murray, the elder Greene grew rare trees and flowers, and his property was described as having "the most conspicuous and extensive and elegant garden" of his day (Wilder 1881:12; Emmet 1996:34).

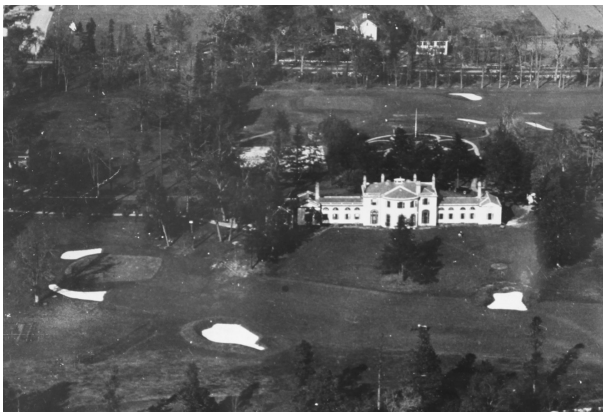

Figure 1.11. Gore Place during the 1920s while the property was used as a golf course. View from the south.

While at Gore Place, John Singleton Copley Greene made several changes to the property. For example, in 1846 Greene excavated a large pond out of low-lying wetlands on the property. The 1806 greenhouse east of the carriage house was also removed during Greene's tenure, and the grapery and fruit wall may have been expanded into a new greenhouse. This structure stood until the early 1900s (Smith and Dubell 2006:52).

Walker Occupation ca. 1856-1907

The Greenes sold the mansion house lot in 1856 to Theophilus Walker who conveyed it to his nieces, Mary Sophia and Harriet Sarah Walker in 1890. Theophilus Walker must have maintained many of the horticultural features because Marshall P. Wilder (1881:85), president of the Massachusetts Horticultural Society, described the property as "a place distinguished for numerous glass structures, for the growth of fruits, flowers, and vegetables, and for the excellent condition in which its grounds and their appurtences are kept by its present owner."

Changes made to the property during this period include removal of the vegetable garden north of the carriage house and improvement of the grapery greenhouse with its superior solar exposure. In addition, the 1900 Atlas of Middlesex County shows that the Walkers added an addition to the carriage house and a new barn. These are not know from any other sources and seem to not have lasted much longer into the 20th century.

Episcopal Church Ownership ca. 1907-1911

Mary Sophia Walker bequeathed the property to the Episcopal Church in 1907. The church sold the property after only four years, but not before a company based in Colorado to whom the property had been leased caused considerable damage by removing trees and household furnishings.

Metz Occupation ca. 1911-1921

Charles Metz purchased the estate in 1911 and he utilized the house as both a home and an office. It was during Metz's ownership that the surrounding neighborhood saw significant change through the development of residential housing and the erection of industrial buildings along the Charles River to the south. Metz was a participant in the development of the area, owning some of the new industrial structures.

Waltham Country Club ca. 1921-1935

In 1921 the estate was sold to Henry Beal and the trustees of the Waltham Country Club. Substantial changes were made to the property during this period as much of the landscape was transformed into a golf course with additional recreational facilities (Fig. 1.11).

Gore Place Society ca. 1935-present

The country club went bankrupt in 1935, and the newly formed Gore Place Society saved the property from demolition. That group has preserved and maintained the estate to the present. Modern-day Gore Place is a 45-acre plot of land that encompasses the original 33-acre "mansion house lot" and an adjacent 12-acre parcel not originally owned by the Gores. Of the property's Gore-era buildings, only the 1806 Federal-style mansion and 1793 carriage house remain standing. The carriage house was moved north and west of its original site in 1967, when Gore Street, on the western edge of the estate, was widened. At the time of this report, plans are in place to move the carriage house back to close to its original location along the entrance drive.

Chapter 2: The Culture of Horticulture in Early 19th-century Massachusetts

> "The grounds at Gore Place are not improved merely to gratify personal feelings, or attract observation and receive applause… utility is the main design of the exertions there displayed, and that it is compatible with the highest rank and most exulted mind, to study the convenience and supply the wants of society."
>
> Reverend Samuel Ripley, quoted in Thornton 1989:29-30

Introduction

Gore Place was created as part of a tradition among the elite of establishing large estates in rural areas. English aristocrats had long maintained both urban and rural residences, and this pattern was partially replicated in first colonial, then independent America (Yentsch 1994:41, 98-112). The Gores themselves maintained a townhouse in Boston in addition to their Waltham estate (Pinkney 1969:48). The family was in good company when they established Gore Place: John Adams, George Washington and Thomas Jefferson, among others, all owned country seats, though on a much larger scale (Hammond 1982; Chesney 2005).

American and British country estates of the early 19th century were very similar in many respects. In both areas, these properties contained mansions and carefully sculpted pleasure grounds, intended to demonstrate their owners' wealth and refinement (Hammond 1982:14-67; Hoskins 1988:130-139; Thornton 1989:22). Great time and effort was spent to keep up with the latest fashions, and the grounds and buildings of many estates were refurbished to correspond to the fashions of the day (Turner 1986; Emmet 1996). Agriculture was normally practiced on these properties as well, and it was a major economic force on estates in both England and the Chesapeake (Thornton 1989:22; Chesney 2005:13-22).

The owners of country estates in late 18th- and early 19th-century Massachusetts, however, tended to practice agriculture for reasons other than the purely fiscal, and it was during this time period that the scientific agriculture movement took hold in the United States. This movement has its origins in 18th-century England, where wealthy landowners began experimenting with new crops and farming methods in order to "increase the body of scientific agricultural knowledge and… to set an example for the farmers of Britain" (Thornton 1989:24-25).

It was not long before the idea of an analytical, experimental agriculture crossed the Atlantic, and by the late 1700s it had found many supporters in eastern Massachusetts (Thornton 1989:26-27). The Massachusetts Society for Promoting Agriculture (MSPA), an elite organization whose members were interested in scientific agriculture, was founded in 1792 and counted many Federalist merchants and politicians among its members. Society members experimented with field crops, fruit trees, and livestock on their rural estates, and some owned personal greenhouses for growing delicate or exotic plants (Thornton 1989). Both Christopher Gore and his neighbor Theodore Lyman Sr. were founding members of the MSPA (Parson 2009:104).

The MSPA often attempted to connect with "practical farmers" who made their living through agriculture, as opposed to the already wealthy elites who managed the MSPA. A major part of the MSPA's rhetoric presented their scientific endeavors as selfless activities intended to improve agricultural practices in Massachusetts, and ultimately, to benefit the ordinary farmer (Thornton 1989:57-77). Indeed, Christopher Gore's eulogy described him as a "public benefactor," not because of his political role but because of his attempts to bring a "judicious system of agriculture" to Massachusetts (Reverend F.W.P. Greenwood, quoted in Thornton 1989:30). Descriptions like these were common of the MSPA members, despite the fact that many of their experimental results were only disseminated in private letters (Thornton 1989:26-30, 61-63), such as those between Christopher Gore and his close friend and fellow politician Rufus King.

There were other reasons to practice scientific agriculture besides the public good, however. Thornton points out that the United States in the late 18th and early 19th centuries was in the midst of a cultural and economic shift. Agriculture had long been held to be an activity of the utmost virtue; the ordinary farmer was seen as industrious, frugal, practical and nigh incorruptible. In contrast stood merchants and traders, to whom wealth seemed to come quickly, and without effort, seeing as they did not actually have to produce the goods they sold (Thornton 1989:1-6). Commerce, associated with laziness and luxury, was thought to eventually lead to the "end of liberty and virtue, the total decay of morals, and the decline of civilization" (Thornton 1989:5).

Few members of the Boston elite in the early United States had made their fortunes through agricultural activities, however. Many were lawyers and politicians, but they also acted as financiers, merchants and bankers; all undeniably commercial activities. As a result, it was politically beneficial for the Massachusetts elite to both distance themselves from commercial endeavors and to cultivate new images for themselves as hard-working farmers. Practicing scientific agriculture on country estates as a "benefit" to ordinary farmers would have helped the elite to project a façade of self-sufficiency and productivity, which could counteract the negative associations their wealth, luxury, and commercial activities held (Thornton 1989:1-6).

The early 19th century also saw the rise of American botanists and plant collectors, centered on Philadelphia (Leighton 1987:18-24), and the proliferation of gardening manuals, both English and American (e.g., Hibbert and Buist 1834; M'Mahon 1806). American botanical gardens such as the Cambridge Botanical Garden in Massachusetts (Records of the MSPA) and the Elgin Botanical Garden in New York (Hix 2005:25) were also established at this time, although European examples had existed as far back as the 16th century (Hix 2005:10).

The agricultural activities at Gore Place were undertaken in the context of a growing interest in the scientific study of plants in the United States, which manifested itself in part through the MSPA. In the early 19th century however, botany was primarily the realm of the elite. Botanists tended to be men with large country properties near the major metropolitan areas of Philadelphia, New York, and Boston. Even the gardening manuals assumed a certain level of wealth. The Green-House Companion, by J. C. Loudon, was written to "enable any lady or gentleman" to manage a greenhouse, provided they could afford to retain the services of "a footman or common labourer" (1824:5). The ladies and gentlemen that Loudon refers to oversaw the work, but probably did not carry out many of the day-to-day tasks.

The rise of a community of people interested in this serious, elite form of gardening in Massachusetts created and supported several sources of supply for plants. Members corresponded with each other and with horticulturalists in England about the success of different types of plants and exchanged seeds, bulbs, clipping, and young trees (Thornton 1989:61). In Gore's letter to Rufus King, for example, he offered to send 100 elm seedlings and reported to on how the wheat seed that King sent fared (Rufus King Papers, New York Historical Society letters of June 9, 1808 and August 20, 1815). A subcommittee of the MSPA oversaw the construction of the Cambridge Botanical Garden greenhouse between 1810 and 1811 (Records of the MSPA Box 13, folder 30, documents 26, 28, 31), and visitors could purchase plants. Their lists of customers in the 1820s are a veritable register of the Boston-area political and cultural elite in the early 19th century, including members of the Cabot, Appleton, Ticknor, Boott, Amory, Lowell, Webster, Otis, Lyman, and Gore families (Records of the MSPA, Box 13, Folder 31, Docs. 75, 80, 90, 91, 143). Although the Botanical Garden recorded most sales as simply plants, flowers, shrubs, or seeds, specific listing s include gold fish, rhubarb, elm trees, horse chestnuts, phlox, and mulberry trees (Records of the MSPA, Box 13, Foler 31, Docs. 119, 143). The existence of this community also supported professional nurserymen such as John Kenrick, founder of the Kenrick tree nurseries in Newton (Wilder 1881:48; Grady, Brockway, and Fuhrer 2010), and George Heussler, a German immigrant to Salem (Moore 1988; see also Leighton 1987:67-82 on the

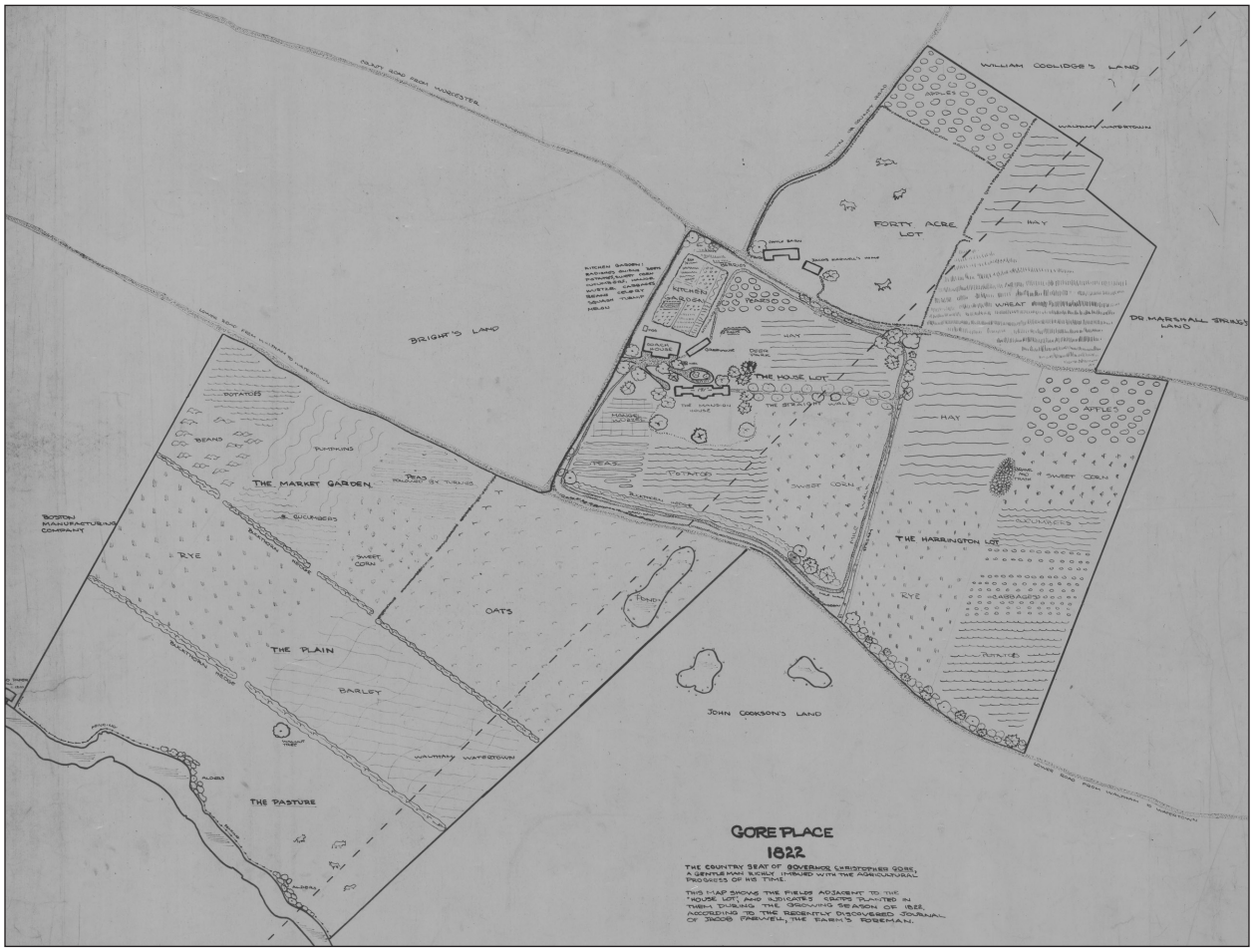

Figure 2.1. A Radcliffe seminar map depicting Gore Place and the organization of its agricultural areas in 1822, based on documentary records. Original on file at Gore Place.

professional gardeners on the east coast). Heussler's 1796 advertisement in the Salem Gazette (quoted in Moore 1988:133-134), gives a sense of the variety of species available locally; he lists 19 types of peach trees, 7 of nectarines, 7 of cherries, 9 of plums, 6 of pears, as well as apricots, quince, walnuts, three sorts of mulberries, almonds, other trees, and flower bulbs.

Agricultural Activities at Gore Place

The level of Christopher Gore's investment in this scientific and agrarian lifestyle is demonstrated in his letters to Rufus King, and the scope of his farm activities is documented in the daily journal of one of his farm managers, Jacob Farwell (Farm Journal, Jacob Farwell, manuscript at the Gore Place Society). Gore's letters record some of his crop yields, his experiences with new plant varieties, and his experiments with animal feeding techniques. They also highlight Gore's familiarity with similar practices in England. Farwell's farm journal, kept in the 1820s, reveals that Gore's agricultural operations were on a large scale. Research by a Radcliffe seminar reconstructed the layout of agricultural areas at Gore Place (Fig. 2.1), while archaeological testing (Smith et al. 2010) delimited areas near the house that were farmed. In addition to keeping livestock, the farm grew corn, cucumbers, hay, melons, potatoes, several grains, beans, beets, cabbages, celery, lettuce, onions, parsnips, radishes, rutabagas, turnips, squash, manglewurzel, strawberries, apples, and grapes. In one of his letters, Gore wrote that his grapery produced 1600 bunches of grapes, and Farwell's

Figure 2.2. One end of the peach wall at the Vale in Waltham, MA, the estate of Theodore Lyman Sr.

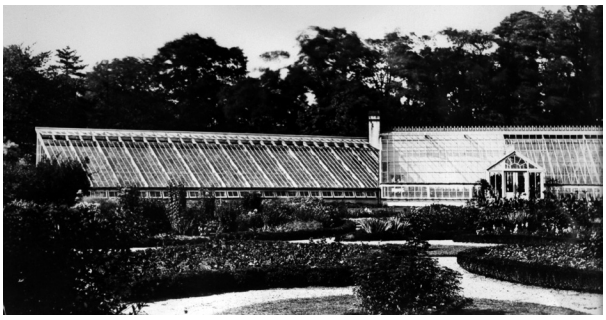

Figure 2.3. The greenhouses along the fruit wall at Gore Place, seen in an early 20th-century photograph. These greenhouses were built in the lean-to style.

journal mentions a large project being carried out by "two men from the farm and one from the garden" (Farwell, June 9, 1825). This suggests that the agricultural enterprise was large enough that labor on it was organized into multiple work groups. Farwell routinely went to Boston for manure, which was tended by adding leaves, turned, stored, and eventually carted off to the fields.

While he conducted his own agricultural experiments, Gore also kept abreast of the latest farming technologies and techniques. For example, unlike many other early 19th-century farmers, Gore grew hay, recognizing its value as livestock feed and its ability to replenish soil nutrients when used in a system of crop rotation. Similarly, the system of crop rotation that Gore implemented was based on a study from Maine on the effects of various plants on soil nutrition. The farm also used cutting edge technologies such as rollers for planting grass seed and a horse-drawn hay rake. The roller was used at Gore Place as early as 1822, but was still considered a new implement in 1839. The horse-drawn hay rake was in general use by the 1820s, but Gore was interested in the machine several years earlier, asking Rufus King to send him one in 1815 (Viens 2010:7-13).

In addition to agricultural fields, the Gores owned woodlots and pastureland, and raised cattle, sheep, pigs, and chickens. The family also grew orchard trees and maintained a fruit wall/grapery (Brockway 2001:23; Viens 2010:6). The fruit wall is depicted on some maps of the estate, and may have resembled the peach wall at The Vale in form (Fig. 2.2). Considering the fruit wall is off center in relation to the Federal-style mansion, it likely predates that building. The fruit wall was eventually expanded into a large greenhouse, but only after the Gores died. The location of this grapery greenhouse was determined by the Fiske Center in 2004 (Smith and Dubell 2004), although it has not been significantly excavated. Historic maps of Gore Place suggest that the fruit wall/grapery was initially expanded into a greenhouse sometime between 1834 and 1841, and that the structure was modified again between 1841 and 1889. These date ranges mean that the grapery greenhouse was built by either the Lymans or the Greenes, and that it was later modified by either the Greenes or the Walkers. The grapery greenhouse stood until around 1921, and was photographed in 1906 (Fig. 2.3).

The grapery greenhouse was the third such structure to have been built at Gore Place. The earliest greenhouse was attached to the 1793 mansion, and was the origin of a fire which destroyed that building in 1799. The remains of this greenhouse have not been examined archaeologically, and were likely impacted by the construction of the Federal-style mansion in 1806, which was built in the same location as its predecessor (Beranek et al. 2011:9, 32).

The second greenhouse, the focus of this report, is the only one of the three to have undergone extensive archaeological investigation. This building appears to have been constructed at the same time as the mansion, and it is first depicted on an 1834 plan of the estate, drawn up when Theodore Lyman Jr. purchased the property. On this map the greenhouse, which is clearly labeled, consists of a south-facing main body with a small exten-

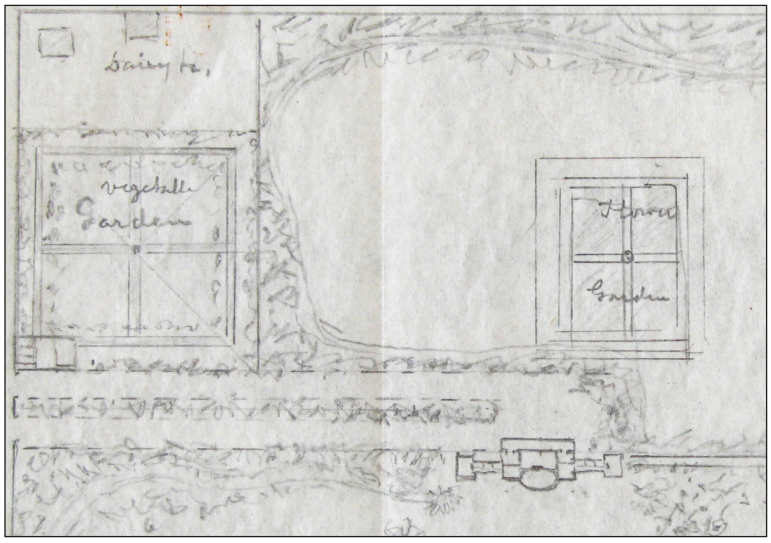

Figure 2.4. An 1881 sketch by Col. Henry Lee based on his recollection of his 1834 visit to Gore Place. Note that he does not depict the fruit wall or second greenhouse. Original on file at Gore Place.

sion off the western end at an angle to the rest of the building. The extension is the only part of the greenhouse aligned with the rest of the buildings on the estate. This second greenhouse also appears on an 1841 map of Gore Place, used to illustrate the property and its contents when John Singleton Copley Greene sold the estate in 1853.

Interestingly, while Christopher Gore discussed his field crops with King and once described his yield of grapes, he never mentioned the greenhouse in these letters. Documentary references to the greenhouse and the plants grown within are limited to the maps described above and a few textual references. Farwell's journal occasionally records "helping Heathcoat about the hothouse" (January 23 and 24, 1822) or "making hotbeds for Heathcoat" (March 11, 1822). Heathcoat, or Heathcot, was Gore's gardener; the new species of pear developed at the property is named after Heathcot, and he was presumably responsible for the specialized tending of the greenhouse plants as well. Greenhouses and hotbeds would have provided a place to start plants that would be later planted in outside gardens or brought inside in pots, and were permanent homes for more delicate species. The only other references to the second greenhouse or its plants come from descriptions of sales after Rebecca Gore's death in 1834. One record is for the purchase of "two fine orange trees, three variegated orange, and four limes" (quoted in Brockway 2001:26), and another lists "the flowers in the vinery, a large collection, of roses, geraniums, and other plants" among the contents of the estate sale (quoted in Brockway 2001:28). Information on the excavations undertaken at the second greenhouse can be found in Chapters 3 and 4 of this report.

In addition to these agricultural components, the Gores maintained a formal flower garden, the latter located north of their mansion (Viens 2010:6). The 1834 map does not show a flower garden per se, though it does delimit a rectangular area around the fruit wall. A formal rectangular garden is shown on a map drawn in 1881 by Henry Lee, as he remembered it from an 1834 visit (Fig. 2.4). Lee questions his own memory of the flower garden, and his plan does not show the grapery wall (Brockway 2001:29). The later, curvilinear incarnation of the flower garden appears on a HABS map of Gore Place (Fig. 2.5), and remnants can be seen on the ground today.

The Rise of Private Greenhouses

In *The Green-House Companion,* J.C. Loudon characterized the progression in people's taste in potted plants from those that were "choice," to

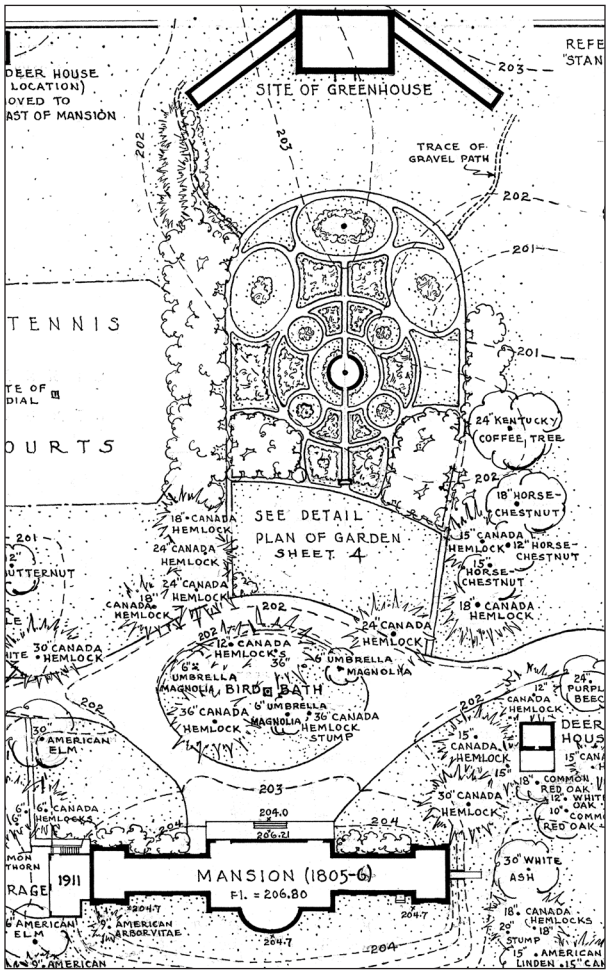

Figure 2.5. Detail of a Historic American Building Survey (HABS) map of Gore Place, produced in 1936. The map shows the location of the grapery greenhouse and the gardens in front of it but not the former location of the 1806 greenhouse.

those that were "rare," and "from things rare to things rare, foreign, and tender," some of these needing the specialized climate of a greenhouse (Loudon 1824:1-2). Loudon described greenhouses as "an appendage to every villa, and to many town residences; - not indeed one of the first necessity, but one which is felt to be appropriate and highly desirable, and which mankind recognize as a mark of elegant and refined enjoyment" (1824:v). To facilitate this refined enjoyment, greenhouse and gardening manuals like Loudon's expounded on the ideal construction methods and settings, provided lists and descriptions of plants, and cataloged the tasks to be performed during each month of the year (Loudon 1824; see M'Mahon 1806 and Hibbert and Buist 1834 for other examples). These manuals present detailed instructions and specifications that may be ideals and not reflect the actual practices of greenhouse owners, but they do provide a sense of the range of possibilities in greenhouse construction and maintenance.

Greenhouses evolved from specialized structures for sheltering plants that had appeared in Europe in the 15th century. Originally little more than temporary wooden shelters built to protect plants during the winter, these buildings spread from Italy to the villas, estates, and palaces of neighboring countries, becoming increasingly permanent over time (Woods and Warren 1988:4-17). These early greenhouses commonly held orange and other citrus trees, and were sometimes called "orangeries" (Hix 2005:11-12). With the dawn of the 17th century came an increased understanding among gardeners of the importance of light for plant growth, and greenhouses began to incorporate more windows in their designs (Woods and Warren 1988:17; Pogue 2009). The 18th and 19th centuries saw the development of increasingly advanced greenhouse designs as gardeners sought to maximize the productivity and efficiency of these structures (Koppelkamm 1981; Woods and Warren 1988; Hix 2005).

From their invention, greenhouses were associated with wealth. Although they were practical garden structures, greenhouses often held delicate, exotic, and potentially expensive plants. Even in their most basic forms, the buildings were costly to build, and normally needed to be managed by gardeners or servants. As a result, greenhouses were most commonly found on the estates of wealthy gentlemen and aristocrats, although some universities maintained greenhouses as parts of their botanical gardens (Woods and Warren 1988; Chesney 2005).

These same gentlemen and aristocrats built greenhouses for more than simply growing food; rather, greenhouses, like gardens, were multifaceted features. Mark Leone (1984, 2005) and others (Yentsch 1990; Ernstein 2004; Chesney 2005) have argued that greenhouses and gardens served several roles outside of horticulture. Gardens and

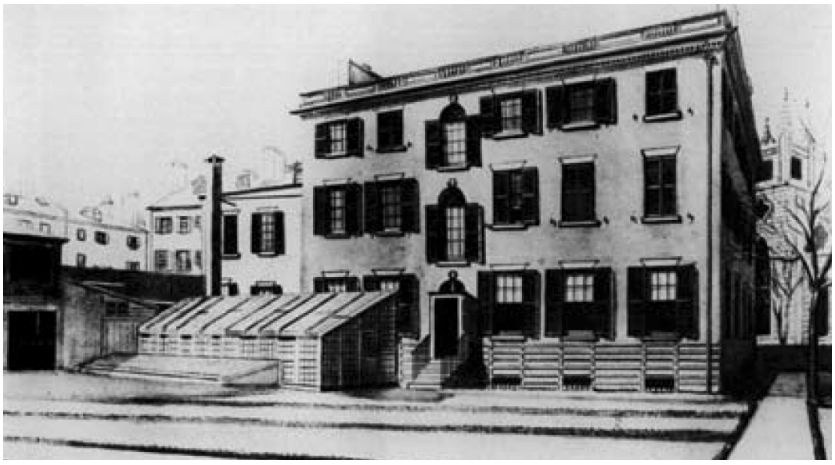

Figure 2.6. An engraving showing the rear of Kirk Boott's home in Boston. Boott's 1805 lean-to style greenhouse and attached hotbeds are visible along the left side of the house. The engraving was made by an unknown artist between 1840 and 1847. From Emmet (1987:26). The original engraving is held at the Boston Athenaeum.

greenhouses were fashionable and decorative features, and their presence on an estate added to its grandeur (Chesney 2005). In addition, both features implied that their owner could control nature itself: gardens were nature put into man-made order, while greenhouses created artificial climates and allowed gardeners to defy the seasons. Within the cultural milieu of the gentlemen who built greenhouses and gardens, these features had hefty symbolic meanings, and were key components of strategies of self-presentation and elite competition (Leone 1984, 2005; Yenstsh 1990; Ernstein 2004; Chesney 2005). The people who owned greenhouses had both ideological and practical reasons to build them.

Wealthy Americans had begun building greenhouses by the mid 1700s, especially in the Chesapeake and the Philadelphia area, though as late as the 1780s they were still considered "unusual" (Pogue 2009). Despite this scarcity, greenhouses had appeared in Massachusetts during the first half of the 18th century. Tradition ascribes the first greenhouse in Massachusetts to Andrew Faneuil, who is thought to have built one in Boston between 1710 and 1738. However it is unclear if this tradition is historically accurate (Pogue 2009:40). Regardless, Gardiner Greene, also of Boston, is known to have owned a greenhouse on his property beginning sometime in the late 1730s (Woods and Warren 1988:84). By the advent of the scientific agriculture movement in the late 18th and early 19th centuries, the state boasted several more greenhouses. Essex County merchants John Tracy and Elias Haskett Derby had greenhouses by 1782 and 1790 (see Fig. 1.5), respectively (Moore 1988:129, 135-136). Kirk Boott, whose descendants later founded the Lowell Boott Mills and become avid horticulturalists, built a small greenhouse on his Boston property in 1805 (Fig. 2.6; Emmet 1996:34-37). Christopher Gore's neighbor and fellow MSPA member Theodore Lyman Sr. constructed his multiple greenhouses and fruit wall between 1797 and 1810 (Thornton 1989:22-24), and a subcommittee of the MSPA oversaw the erection of the Cambridge Botanical garden greenhouse between 1810 and 1811 (Records of the MSPA Box 13, folder 30, documents 26, 28, 31). Marshall Wilder's (1881) history, *The History of Boston and Vicinity,* lists other properties with greenhouses in the late 18th and early 19th centuries as well, though without providing specific dates.

Visitors to the private greenhouses commented regularly on the orange and lemon trees (see quotations in Moore 1988) and noted other exotic plants which may have been in the greenhouses, such as aloes and prickly pears at the Derby property (Moore 1988:135). The Lyman greenhouses

specialized in growing flowering exotic fruit such as pineapple and citrus and, later, flowers such as roses and camellias (Historic New England).

The Gores had owned a greenhouse as early as 1793, and they built a second in 1806. Although this second greenhouse is depicted on maps of the property, no additional documentary information exists about its design and appearance. As a result, any description of the building must be drawn from other contemporary sources and from the archaeological record. Documentary and architectural data about other greenhouses of the period is presented here; results from the archaeological excavations at the Gore Place greenhouse site are presented in Chapters 3 and 4.

Greenhouse Terminology and Forms, with contributions by Heidi Krofft

American greenhouses of the 18th and early 19th centuries were long rectangular buildings 10 to 20 feet deep and up to 100 feet long. Authors of 19th-century gardening manuals agreed that the greenhouse should be oriented with its long axis facing south for maximum sun exposure, since the importance of sunlight to plant growth was understood by this point, although it had not been considered important in older manuals (Abercrombie 1789; Loudon 1805, 1817, 1824; M'Mahon 1806; Woods and Warren 1988; Hix 2005:22-27). The north wall generally had few or no windows.

The authors also usually recommended that there be an attached shed for holding tools and to provide a place to repot plants. The shed, which should ideally be out of sight, might also hold the furnace, which would be located behind the greenhouse or at one of its ends. M'Mahon illustrates a greenhouse with a full cellar to house the furnace, cisterns for watering the plants, and tools, so that no unsightly sheds are visible (1857:518). Loudon's list of necessary supplies makes clear that anyone with a greenhouse would need to also maintain both indoor and outdoor storage space: outdoor space for piles of soil components such as loam, peat, leaf mould, different sorts of dung, and sand; indoor space for pots, saucers, thread and wire for tying up plants, rods for plant props, brushes and sponges for cleaning leaves, mats, watering cans, a syringe, a thermometer, bell-glasses, naming sticks, and the range of small gardening tools (1824:151-152). For killing insects, various ingredients and apparatus needed to be at hand including tobacco and fumigating bellows, soap, sulfur, and others.

Rectangular greenhouses of the mid- to late 18th and early 19th centuries have two basic profiles, though with any number of variations. One, the earlier "conservatory" style, was an ornamental architectural structure of brick or stone with tall front sash windows between piers. M'Mahon describes how a typical greenhouse of this type should be constructed in *The American Gardener's Calendar* (1806:79). Sash windows would hang between piers of brick, stone, or wood, and extend almost the entire height of the building. If the piers were sufficiently sturdy and wide, folding shutters could be hung on them (M'Mahon 1806:79). M'Mahon also recommends a wide glass door in the middle of the front wall "for both ornament and entrance," and to facilitate the movement of plants in and out of the building. He also suggests a second, smaller door be installed at one end of the structure for use in inclement weather (1806:79). Examples of this type were built at Mt. Clare in Baltimore, Mt. Vernon in Virginia, the Wye Plantation in Maryland, and at the Derby House in Salem, Massachusetts, among others.

The second type was introduced in the United States near the end of the 18th century, although earlier examples were present in Europe (Loudon 1817:11-14; Pogue 2009). This type of greenhouse, sometimes called a "lean-to" style, was designed to take more advantage of the sun's energy than its predecessor, and had a substantial back wall and a sloped roof and front constructed mostly of glass, resting on a shorter and less substantial knee-wall in front (Abercrombie 1789; Loudon 1817, 1824). Examples of this type of greenhouse were built at the Lyman estate in Waltham, Massachusetts, and Oatlands Plantation in Virginia.

Within both types of greenhouse, plants could either be placed in built-in beds or planted in pots and seated on tiered shelves (Loudon 1824:12) (Fig. 2.7). A third option was to have a sunken section of the floor, known as a "bark pit." The pit was filled with pieces of bark and plant pots were set into the bark medium, which would provide

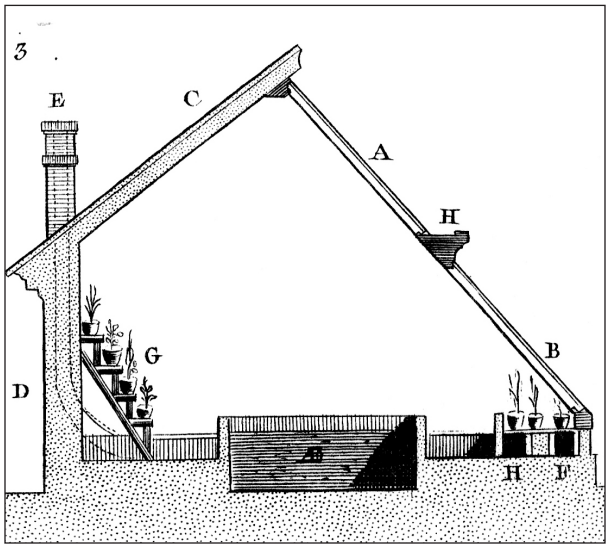

Figure 2.7. Profile of a lean-to style greenhouse from Diderot's late 18th-century *Encyclopedia*. This greenhouse has plants on shelves at the front and back of the structure, as well as a central bark pit.

a moist heat as it decayed (M'Mahon 1857:104-109). Jacob Farwell's Farm Journal notes that on occasion he hauled loads of oak and cherry tree bark (April 5, 1823); he does not specify whether this is for a bark bed, other aspects of soil preparation, or another purpose such as tanning hides. This last use is possible, as Farwell also mentions the existence of leaching pits at the farm, which were likely used for tanning. On two occasions, he specifically states that he was getting the bark "for Mr. Gore" (March 4, 1823; June 22, 1824).

Terminology

Early 19th-century authors sometimes, although not consistently, distinguish between greenhouses and other types of plant-houses. M'Mahon, for example, describes a greenhouse as "a garden-building fronted with glass, serving as a winter residence, for tender plants from the warmer parts of the world, which require no more artificial heat, than what is barely sufficient to keep off frost" (1806:78). In contrast, M'Mahon identifies "hot-houses" as those buildings that protected exotic tropical plants which required a great deal of heat (1806:84). That author also makes a distinction between greenhouses and "conservatories"; the former holding plants in pots on shelves, the latter growing plants in beds (1806:82). J.C. Loudon, on the other hand, seems to use the terms "greenhouse" and "conservatory" interchangeably (1824). Other authors distinguish building types based on what is grown within, discussing "pineries," "vineries," "peacheries," and myriad other types (Abercrombie 1789). During the 18th century and earlier, the term "orangery" was common, as these buildings often held citrus trees (Woods and Warren 1988:8-59; Hix 2005:14-15).

The Cambridge Botanical Garden originally planned to build two structures: a greenhouse and a hothouse (MSPA Records, Box 13, Folder 30, Doc. 26). Due to the expense of the first structure, only the greenhouse was constructed. Receipts for maintenance to its furnaces and chimneys show that it was heated; in fact, an 1816 receipt for "building [a] chimney at [the] west end of the green house" suggests that they may have upgraded the structure's heating capabilities once it became clear that there would be no separate hothouse (MSPA Records, Box 13, Folder 31, Doc. 43). Jacob Farwell's accounts refer to helping Heathcot at the "hot house" at Gore Place, establishing that somewhere on the property there was a heated structure for exotic plants. Whether that corresponds to the excavated building discussed in this report, or refers to an element of the fruit wall and grapery complex is unclear. Due to this uncertainty and to the fact that 19th-century authors, while sometimes making distinctions between types, seem to have used "greenhouse" as a generic term, that is the term used throughout this report.

Heat and Light: Furnaces, Flues, and Windows

Eighteenth- and nineteenth-century authors were full of advice about constructing, maintaining, and equipping greenhouses; some going so far as to offer sample building plans (see for example Abercrombie 1789; Loudon 1805, 1817, 1824; M'Mahon 1806, 1856; Hibbert and Buist 1834). These published sources were probably important references for people seeking to build greenhouse in New England. The Cambridge Botanical Garden noted that they could not find a builder who would agree to construct the greenhouse for

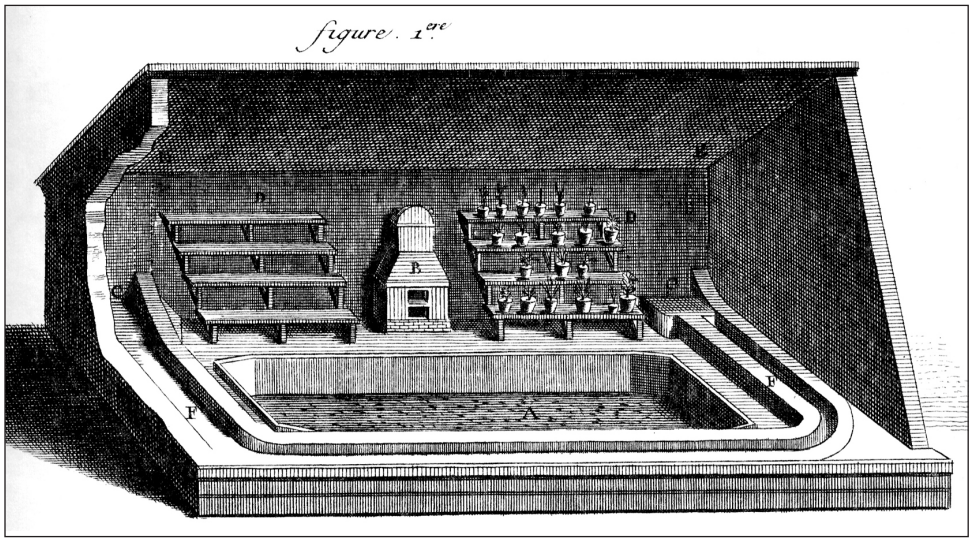

Figure 2.8. An illustration from Diderot's *Encyclopedia* showing a greenhouse with sub-floor flues circling the interior of the building. A furnace is visible between the shelves along the back wall.

Figure 2.9. A brick flue that runs along the back wall of the 1804 greenhouse at the Vale. Part of this flue has been removed, making the interior visible.

a fixed sum, suggesting that the form was novel, and construction costs relatively unknown. In a letter from 1810, the committee noted that they did not have enough data to "enable them to offer or accept any terms" (MSPA Records, Box 13, Folder 30, Doc. 28).

One of the most actively discussed topics in the advice manuals was the method of heating the greenhouse. The size of the furnace varied depending on the type of fuel, the size of the building, and the number of returns of the flues, which could run under the floor or through the walls (M'Mahon 1806:86) (Figs. 2.8 and 2.9). Exact dimension for the furnace vary between 1.5 to 5 feet deep, 12 to 20 inches wide and 18 to 22 inches high (Abercrombie 1789:24; Loudon 1805:22; M'Mahon 1806:86). Regardless of the exact size, the furnace consists of a main fuel chamber with an arched ceiling, an iron grate at the floor or bottom of the chamber, and an ash pit below. There must also be an iron door for the furnace. In some cases the ash pit may also have an iron door (M'Mahon 1806:86). Loudon goes into great detail on improvements that can be made to furnaces to increase efficiency and heat output (Loudon 1805:23-30), and Abercrombie stresses the importance of temperature regulation, suggesting gardeners place "a good thermometer" in their greenhouses (1789:54). Furnaces could be fired by wood or coal and could send hot air, steam, or smoke through the flues to heat the space. M'Mahon advocates heating by running pipes of hot water under the floors and through the walls, rather than using flues (1857:20), whereas Loudon advises against steam and hot air systems in favor of "smoke flues" (1824:25).

The size and layout of the flues was also a subject of frequent discussion; much of Loudon's 1805 publication is devoted to improved schemes for flues. Flues could run under the greenhouse floor or through walls, sometimes snaking back and for the in the tall back wall several times. Flues could also be built detached from the wall and coiled around planting beds (Abercrombie 1789:28). Hibbert and Buist advise that if using coal, the flues should be 6 inches wide and 8 inches deep, plastered only on the bottom; if using wood, the flues should be larger by half (1834:346).

Heat and light were two of the most important factors in the ability to cultivate or house plants in a greenhouse and were obtained through the use of the sun and a furnace. Loudon stresses the importance of glass in construction of the greenhouse. The best glass should be chosen, "that which is clearest and has fewest inequalities of surface, in order that the light may pass through it as little changed as possible" (Loudon 1824:158). The adoption of metallic sashes was seen as improvement in the construction of greenhouses (Loudon 1817:78). Metallic bars, or astragals, of iron, copper, or pewter would eventually replace the wood used in early greenhouses, and facilitate the construction of later 19th-century structures made almost solely of glass and metal (Koppelkamm 1981).

In either type of greenhouse, a vast majority of the southern wall and sometimes a portion of the roof were constructed of glass. A covering was necessary to retain heat during the nights and in inclement weather (Loudon 1805). As mentioned above, interior shutters were used in greenhouses where only the southern wall was constructed of glass. In greenhouses where the roof was also constructed of glass, an inner roofing system was created. Loudon describes the inner roof as "simply a collection of curtains of coarse wooden cloth, which are made so as to slide down upon wires, six or eight inches within the glass. These curtains can be drawn up, and let down at pleasure, by means of cords and pulleys" (1805:63-64).

Other suggestions in the construction of greenhouses were made to help make the most of light and heat from the sun. Gardening manuals instructed that the interior of the greenhouse be finished with plaster and whitewash to maximize the power of the sun (M'Mahon 1806:81; Hibbert and Buist 1834:300). These authors also suggest that the floor of the greenhouse be raised above ground level and made of large paving tiles or flagstone to help maintain heat and reduce dampness within the greenhouse (M'Mahon 1806:81; Loudon 1817:73).

Hot Beds

Hot beds are outdoor pits or raised beds filled with prepared dung or manure, topped with dirt and enclosed within a sloped, glazed frame (M'Mahon 1857:20-22). M'Mahon advised different sized beds for different plants, but gave a size range of 9 to 12 feet long and roughly 5 feet wide; the frame should be twice as high in the back as the front to allow moisture to run off (1857:18-19). These semi-permanent structures were used to start plants early in the season and grow early season vegetables since the glass enclosure let in sun and kept in warmth generated by the decaying manure. Seeds were planted in pots in hot beds; the pots were "plunged" into the dirt layer to be heated by the underlying dung. These plants could later be transplanted elsewhere outdoors. Farwell's journal at Gore Place records that he built hot beds for Heathcot, presumably to be used in conjunction with the greenhouse, and for Isaac Farwell. Isaac's hot beds were located "in the hog yard" and seem to have been used for starting vegetables since there is one reference to "setting out lettuce in a hotbed in the hog yard" (Farwell, March 27, 1822). Jacob Farwell's descriptions of building the hot beds gives a good sense of the process and include entries for "fixing a place for the hotbed" (August 15, 1822), "digging a hole for Isaacs hotbed" (August 20, 1822), "carting gravel… to level a place for Isaac's hotbed" (January 28, 1823), "turning manure for hotbeds" (February 11, 1823), and finally, "making hotbeds" (Feb. 21 and March 10, 1823). These are merely excerpts of Farwell's recorded interactions with hot beds, and not an exhaustive list.

Maintaining a Greenhouse

A greenhouse and its plants and tools were al-

ready expensive additions to a house, but the cost of maintaining the building was quite costly. One source gives the cost of maintaining an elaborate greenhouse in the mid-19th century as $10,000 per year (Wilder 1881:39). The authors of advice manuals insist that each plant should be inspected daily to ensure that dead leaves were removed and it had received the appropriate amount of water. When plants became infested with insects, the greenhouse had to be fumigated with tobacco smoke for several hours every few days over a period of several weeks. For other kind of pests, every individual leaf of each plant needed to be sponged with a chemical mixture, or have a mixture applied to the stems with a syringe (Hibbert and Buist 1834:14; M'Mahon 1857:179-184). Plants were often repotted in the course of a year, and different seasons required different activities at the greenhouse. Except for in the summer, fires were lit in the morning and evening to warm the greenhouse and drive off the chill; in the winter fires were kept burning overnight and needed constant tending, lest the greenhouse get too hot (M'Mahon 1857:103). To admit fresh air, the greenhouse windows needed to be opened, except for in cold or stormy weather, when they needed to be left closed. Some greenhouses had roofs that were removed in the summer, to give plants access to more sunlight and fresh air (Loudon 1824:19-20). Gardeners were also encouraged to move potted plants outdoors in the summer for the same reasons (Loudon 1824:173).

Hibbert and Buist recommend repainting, repairing broken glass, inspecting the flues, and whitewashing yearly (1834:284). The records of the Cambridge Botanical Garden greenhouse are evidence for the types of regular specialized labor required for the physical upkeep of the greenhouse. While they employed a full-time gardener and seasonal labor for the horticultural work, specialists performed other kinds of regular tasks. Their receipts show substantial episodes of masonry repair in 1815, 1823, and 1830, including repairs to the fireplaces, preparing and repainting the masonry, plastering, and whitewashing (Records of the MSPA, box 13). Wooden elements such as window frames and water conductors were repaired more frequently, and there are several receipts for repainting. The accounts of the glazier who replaced broken panes of glass show that he visited several times a year (31:9 for 1815-1816; 31:50 for 1815-1816; 31:77 for 1824-1825). There were also running accounts with a person who made and repaired metal tools such as spades, rakes, hoes, shovels, dung forks, locks and keys, grass shears, water pots, and hinges, and sharpened knives, saws, pick axes, and other implements (31:48 for 1814-1816; 31:130 for 1821; 32:117 for 1825-1830). Greenhouse owners like Christopher Gore were dependent on specialists to build and maintain their greenhouses, and staff to manage its operations.

Even if the cycle of tasks outlined in the greenhouse manuals represents an ideal rather than a reality, greenhouses were undoubtedly costly, requiring capital, labor, and specialized knowledge to build and maintain. As a result, it is unlikely that the Gores, Lymans or Greenes ran their greenhouse by themselves. Some advice manuals were explicit that a lady or gentleman only oversaw greenhouse operations, while professional gardeners or other laborers would do most of the work (Loudon 1824:2-5). Although they were ostensibly built and owned by gentlemen, some advice manuals suggested that greenhouses were the domains of women. For example, J.C. Loudon wrote "a green-house is in a peculiar degree the care of the female part of a family," (Loudon 1824:2), and his wife authored several gardening manuals aimed expressly at women (Loudon 1857). Similarly, William Cobbett, writing in The American Gardener (2003 [1821]:44-45), stated that greenhouses were very beneficial "to the females of a family" since from them they "would receive constant amusement and delight, during a season when they are cut off from almost all other recreation." English tradition occasionally pegged women as gardeners, and some American women were known to have managed gardens and greenhouses (Turner 1986:71; Weber 1996). As a result, it is possible that Rebecca Gore had a hand in running the Gore Place greenhouse.

Sources for Comparison

A number of other late 18th- to mid 19th-century North American greenhouses are either still

standing or have been excavated. Some of these are referred to throughout this report as sources of comparative information and are briefly described here.

Quebec City

Excavations in the mid-1980s at the historic Château Saint-Louis, one-time home to Quebec's governors, uncovered two greenhouses. The first had been built in 1781, and was used to nurse foreign plants to maturity before they were relocated to the property's kitchen garden. This greenhouse had a shed on the north side that was used as a storage area for planting pots and tools and contained the stove used to heat the building. The 1781 greenhouse also had stone foundations, plastered walls and a pine floor, within which was found the remains of a planting bed. This greenhouse is believed to have been built in a lean-to style, and measured at least 33 by 13 feet (Beaudet 1990:95-97). The second greenhouse was built in 1815, and identified in account books as a hot house or greenhouse. Documentary records reference shelving being put up in the building, making it likely that plants were grown in pots in the 1815 greenhouse. This greenhouse also contained a cistern, on the west end of the building, plastered walls, stone foundations, two chimneys and a wooden floor. The 1815 greenhouse was approximately 65 by 26 feet, and was interpreted as a lean-to style structure (Beaudet 1990:97-104).

Maryland and Virginia

A number of greenhouses of this period are known from Maryland and Virginia, including those at Mt. Clare, Mt. Vernon, and the Wye House. None of these greenhouses were built in the lean-to style. The Mt. Clare greenhouse, outside of Baltimore, Maryland, was constructed between 1760 and 1770, and family correspondence shows that Margaret Carroll was primarily responsible for running it (Weber 1996:34-45). In fact, George Washington wrote to Mrs. Carroll for advice and a supply of plants when he built his greenhouse in the 1790s (Weber 1996; Pogue 1996). The Mt. Clare greenhouse measured 24 ft 8in by 26 ft 8in, and was built into the side of a hill. It had stone foundations and was constructed mostly of brick, with large windows along the southern façade. The heating system at Mt. Clare consisted of a sub-floor flue system attached to a brick-lined firebox (Chesney 2005:30-33).

The Mt. Vernon greenhouse in Virginia was excavated in the 1950s and subsequently reconstructed. It included, unusually it seems, slave quarters in the two wings (Pogue 2002:8-10). It was built in 1787 and was made of brick with plastered walls and a flagstone floor. The building was two stories tall, and held several large windows on its southern side. Its hipped roof was covered with red-painted tiles, and a flue system ran under the floors. The furnace was housed in a room on the east side of the building. The greenhouse building itself was approximately 42 by 27 feet, although it was made much large with the addition of the flanking slave quarters. The doors to the building were located on its east, west and north sides, the latter of which allowed access to storage areas and the furnace (Chesney 2005:26-29).

The Wye greenhouse, belonging to the Lloyd family on the eastern shore of Maryland, was built in 1740 and expanded in the 1780s. The oldest portion of the building is two stories tall, and made of brick. This section is roughly square and measures 32 by 30 feet. The ground floor of the southern façade holds four large windows which stand 12 ft 8in high and 6 feet wide. The floor was brick laid on sand, and the walls were coated with a layer of hard clay and then plaster. A room on the east side of the building held a furnace for heat and may have also been a storage area. The furnace was built of unmortared brick and was connected to a flue system that ran through the northern wall and under the floor.

In the 1780s the building was expanded, and two new single-story greenhouses were added to the east and west ends of the original greenhouse. This enlarged the building to 85 by 30 feet in size. The building was accessed through the windows on the southern façade as well as through a back entrance (Chesney 2005:40-43). The Wye greenhouse is still standing today, and excavations are currently being conducted there by Mark Leone.

Pennsylvania

The Philadelphia area was a major center of

botanists and greenhouses in the late 18th and early 19th centuries. Some of the greenhouses are known from period paintings, such as John Woodside's painting of Lemon Hill, owned by Henry Pratt and built in 1807 on the banks of the Schuylkill River (see Woods and Warren 1988:87). Excavated examples include the Woodlands Estate, home to William Hamilton; Andalusia, home of the Biddle family (Kratzer 1995); and the Highlands, home of Anthony Morriss (Besherer, Kratzer, and Goodwin 1990). At Andalusia, Judson Kratzer uncovered remains of the enclosed grapery greenhouses in use between 1835 and 1875, the back walls of which are still standing (Kratzer 1995:104-133). Interestingly, Kratzer found that Biddle closely followed published specifications and suggestions for grapery construction. The Andalusia graperies were of a lean-to style and consisted of a back wall with multiple furnaces north of the wall and hot air flues running into the greenhouse, probably just above the greenhouse floor. The front wall was supported by piers, and the spaces between the piers allowed the grapes' root systems to spread outside the greenhouse. The front wall supported a sloping glass roof that ran to the top of the back wall. Kratzer also uncovered the prepared planting beds and sub-bed layers for the grapery and an extensive external drainage system. These features provide one example of how the fruit wall / grapery depicted on the 1834 map of Gore Place may have functioned, though the standing peach wall at the Lyman estate is another possible model. At the Lyman estate, portions of the wall were incorporated into greenhouse structures while other sections continued to function only as a sheltering wall (see Massachusetts below).

The greenhouse at Highlands, also outside of Philadelphia, was constructed between 1813 and 1841 and destroyed in 1871 (Bescherer, Kratzer, and Goodwin 1990:68-91). It was a lean-to style greenhouse with a tall back wall and shorter front wall with overall dimensions of 68 by 16 feet. The firebox was at the north (back) wall of the greenhouse and flues ran under the floor. There was also a deep pit inside the greenhouse that may have been a bark pit or storage cellar. Architectural artifacts recovered include pulleys for sash windows and window glass from non-rectangular panes (possibly shield and rhomboid shapes). Artifacts associated with the greenhouse included numerous planting pot fragments and many sections of iron wire that may have served to hold plants or vines to their supports.

Massachusetts

A number of Christopher Gore's contemporaries are known to have built greenhouses in the late 1700s and early 1800s. Kirk Boott, an English immigrant and member of the Boston elite, built a greenhouse on his Bowdoin Square property in 1805. Boott's greenhouse was built as a lean-to with a partially glazed roof. It had a chimney and flue heating system; smoke from a fire was conducted through a horizontal brick flue from one end of the building to the other. The greenhouse was attached to the back of the Boott home; the rest of the relatively small lot was occupied by a large garden. Boott appears to have been a passionate gardener, a trait passed down to some of his descendants (Emmet 1996:35-37).

John Tracy and Elias Haskett Derby also owned greenhouses on their properties, the former building his in 1782 and the latter 1790 (Moore 1988:129. 135-136). The Derby property was located in Salem, Massachusetts, and his greenhouse was built as a two-story structure. A plan of the building drawn by its architect, Samuel McIntire, suggests the greenhouse may have been more decorative than practical, as it had relatively small windows and faced east, limiting the sunlight that could reach the plants within.

Theodore Lyman Sr., the Gores' Waltham neighbor, built a series of greenhouses and a fruit wall at his estate, the Vale (now owned by Historic New England). Lyman Sr.'s first greenhouse was constructed in 1798 and was probably not intended for display purposes. It was constructed at some distance from the house in a kitchen garden and built into the slope of a hill. The walls are brick, and only the roof is glass. It is heated, and flues run the length of the building. The interior consists of a narrow walkway between two raised beds in which plants were grown. Behind (north) of this greenhouse is a cold frame with hinged windows that could be opened in good weather.

Lyman also constructed a 425 foot long peach wall at the top of the slope behind the house (Fig. 2.2), separating the house from the kitchen gardens, 1798 greenhouse, and other utilitarian structures. That the greenhouse was also hidden from view is not surprising; practical structures such as greenhouses were sometimes considered to have unappealing appearances not befitting pleasure grounds (Woods and Warren 1988:61). Besides the greenhouse and garden, the peach wall hid a large drainage system and series of paths. The wall itself is built of brick sitting atop a dry-laid field stone foundation (Pinello 1999). The interface between the stone foundation and the brick wall contained slate tiles set into mortar, in order to "shed surface water away from the wall and to prevent the 'rising damp' from moving into the bricks and mortar above" (Pinello 1999:9). The inspiration for Lyman Sr.'s peach wall is unclear, but it may be derived from the designs of English walled kitchen gardens (Pinello 1999:9-10)

In 1804, Lyman Sr. added a lean-to style greenhouse to one end of the wall, incorporating the peach wall into the back wall of the greenhouse. This greenhouse was intended to grow fruits such as pineapples, figs, lemons, limes, and bananas. Flues were run through the back wall, which moved air heated by basement furnaces around the greenhouse. The 1804 greenhouse was later transformed into a grapery, at which point beds were added for grape vines. The original configuration of the interior is not known.

In 1820, Lyman Sr. built another lean-to greenhouse along the peach wall, now known as the Camellia house, but apparently originally built to grow peach trees. In 1840, the space between these two greenhouses was filled with a third greenhouse, intended to grow flowers to be cut for use in the house, creating a connected complex (Historic New England).

As a neighbor and fellow MSPA member, Theodore Lyman Sr.'s greenhouses would undoubtedly have been seen by the Gores, and they may have served as models for the greenhouse built at Gore Place. Since Lyman's son, Theodore Jr., purchased Gore Place after Rebecca Gore's death in 1834, he also had a brief period when he could have directly influenced the greenhouses on the property. The Lyman greenhouses at the Vale still exist, and several have been tested archaeologically (Pinello 1999; Pinello and White 2000).

In Newbury, Massachusetts, Mary Beaudry identified a large area of prepared soil at the Spencer-Pierce-Little farm that may have been associated with either an open garden bed or an unknown structure (Beaudry 1994). The late 18th- or early 19th-century occupants removed the upper layers of soil (A and B horizons) and replaced them with a cobble-rich layer to create a well-drained area similar to some of the grapery bedding at Andalusia (Kratzer 1995). This process of removing natural soil layers and replacing them with specially prepared mixtures has been identified in a number of areas at Gore Place.

Chapter 3: Excavation and Geophysical Survey Results

Introduction

Excavation of the second Gore Place greenhouse site took place in the area east of the parking lot and old English oak, and immediately north of the entrance drive. The project area was roughly centered on the decorative Knot Garden, although excavation was performed inside the tall yew hedge to the north as well (Fig. 3.1). A Gore Place grounds crew removed the Knot Garden prior to the commencement of this project.

This project was split into two phases. The first took place from May 18 to June 29, 2012, and included ground penetrating radar (GPR), magnetometry, and electromagnetic conductivity surveys, as well as excavations by a University of Massachusetts Boston (UMass Boston) field school. The second phase took place from October 21 to November 16, 2012, and consisted of further excavation of the greenhouse and surrounding area by a UMass Boston field crew. Drs. Christa Beranek and David Landon of the Fiske Center for Archaeological Research supervised both phases of the project.

This project was the third archaeological excavation at the site of the second Gore Place greenhouse. In 2004, the Fiske Center performed an archaeological survey at Gore Place and ascertained the approximate location of this building using small shovel test pits at 5 meter intervals. Data recovery excavations of the westernmost portion of the greenhouse took place in 2008. Detailed information on these projects can be found in Smith and Dubell (2006) and Beranek et al. (2011). Because they will be useful for interpreting the greenhouse site as a whole, important artifacts and features from these projects are briefly described in this chapter.

A total of eight excavation areas were opened during the 2012 project. These areas, termed "trenches," were selected based on the results of geophysical surveys at the greenhouse site, the approximate locations of features seen on historic maps of the area, and the results of the 2004 and 2008 excavations. These trenches were subdivided into excavation units, which were identified by the coordinates of their southwest corners. The Fiske Center opened a total of twenty-four excavation units during the 2012 project; with the exception of a lone 1 × 2 m unit, all excavation units measured 2 × 2 m in size. Each unit was hand excavated in natural layers to sterile subsoil or until architectural features were encountered. Most architectural remains (wall and floor segments) were left in place; non-architectural features were at least partially excavated.

Each soil layer within a unit was assigned a unique, three-digit context number. Similar contexts spread across multiple units were grouped together as lots. Contexts were assigned to lots in order to facilitate analysis of soil deposition patterns across the site. Table 3.1 contains information about the various lots assigned during this project. All soil interfaces were photographed and mapped, and soil recovered from the excavation areas was screened through ¼ inch mesh. In most cases, all artifacts removed during the project were collected for laboratory analysis. However, due to the large amounts of brick, mortar, plaster, slag, coal, charcoal and architectural stone recovered, only samples of these artifacts types were retained. Artifact processing and analysis took place at the Fiske Center lab at UMass Boston.

2004 and 2008 Project Results

The results of the 2004 and 2008 Fiske Center excavations at the second Gore Place greenhouse had a direct effect on the 2012 project, influencing the selection of excavation areas and research questions. As a result, important features and artifacts are discussed below. More detailed information can be found in Smith and Dubell (2006) and Beranek et al. (2011).

2004 Project

The Fiske Center excavations in the greenhouse area during this project consisted of a 30 × 30 m block of 40 shovel test pits supplemented by four test units. The excavation area was selected based on the location of the greenhouse depicted on the 1838 Lyman and 1841 Greene estate maps,

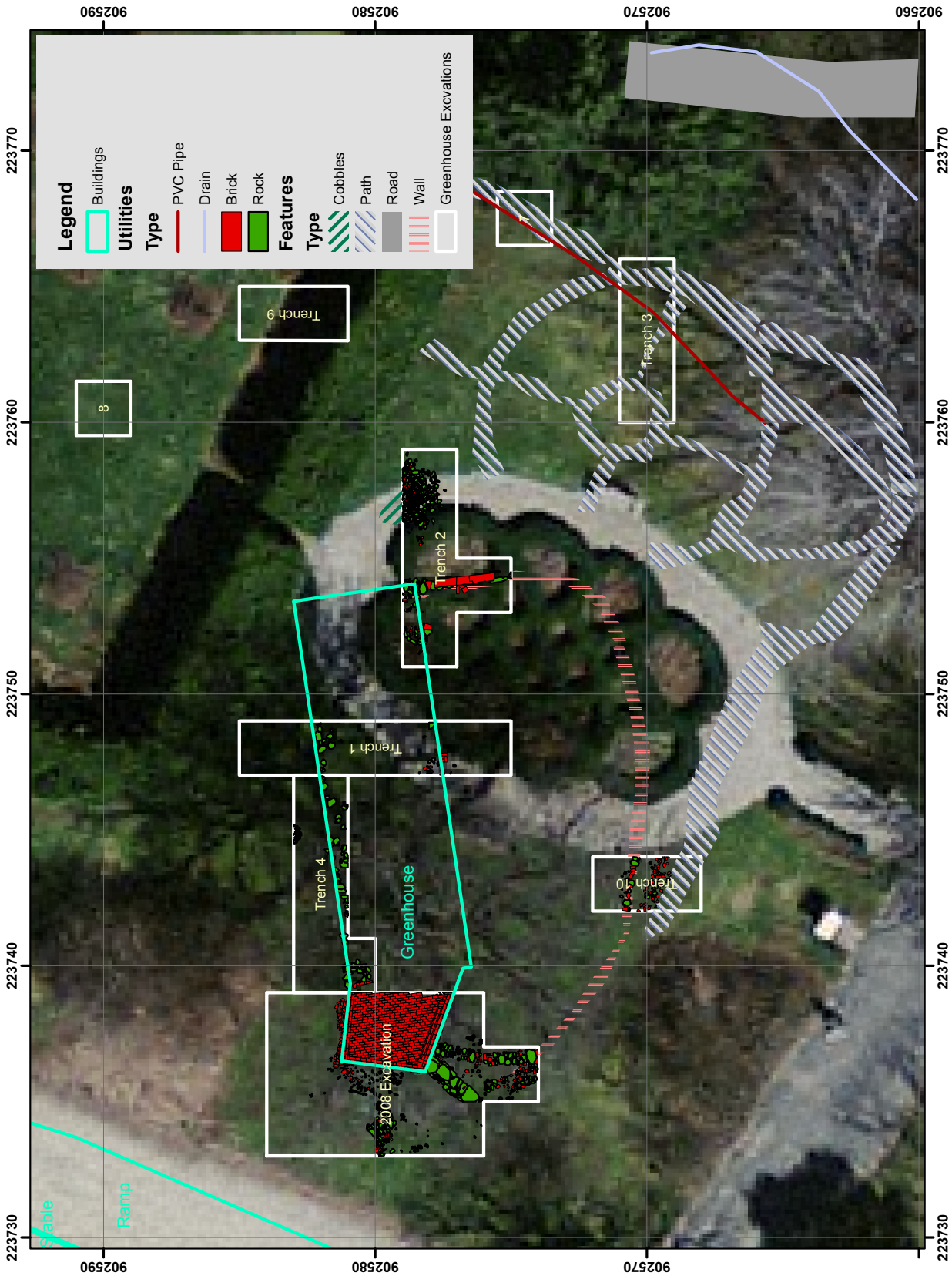

Figure 3.1. The excavation areas and features at the greenhouse site. North is to the left.

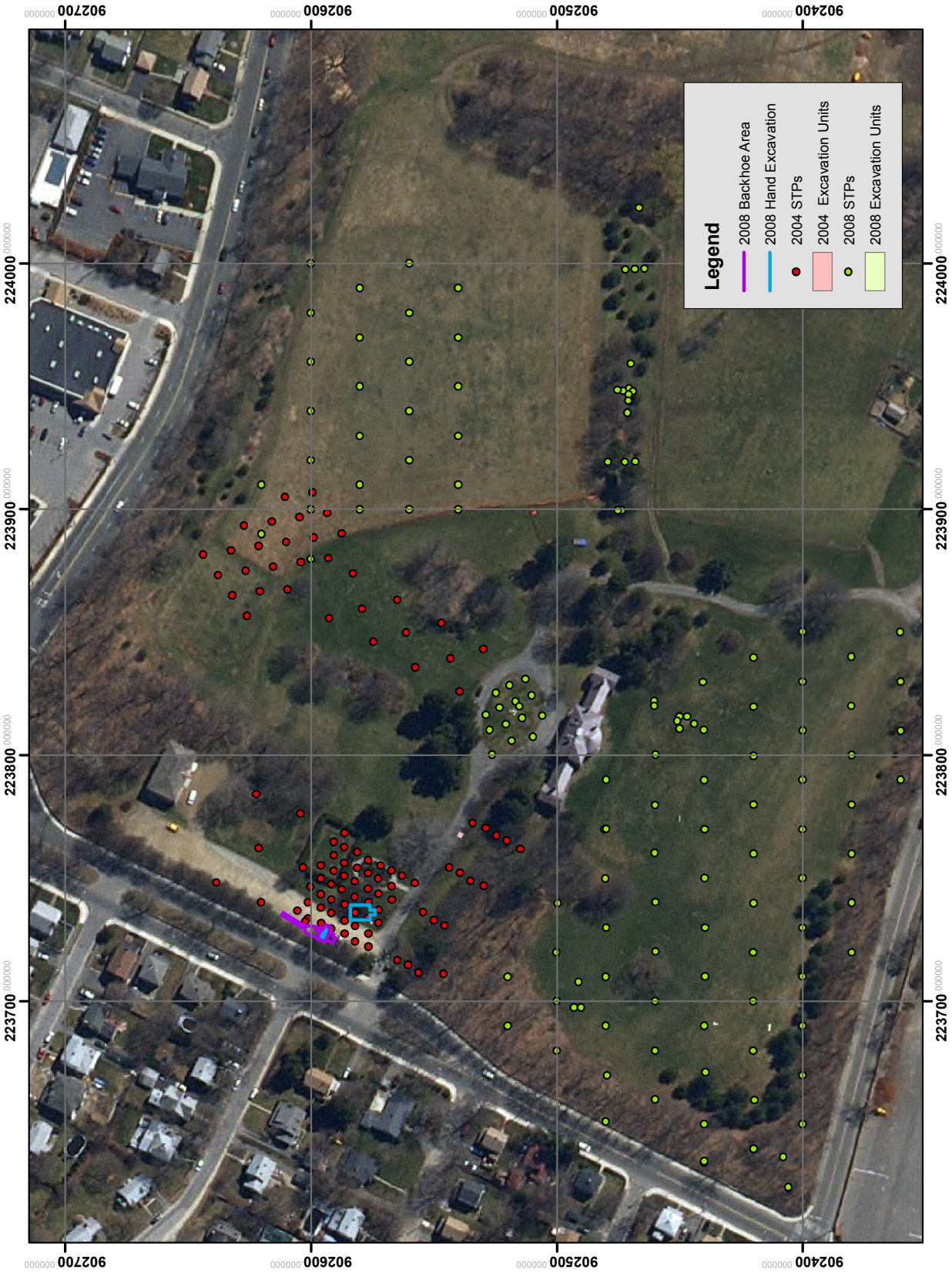

Figure 3.2. 2004 and 2008 excavations. North is to the left.

Figure 3.3. The stone drain, initially uncovered during the 2004 project (left), and south yard wall (right) in the 2008 excavation area. The stone drain abuts the greenhouse and was likely part of a water management system for the building.

and was located over and to the west of the decorative Knot Garden (Fig. 3.2).

Although the survey did not encounter any of the foundations for the greenhouse, it did locate rubble deposits associated with the building and evidence for landscape modification around the structure. Leveled areas were identified in the greenhouse yard and to the west of the structure. To the southwest of the building, a stone drain was uncovered. This drain had field stone walls, an earthen floor, and a cap of rough paving stones, and its interior space measured approximately 15 cm (6 in) deep and 25 cm (10 in) wide. This feature ran generally east-west (Fig. 3.3). A well was also identified southwest of the greenhouse, although it was not investigated until the 2008 project.

The most commonly recovered artifacts from the greenhouse and surrounding area were flower pots, window glass, and creamware/pearlware, although bottle glass, oyster shell, smoking pipe fragments, and architectural debris were also encountered. The architectural materials included brick, mortar, nails (both cut and hand wrought), slate, and white marble tiles.

Two other artifacts recovered during this survey include a fragment of a soapstone brick and shards of a glass bell jar. The brick may have been used to maintain humidity in the greenhouse: soapstone is resistant to the expansion and contraction associated with temperature changes and may have been heated and then wetted to produce steam. The soapstone brick was recovered from within rubble deposits associated with the greenhouse. The glass bell jar was discovered southwest of the greenhouse structure, at the western end of a stone drain. The jar would have been used to protect moisture and temperature sensitive plants within the greenhouse and was cylindrical in shape (Fig. 3.4). It should be noted that none of the subsequent excavations uncovered any more soapstone or identifiable bell jar fragments.

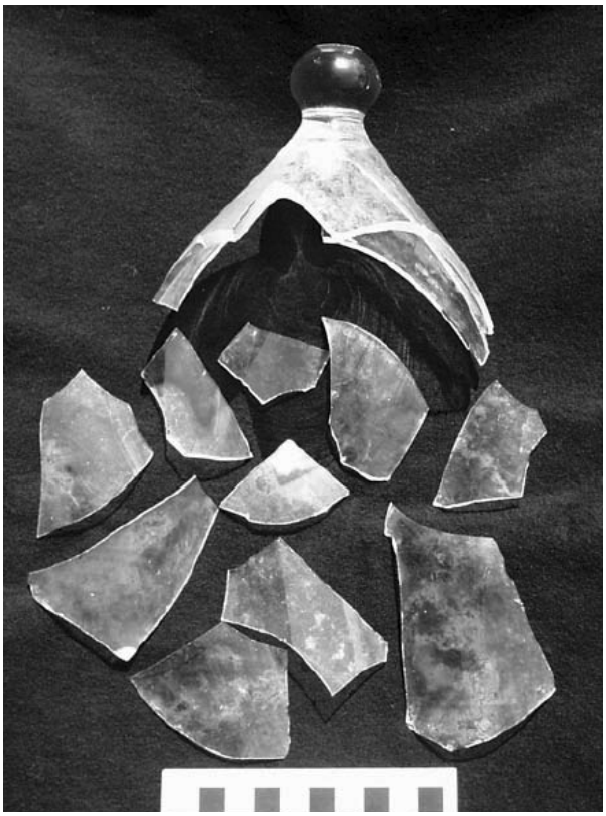

Figure 3.4. Fragments of a glass bell jar found in 2004.

2008 Project

The 2008 Fiske Center excavations consisted of thirteen 2 × 2 m units covering a 6 × 8 meter area with one additional unit to the south (Fig. 3.1). The excavation area was selected based in part on the results of the 2004 survey and in part on the area that might be affected by relocating the carriage house to the front of the property. The excavations were west of the Knot Garden, north

Figure 3.5. The brick-floored extension to the greenhouse and nearby features. The stone drain and south yard wall are visible at the upper left corner.

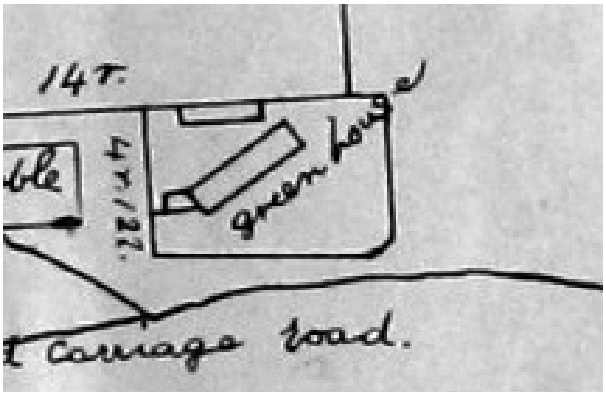

Figure 3.6. The 1806 greenhouse, as depicted on an 1834 plan of Gore Place. The small, trapezoidal room at the west end of the building is the brick-floored extension uncovered in 2008. The box around the greenhouse was initially believed to be a wall, but excavation found it was a gravel path.

of the entrance drive, and bounded on the west by the parking lot. The Fiske Center also undertook a ground penetrating radar (GPR) survey in this area.

Unlike the 2004 survey, the 2008 excavations uncovered intact portions of the greenhouse itself, in addition to associated rubble deposits and other nearby features. A roughly 3 × 3 m trapezoidal red brick floor was discovered in the excavation area, and was interpreted as a small room built off the west end of the main greenhouse structure (Fig. 3.5). This room is depicted on historic maps of the building (Fig. 3.6). This room, hereafter referred to as the brick-floored extension, had a mortared field stone and rubble base layer set into B-horizon soils, supporting one to two courses of mortared brick pavement. The extension also held a brick channel, which appears to have carried water out of the greenhouse. Only the lowest courses of the brick walls of the extension were intact, and no portion of the main body of the greenhouse was excavated at this time.

The brick-floored extension abutted two other features at its southwest corner. The first feature was the northern end of the stone drain discovered during the 2004 survey (Fig. 3.3). Artifacts from within the drain were limited, although creamware (post 1762) and polychrome painted pearlware (post 1795) were both recovered. The drain was located at the end of the brick channel found within the brick-floored extension, and was likely

constructed as part of a water management system within the greenhouse. It is unclear whether the drain was part of the original construction of the greenhouse or was added later in its lifetime.

The other feature at the southwest corner of the brick-floored extension was the base of a curving stone wall, hereafter referred to as the south yard wall (Fig. 3.3). The foundation of the wall sat atop a truncated A-horizon, and consisted of a single course of irregularly placed stones, bricks and mortar that measured between 45 and 50 cm wide. Although only 3.75 m of this wall was exposed in 2008, two other segments of the feature were uncovered during the 2012 excavations, and its full extent is visible in GPR slices from the site.

Several other features were discovered during the 2008 excavations. A historic road was present at the far west of the excavation area, and its construction method suggests it was built during the Gore occupation of the estate. A possible planting bed or compost area was found immediately north of the brick-floored extension, and a line of post holes was present just west of the greenhouse. The post holes run approximately north-northeast, and would have supported a substantial fence, with posts 20 to 30 cm (8 to 12 inches) in diameter. A clay and gravel path also ran near the greenhouse. This path sat atop a historic surface and was likely contemporary with the greenhouse.

Other features to the north of the building include a large layer of landscaping fill, deposited sometime after the greenhouse was constructed, and a later French drain cut into this fill. This northern French drain ran roughly north-south and was located between the road deposits and the line of posts. The drain was a sloping trench, up to 50 cm deep and 90 cm wide in the north, with a relatively flat bottom that had been partially lined with marine clay. This same clay was present in the road deposits to the west. The drain was filled with a mix of cobbles and artifacts associated with the greenhouse, such as planting pots, window glass, marble tiles and agricultural tools (Fig. 3.7).

Another French drain was found to the south, which differed in contents from its northern counterpart. The southern French drain held mostly cobbles, brick fragments, mortar, bone, and oyster shell. This drain also ran over both the south yard

Figure 3.7. The northern French drain. The fill of this feature contains many artifacts which likely originated in the greenhouse, including shovel blades and planting pots.

wall and the nearby stone drain, both at the southwest corner of the brick-floored extension, indicating it post-dated both of these features.

Greenhouse destruction layers were present both within and around the building, covering portions of the line of posts and the road to the west. These deposits contained artifacts similar to those found during the 2004 survey: marble tiles, slate roofing, nails, planting pots, glass, and refined earthenwares. Ceramics from the destruction deposits had terminus post quem dates (TPQ) of 1830 or earlier. Documentary and artifact analysis put the construction date of the greenhouse at circa 1806. Rita DeForest (DeForest 2010; Beranek et al. 2011) undertook a detailed analysis of the planting pots recovered from the site, and found that they were present in a variety of sizes, ranging from thumb pots to those large enough for small trees or shrubs.

Similar soils and features from this project were grouped together into analytical units during

analysis. These groupings were intended to facilitate the rapid comparison of sets of features and site-wide patterns. In 2012, soils and features were grouped into lots for the same purpose, and the original analytical units from 2008 were assigned lot numbers to speed comparisons of the results of both projects. Table 3.2 shows the lot groupings for the 2008 project.

The well to the northwest of the greenhouse was further investigated during the 2008 project. The well was circular with an interior diameter of approximately 80 cm. It was surrounded by an olive grey clay loam fill, which sat atop a cobble stone-filled builder's trench. The clay may have helped to seal the well. Seven courses of brick form the uppermost levels of the well; below these courses the feature is comprised of stone.

2012 Project Results

Excavation Areas

The 2012 excavations took place immediately east of the area excavated in 2008 (Fig. 3.1). This area was chosen due to the high likelihood of uncovering the main body of the greenhouse, which is shown on historic maps of the area to have extended east of the brick-floored extension. Prior to excavation, GPR, electromagnetic conductivity, and magnetometry surveys were carried out across the project area, in order to identify the locations of potential features and architectural remains. Based on the results of the geophysical surveys and previous excavations, three trenches were opened during the first phase of the 2012 project.

Trench 1 was oriented north-south, and placed across GPR signatures that appeared likely to represent the walls of the main body of the greenhouse (Fig. 3.8). Although it turned out that the strong reflectors in the GPR slice are not the greenhouse walls themselves, the foundations for the building, in addition to rubble deposits associated with its destruction, were discovered in trench 1. This trench was 2 × 10 m in size, and contained five 2 × 2 m excavation units. The southwest corner of the trench was located at E223747 N902575.

Trench 2 was oriented east-west, and placed along the apparent GPR signature for the south wall of the greenhouse (Fig. 3.8). This trench was opened two meters east of trench 1, and was intended to expose more of the south wall of the greenhouse and adjacent yard, as well as to find the easternmost extent of the structure. As with trench 1, excavation showed that the GPR survey did not in fact locate the south wall of the greenhouse; however, rubble deposits associated with the building's destruction were present. Trench 2 also contained a portion of the east foundation of the greenhouse, as well as features located south and east of the building. This trench was 2 × 8 m and initially contained four 2 × 2 m excavation units, with its southwest corner located at E223751 N902577. Upon discovery of the western extent of the south yard wall, whose eastern end had been discovered during the 2008 excavation, a fifth 2 × 2 m unit was opened along the south edge of the trench to further define the feature.

Trench 3 was also oriented east-west, and placed over the GPR signature of a circular, spoked feature located in the southeast corner of the historic greenhouse enclosure (Fig. 3.9). The feature appeared to intersect what was initially believed to be a wall enclosing the greenhouse and its yard, which is visible on historic plans of Gore Place (Fig. 3.6). Excavation revealed that both the spoked feature and the presumed wall were in fact gravel paths. Trench 3 was positioned to uncover segments of both of these features. The trench was 2 × 6 m, and contained three 2× 2 m excavation units. Its southwest corner was located at E223760 N902569.

During the second phase of the project, an additional five trenches were opened (Fig. 3.1). These trenches were placed based on the results of the first phase of the project, as well as the locations of anomalies identified during the GPR survey. Seven excavation areas were laid out initially, but trenches 5 and 6 were deemed unnecessary and left unopened.

Trench 4 initially measured 2 × 8 m, and ran east-west, with its southwest corner at E223739 N902581. The eastern end of the trench was contiguous with the west wall of trench 1, unit E223747 N902581, the second unit down from the north end of that trench. The trench 1 unit contained the north foundation for the greenhouse,

Table 3.1. Lot descriptions for the 2012 excavations.

Lot	Description	Contexts within the lot	Trench
A	Sod and topsoil across the site.	800, 801, 802, 828, 923, 925, 926, 936, 937, 944, 945, 946, 956, 957, 960, 961, 962, 963, 967, 970, 976	1, 2, 4, 7, 8, 9, 10
B	Gravel and topsoil from within Knot Garden.	803, 804, 805, 823, 824, 825, 829, 866, 877	1, 2
C	Clean soil under Knot Garden gravel and over greenhouse rubble deposits.	807, 810, 811	1
D	Upper level of greenhouse rubble deposits and soil.	809, 813, 814, 927, 934	1, 4
E	Upper level of redeposited subsoil outside the north greenhouse wall.	808, 822	1
F	Large, deep pit outside north greenhouse wall, possibly manure/compost pit or garden feature.	812, 818, 941, 947, 952	1, 4
G	Greenhouse rubble in trenches 1 and 4, comprised of fragmentary brick, mortar and plaster with limited soil. Includes some wall deposits.	815, 817, 820, 835, 845, 935, 949, 950, 959, 978, 996	1, 4
H	Historic surface south of the greenhouse.	816, 819, 980, 981, 992, 995, 1001, 1002	1, 10
I	Lower level of redeposited subsoil outside the north greenhouse wall.	821, 827, 831, 834, 837, 842	1, 4
J	Very thin layer of gravel below redeposited subsoil outside north greenhouse wall.		1
K	Clean soil under Knot Garden gravel and outside the east greenhouse wall.	830, 832, 836, 879, 899	2
L	Subsoil and transition to subsoil outside the south wall of the greenhouse.	826, 833, 860, 998, 1009, 1010	1, 10
M	Greenhouse rubble in trench 2, comprised of mixed soil and fragmentary brick, mortar and plaster.	839, 850, 864, 865, 881, 889	2
N	Historic surface south of the greenhouse in trench 2.	840, 841, 880	2
O	Glacial subsoil (C-Horizon).	838, 844	1
P	Soil with light mottling atop the east cobble surface and surrounding subsoil.	847, 848, 851	2
Q	Subsoil in trench 2.	849, 868, 872, 902, 903	2
R	South yard wall and associated builder's trench.	846, 870, 884, 885, 1003, 1004	2, 10
S	Greenhouse floor and wall deposits in trench 1.	852, 854, 855, 856, 859, 908	1
T	Shallow root or rodent related trench just south of the greenhouse.	857, 858	1
U	East cobble surface and underlying fill.	853, 861, 867, 869, 871, 876, 886	2
V	Sod and topsoil from trench 3.	873, 874, 875	3
W	Soil adjacent to gravel paths. Possibly earlier surface level.	878, 883, 887, 890, 896, 969, 987, 989	3, 7
X	Circular gravel path in trench 3. Likely a path for a decorative garden.	882, 888, 891, 895	3
Y	Soil under and adjacent to gravel paths.	892, 893, 897, 900	3
Z	Enclosure gravel path that runs around the greenhouse yard. Visible on historic maps.	894, 901, 958, 977, 997, 1005, 1006	3, 7, 10
AA	Transition to subsoil cut into by planting features.	898, 904, 905, 906, 907, 909, 910, 917, 1007, 1011	3, 7

Table 3.1 continued.

AB	Soil in trench 4 that partially caps greenhouse rubble deposits. Includes the west cobble surface.	928, 929, 931, 932, 933, 973	4
AC	Thin, gravel filled depression in lot AB.	930, 972	4
AD	Historic surface north of and adjacent to the greenhouse in trench 4.	938, 942, 948, 951, 979, 990	4
AE	Shallow trench or other linear feature cut into lot AD.	939, 940	4
AF	Eastern French drain. The drain is filled with rubble from the greenhouse and cuts lot Z.	953	10
AG	Soil cut by possible planting beds in Trench 9.	968, 971, 983, 985	9
AH	Possible post hole cut into redeposited subsoil.	965, 966	4
AI	Landscaping material and possible planting beds from trench 8.	974, 975, 982, 988	8
AJ	Possible planting beds from trench 9.	984, 986, 994, 999	9
AK	Fill above the brick-floored extension.	993	4
*	Unassigned to lots – clean-up contexts.	862, 863	

Table 3.2. Lots excavated during the 2008 project, previously called analytical units.
Lot designations were assigned during the writing of this report.

Lot	**Desc.**	**Contexts within the Lot**
BA	Historic surface level around the greenhouse.	628, 646, 658, 678, 681, 682, 691, 692, 700, 703, 710, 717, 727, 737, 747
BB	Greenhouse destruction deposits outside the building footprint.	633, 634, 651, 655, 669, 672, 676. 683
BC	Greenhouse destruction deposits within the building footprint.	620, 641, 654, 659, 660, 661, 675, 712, 714, 725, 726, 732, 733, 736, 738, 739, 744
BD	Structural elements of the greenhouse.	642, 741, 743, 745, 746, 751
BE	Historic landscaping fill.	612, 614, 618, 621, 622, 623, 624, 625, 627, 629, 631, 639
BF	Modern landscaping fill.	601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611
BG	Historic post hole (feature 12).	687
BH	Historic post hole (feature 13).	688
BI	Historic post hole (feature 16).	702
BJ	Historic post hole (feature 19).	711
BK	Historic post hole (feature 20).	713, 730, 771
BL	Historic post hole (feature 21).	719
BM	Historic post hole (feature 24).	718, 777
BN	Historic post hole (feature 25).	731
BO	Historic post hole (feature 28).	742, 748
BP	Historic post hole (feature 23).	729
BQ	Road between the greenhouse and the carriage house.	650, 686, 697, 698
BR	Modern planting hole.	645
BS	Northern French drain.	630, 632, 635, 637, 666, 689, 706, 707, 721, 723, 724

Table 3.2. 2008 lots, continued.

BT	Clay and gravel path adjacent to the greenhouse.	684
BU	Historic planting bed adjacent to the greenhouse.	652, 679, 704, 740
BV	Possible planting hole.	656
BW	Southern French drain.	657, 663, 677
BX	Builder's trench for the stone drain.	693
BY	Possible planting feature.	696
BZ	Destruction debris from the greenhouse.	701, 708
CA	Stone drain.	756
CB	Gravel deposit which may be the remains of a path.	626, 636
CC	Intermediate soil layer.	674, 695, 752
CD	Possible planting bed.	690, 716
CE	Possible post hole.	728, 734
CF	Fill deposited sometime after the greenhouse and south yard wall were demolished.	662
CG	Fill deposited after the greenhouse was demolished.	640, 647, 709
CH	Surface layer subsequent to the demolition of the greenhouse.	644
CI	Redeposited B-Horizon soils.	673
CJ	Fill that sits atop lot CJ.	705
CK	Modern sod and topsoil.	613
CL	Clay feature of indeterminate purpose.	649
*	Unassigned to lots – clean-up contexts.	615, 616, 617, 643, 694, 699, 750, 758, 762, 763, 765, 766, 767, 768, 769, 770, 778

and trench 4 was placed to uncover more of this part of the structure. Trench 4 was also intended to expose the junction between the main body of the greenhouse and the brick-floored extension. During excavation, it became apparent that the brick-floored extension intersected the north foundation of the greenhouse just south of trench 4, and in response a 2 × 1 m unit was placed along the south wall of the westernmost unit in the trench. The southwest corner for this unit was E223739 N902580. In total, trench 4 contained four 2 x 2 m excavation units and one 2 × 1 m unit.

Trench 7 was comprised of a single 2 × 2 m excavation unit, whose southwest corner was E223766.5 N902573.5. The trench was placed north of trench 3, and was intended to investigate an apparent gap in the east side of the gravel path that enclosed the greenhouse yard, visible in the GPR results (Fig. 3.9). The trench was also placed to examine an object that produced a strong signal during the electromagnetic conductivity survey of the site. Upon excavation, this object was discovered to be a saw blade.

Trench 8 was one of two trenches placed within the tall hedge just north of the greenhouse, and contained a single 2 × 2 m excavation unit. The southwest corner for this trench was located at E223759.5 N902589, and it was placed over a linear anomaly seen in the GPR results (Fig. 3.10). This anomaly seemed to match the anticipated location of a gravel path or fence line that enclosed the greenhouse yard, based on historic maps.

Trench 9 was also placed in the tall hedge, again over anomalies seen in the GPR results. The trench was intended to expose these anomalies and to allow for an investigation of the uses of the north greenhouse yard. The trench was 2 × 4 m in size, running north-south, and contained two 2 × 2 m excavation units. The southwest corner of the trench was located at E223763 N902581.

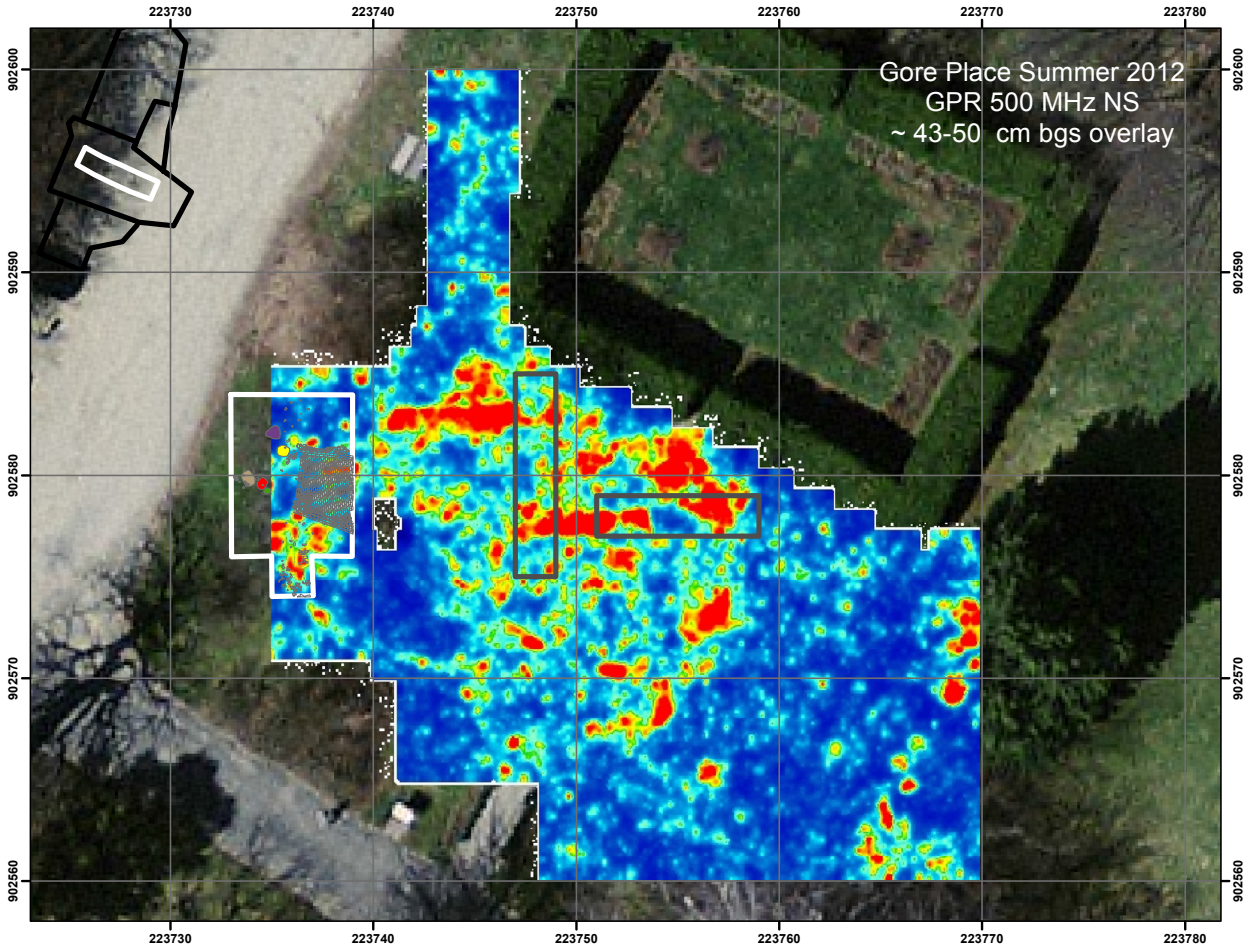

Figure 3.8. A GPR slice showing the linear red anomalies initially thought to be the walls of the greenhouse. Excavation revealed that these anomalies did not represent the walls themselves, but fell just outside of the wall locations. The 2008 excavation area and trenches 1 and 2 are shown for reference. North is to the top.

Finally, trench 10 was located south of trenches 1 and 4, near the driveway to the Gore Place mansion. The trench was 2 × 4 m long, running north-south, and was intended to examine the south yard wall and the gravel path enclosing the greenhouse yard, both seen during the GPR survey (Fig. 3.9). The southwest corner for this trench was at E223742 N902568.

2012 Lots

As previously mentioned, all soil layers within units were given context numbers, and similar contexts were grouped together into lots. These lots are listed in Table 3.1. Some of these lots were eventually grouped together based on overall similarity to each other, as shown in Table 3.3. It is important to note that for this project no unique feature numbers were assigned; instead, features were subsumed into the lot system. Kellie Bowers developed terminus post quem (TPQ) and mean ceramic dates (MCD) for the lots, which can be seen in Table 3.4. The TPQ date is the starting production date of the most recent artifact in a collection; the MCD is a weighted average of the production date ranges of all of the artifacts in a group.

Interestingly, the MCDs for most of the lots and lot groupings stays within 10 years of 1795. TPQs for the lots tend to be either 1790, 1795, or 1820, with a few 1850 and later dates due to the presence of wire nails or modern artifacts. This overall similarity suggests that artifact deposition

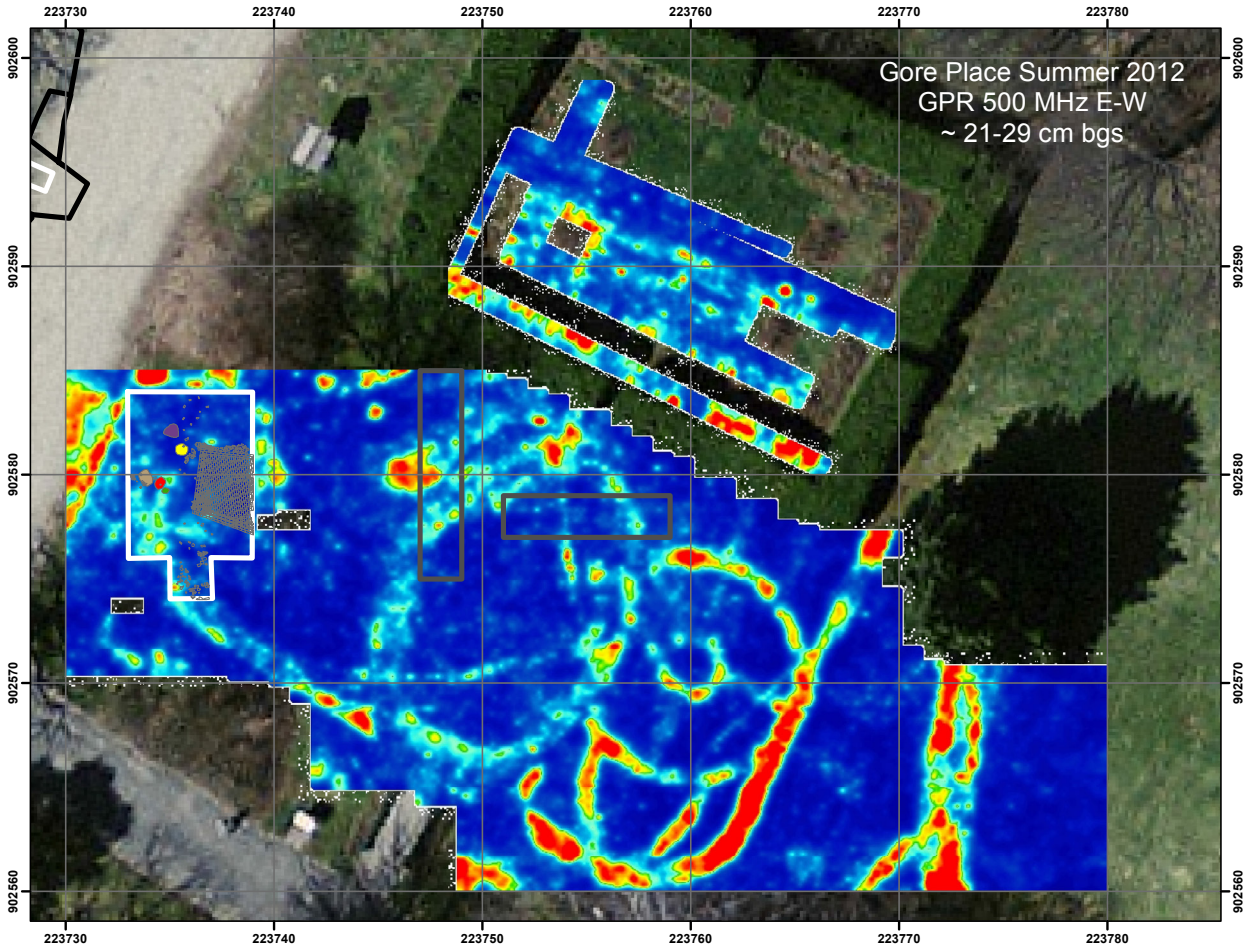

Figure 3.9. A GPR slice showing the anomalies investigated in trenches 3, 7 and 10. Two of these anomalies turned out to be gravel paths, while the third was part of the south yard wall. North is to the top.

patterns may have changed when the greenhouse was built in 1806, limiting the deposition of later artifacts, and restricts our ability to concretely date many of the features, since there are no major differences in their datable ceramic assemblages. However, based on relative dating schemes, the lots can be further subdivided into different temporal periods (Table 3.4).

These categories are simple: pre-greenhouse, greenhouse-era, and post-greenhouse. With the exception of some of the planting features (Lots AA, AG, AI and AJ), eastern French drain (Lot AF) and a possible post hole (Lot AH), almost all the features discovered during the 2012 project appear to have been contemporary with the greenhouse. That attribution does not preclude the features from having a lifespan greater or shorter than the building, but lots classified as 'greenhouse-era' were either clearly or very likely in use while the building stood.

It is important to note that although some lots post-date the greenhouse, such as lots C and K, most lots contained similar artifact assemblages. Even lots with modern artifacts, such as lot A, which contained a 1984 penny, plastic, and other recent materials, still contained mostly historic artifacts of the same general types. Overall, there was very little variation in the artifact assemblages between lots.

Features

Greenhouse

Deposits from the greenhouse were uncovered

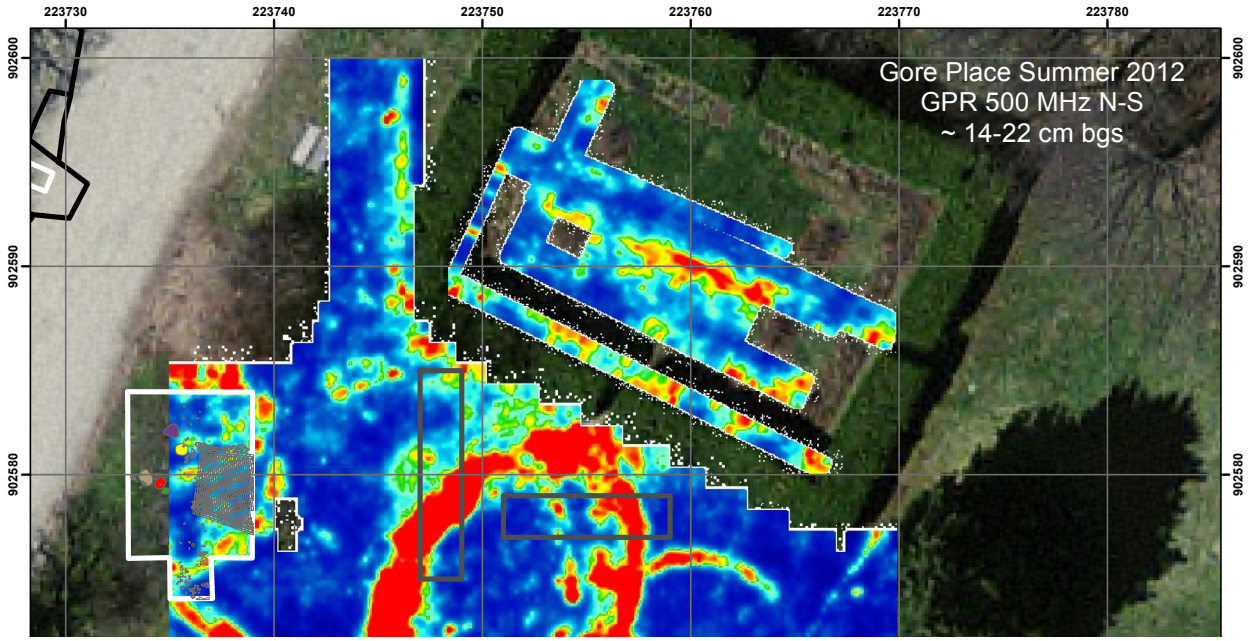

Figure 3.10. GPR slice showing anomalies found in the tall hedge at the northern end of the project area. Trenches 8 and 9 were placed in the hedge to investigate these features. North is to the top.

in trenches 1, 2, and 4. These deposits consisted of dense layers of mortar, plaster, brick, and stone rubble (Lots D, G, M, and AK) atop limited floor and wall deposits (Lots G and S). The rubble layers contained highly fragmented material, with few non-architectural artifacts. These deposits had clear horizontal boundaries, two of which correspond with the locations of the north and east greenhouse foundations (Lots G and S)(Fig. 3.11). Comparison of the extent of the rubble deposits with the results of the geophysical surveys suggests that it is the approximate boundaries of the rubble that can be seen in the GPR slices, and not the walls of the building as originally surmised.

Both the north and east foundations were highly degraded, with only the lowermost portions remaining. Interestingly, the north greenhouse foundation does not run along a simple east-west axis, as originally anticipated. Instead, the wall was angled, running slightly east-north-east. Both foundations were made of large, dry-laid field stones, and appear to have been built directly atop subsoil or redeposited subsoil. The overlying rubble deposits contained mortared stone and large amounts of fragmented brick, suggesting that the greenhouse walls were comprised of stone

Figure 3.11. the southern boundary of the greenhouse rubble deposits. The boundary is clear and abrupt and likely marks the original location of the south wall of the greenhouse. Photo facing east.

foundations mortared to and supporting brick walls, similar to the Robert Murray farmhouse on the "Cookson lot." Thin pieces of slate, covered

Table 3.3. Lots excavated in 2012, with very similar lots grouped together. Analogous lots from the 2008 project are also included.

2012 Lot	Description	Similar lots from 2008
A, V	Sod and topsoil across the site.	BF, CL
B	Gravel and topsoil from within Knot Garden.	
C, K, P, AB	Soil over and around greenhouse rubble deposits and cobble surfaces.	CD, CG, CH, CI
D, G, M, S, AK	Rubble, floor and wall deposits from within the greenhouse and brick-floored extension.	BC, BD, BZ
E, I, J	Redeposited subsoil outside of the north wall of the greenhouse.	BE, CJ, CK
F	Large, deep manure/compost pit or garden feature outside the north wall of the greenhouse.	BU
H, N, AD	Historic surface levels outside the greenhouse.	BA, BB
L, O, Q	Subsoil and transition to subsoil.	
R	South yard wall and its builder's trench.	
T	Shallow root hole or rodent burrow south of the greenhouse.	
U	East cobble surface and underlying fill.	
Y	Soil adjacent to and under gravel paths. Possibly earlier surface level.	
W, X, Z	Gravel pathways around greenhouse, including circular garden paths and enclosure path. Includes associated soils.	CC
AA, AG, AI, AJ	Planting features, possible planting features and surrounding soil.	CE
AC	Thin, gravel filled depression in lot AB.	
AE	Shallow trench or other linear feature cut into lot AD.	
AF	Eastern French drain. The drain is filled with rubble from the greenhouse and cuts lot Z.	BW, BX, CA
AH	Possible post hole cut into redeposited subsoil.	

in mortar, were also found in this rubble, and they may have been used to help protect the greenhouse walls from water damage. At the Vale, mortared slate tiles were set between the stone foundation of the peach wall and the overlying bricks to "shed surface water away from the wall and to prevent the 'rising damp' from moving into the bricks and mortar above" (Pinelo 1999:9). The south yard wall, which was constructed of the same types of materials as the greenhouse foundations but is far more intact, may provide an example of what the greenhouse foundations looked like prior to demolition (see South Yard Wall below).

The brick-floored extension meets the main body of the greenhouse at the northwest corner of the latter. The extension is generally far more intact than the rest of the structure, although most of the bricks are missing from the floor in the area adjacent to the north greenhouse wall. The mortar that sat below the floor remains, however, preserving an outline of the bricks (Fig. 3.12).

Based on the correspondence of the north and east boundaries of the rubble deposits with the north and east greenhouse foundations, the south edge of the rubble can be used to approximate the location of the south greenhouse wall. However, no intact south foundation was discovered below the rubble deposits. Instead, three features were found in the anticipated location of the south greenhouse foundation. Trench 1 held two shallow depressions (Lot S), spaced approximately 5 feet apart, which cut into thin transitionary soils (Lot L) and came down upon glacial subsoil. These depressions contained rubble and could represent a number of features, including a robber's or builder's trench for the south foundation or the lowermost levels of built-in planting beds in the greenhouse. It is also possible that these features

Table 3.4. Lots by period, as well as terminus post quem (TPQ) and mean ceramic dates (MCD) for those lots. Lots were considered to date to a time period if they were open surfaces or in-use features at that time. Overall, the artifact assemblages for the 2012 lots are very similar, with only a few lots containing modern artifacts. The 1850 TPQ dates for lots E, I, J and R are derived from wire nails found in these lots. However, these nails are likely intrusive, and alternate TPQ dates which did not use the nails were also calculated (shown in parentheses). Lot AH has no dates due to the lack of diagnostic artifacts from that deposit.

Time period	Lots	Description	TPQ	MCD
Pre-Green-house	H, N	Historic surfaces south of the greenhouse	1820	1792
	AD	Historic surface north of the greenhouse	1795	1792
Greenhouse-era	AA	Historic planting holes	1820	1803
	D, G, M, S, AK	Greenhouse destruction deposits	1795	1789
	E, I, J	Redeposited subsoil	1850* (1795)	1796
	F	North yard pit	1795	1789
	H, N	Historic surfaces south of the greenhouse	1820	1792
	AD	Historic surface north of the greenhouse	1795	1792
	L, O, Q	Subsoil layers	1780	1805
	R	South yard wall	1850* (1790)	1792
	U	East cobble surface and underlying fill	1790	1778
	X	Circular gravel path.	1790	1792
	Z	Enclosure gravel path.	1790	1792
	W, Y	Probable historic surface southeast of the greenhouse	1820	1792
Post-Greenhouse	A, V	Modern surface	2001	1792
	B	Knot garden (modern)	2000	1789
	C, K, P, AB	Layers which seal greenhouse-era deposits	1966	1794
	AC	Gravel-filled depression in lot AB	1780	1805
	AF	Eastern French drain	1780	1792
	AH	Possible post hole	N/A	N/A
Unclear	AG, AI, AJ	Planting features and surrounding soils	1800	1792
	AE	Shallow trench cut into lot AD	1780	1805
	T	Root hole / rodent burrow	1780	1805

are simply areas where destruction debris became embedded in the ground and have no further significance.

Trench 2 contained a more substantial feature below the rubble deposits' southern edge. Initially believed to be a shallow depression similar to those in trench 1, this feature was instead a deep pit (Lot M), which cut through normal clayey subsoil (Lot Q) and into deeper glacial subsoil (Figs. 3.12 and 3.13). This pit was ringed with large stones in a regular pattern, suggesting an effort to reinforce the hole. It is possible that this pit represents a stone-reinforced post hole, which would have supported the south wall or the roof. If this is the case, it would suggest that the south wall of the greenhouse was wooden and not brick, unlike the other walls of the building, or that the roof was supported by wooden posts separate from the greenhouse walls. Alternatively, the pit could have functioned as a sump, allowing water to

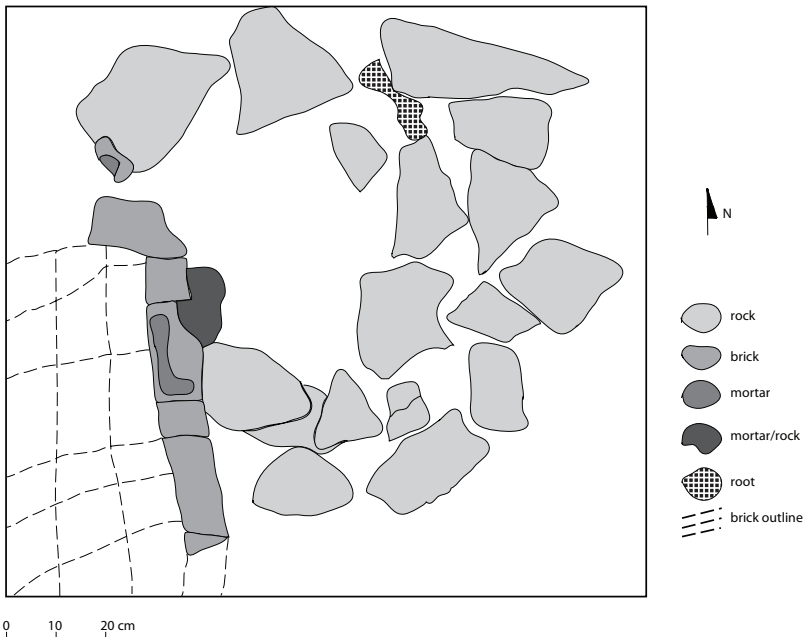

Figure 3.12. The junction of the north wall of the greenhouse with the remains of the brick-floored extension in trench 4. The brick flooring was absent, but the underlying mortar preserved outline of the bricks. See also Figure 3.13.

Figure 3.13. The pit features discovered in trenches 4 (left) and 2 (right). Both pits were ringed with stone, and found adjacent to or along the greenhouse foundations: the trench 4 pit was located at the junction of the north greenhouse foundation and the brick-floored extension, while the trench 2 pit was present in the anticipated location of the south greenhouse foundation.

flow into the well-drained glacial soils below the structure. In this instance, the stones ringing the pit would have helped prevent the erosion of the sump's walls.

A similar feature was discovered in trench 4, but this time in the north foundation wall, at the juncture between it and the brick-floored extension (Fig. 3.13). This feature was also a deep pit ringed with large stones and cut into underlying deposits; in this case, redeposited subsoil (Lot I). The pit was filled with greenhouse rubble (Lot G). Its placement in the north foundation calls into question the idea that the pit was a post hole, as it would be unnecessary in a robust stone and brick

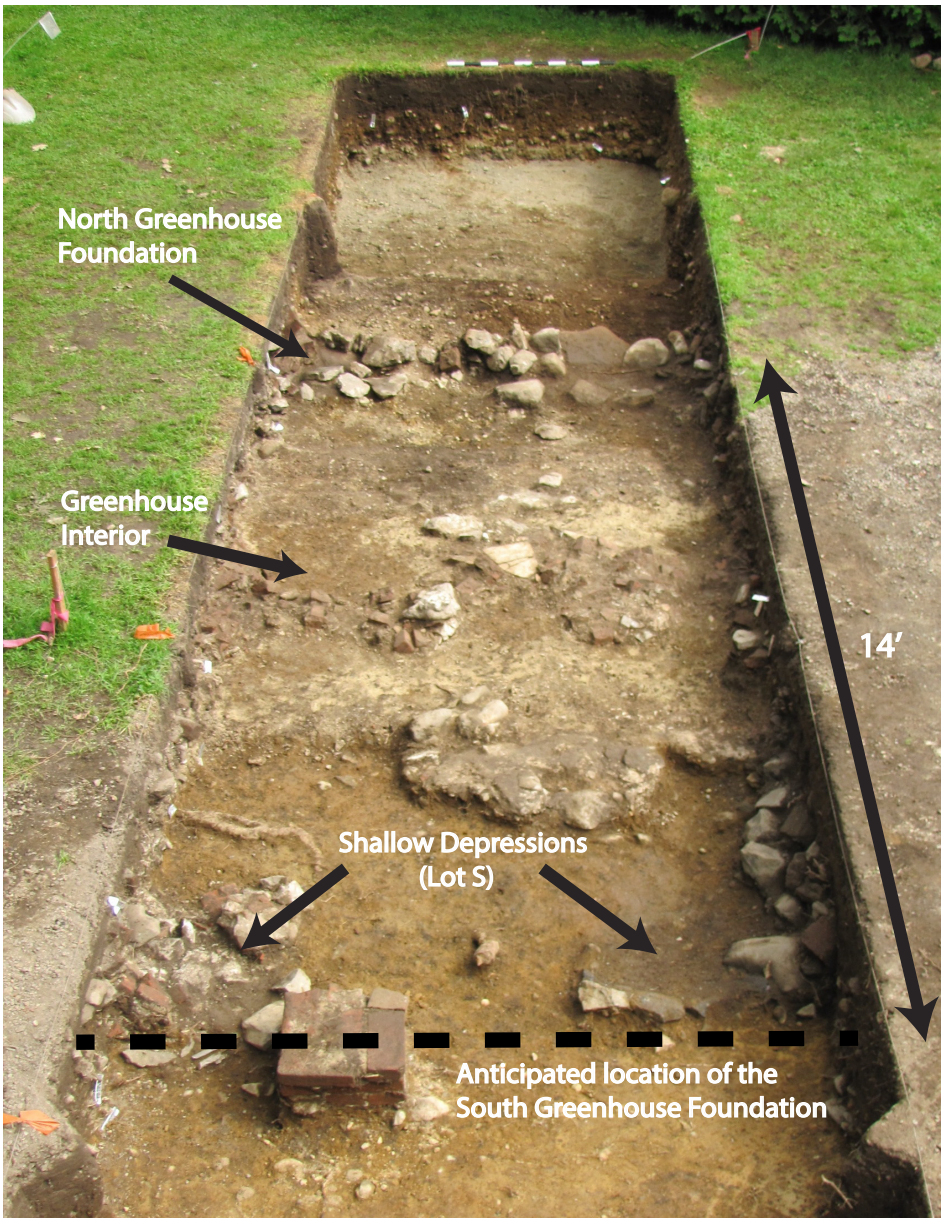

Figure 3.14. Trench 1 facing north. Although the north foundation remains partially intact, the south foundation was not. The tight bounds of the destruction debris found within the greenhouse offer a probable location for the south foundation, and indicate the building was 14 feet wide.

wall, which the north greenhouse wall appears to have been. As a result, it is likely that the feature represents a sump used to drain water from the greenhouse. Because the pit in trench 2 is so similar in construction, they both features probably had the same function.

Regardless, the locations of the north, east, and west walls of the greenhouse, and the horizontal extent of the rubble deposits indicate that the main body of the structure was approximately 47 feet long (east-west) and 14 feet wide (north-south)(Fig. 3.14). With the brick-floored extension, the greenhouse would have extended to almost 60 feet long. These measurements are in line with the dimensions suggested in contemporary greenhouse manuals. It is difficult to estimate the height of the building solely from the archaeological record, but greenhouse manuals indicate a height of around

14 feet (4.27 m) would have been appropriate for a greenhouse with a 47 ft (14.33 m) by 14 ft (4.27 m) footprint (Abercrombie 1789:22; M'Mahon 1806:79, 84).

The main body of the greenhouse was closely aligned with the cardinal directions, although it did not run exactly east-west. This orientation sets it apart from the rest of the estate, which is set on a different axis. Interestingly, the brick-floored extension appears to have been constructed on the same axis as the rest of the Gore Place estate. A historic map of the property shows a road leading toward the east end of the building, suggesting that the main entrance may have been in this area. This fits with suggestions found in several greenhouse manuals, which recommend at least one door be placed at an end of the greenhouse (M'Mahon 1806:79; Loudon 1824:19-20). 18th- and 19th-century English greenhouses traditionally had entrances at the east or west ends of the building as well (Beaudet 1990:101). As British agricultural and horticultural practices were eagerly studied by many in the United States during that time period (see Chapter 2), it would not have been unusual for the Gores to have followed English tradition when building their greenhouse.

Artifacts found within the greenhouse rubble deposits help to fill in details about the building. White marble tiles discovered in the rubble appear to be remains from the floor of the building, and match those found during the 2008 excavations. The same or a similar marble is present in the Gore Place mansion. The tiles appear to have been mortared together atop a layer of sand situated over a substrate of subsoil or redeposited subsoil. Plaster with lathe impressions indicates that either the walls, ceiling, or both were constructed with lathe, plastered, and then whitewashed. However, lathe-impressed plaster was a relatively minor component of the destruction debris, suggesting that only small parts of the building were plastered wood. Thin, unmortared slate tiles, some with nail holes, were likely used as roof shingles, though it is not clear if they were used across the entire greenhouse, or just in certain areas (such as the brick-floored extension).

TPQ dates for greenhouse destruction deposits average to 1795, and the mean ceramic dates (MCD) for these same deposits averages to 1789 (Table 3.4). The vast majority of ceramics recovered from the greenhouse rubble deposits were redwares, which made up approximately 70% of the ceramic assemblage. This high concentration of redwares is unsurprising, as the planting pots and utilitarian vessels they comprised would have been important for managing the greenhouse. Refined earthenwares, predominantly creamwares and pearlwares, accounted for approximately 27% of the ceramic assemblage, which contained only very small amounts of porcelain and stoneware. As with the greenhouse destruction deposits encountered in the 2008 excavation area, all the ceramics present dated to 1830 or earlier. Additionally, no evidence was found to contradict the 1806 construction date for the building, calculated during the 2008 project.

Relatively little window glass was recovered from the greenhouse destruction deposits. This was unexpected due to the high volume of glass utilized in all greenhouse designs. However, three different colors of window glass were discovered: aqua, colorless, and solarized. Unfortunately, it is unclear whether this variation in color represents experimentation with lighting in the greenhouse, the acquisition of glass from multiple sources, or changes caused by the replacement and repair of broken windows. Window glass is discussed in more detail below.

Although the volume of architectural debris was high within the greenhouse footprint, it is clear that some materials from the building, such as window glass, were repurposed after its destruction. The fruit wall / grapery complex appears to have been expanded around the time the 1806 greenhouse was destroyed, and it is possible that some material from the building was reused in that area.

North Yard Landscaping

Three layers of redeposited subsoil (Lots E, I, and J) were discovered outside the north wall of the greenhouse in trenches 1 and 4 (Fig. 3.15). Few artifacts were recovered from these layers, which sat atop sterile glacial subsoil (Lot O). The artifacts that were recovered suggest a TPQ of 1850 for Lot E, the uppermost landscaping layer,

Figure 3.15. Profile view of the north yard pit and surrounding soils. The pit may have been used for manure or compost production and cuts into subsoil that was redeposited as a result of Gore's landscaping activities.

and a date of 1790 for the underlying Lot I. The 1850 date for Lot E is derived from a wire nail found in the deposit, and may suggest that Lot E was a surface layer at one point. No artifacts were present in Lot J.

These redeposited subsoil layers were present adjacent to deposits associated with the north wall of the greenhouse (Lots G and S), and in some areas seem to have been piled up against the building. This suggests that prior to the construction of the greenhouse, Christopher Gore removed the topsoil from the greenhouse area, then laid the building's foundations. During or immediately after construction, sterile subsoil was redeposited along the north site of the building. These soils are cut by a large pit (Lot F) just north of the greenhouse. Other historic landscaping episodes were recorded in the area around the greenhouse during the 2008 excavations as well (see Beranek et al. 2011), suggesting Christopher Gore had extensively modified this portion of the estate prior to the construction of his greenhouse.

North Yard Pit

Just north of the greenhouse deposits in trenches 1 and 4, a wide, deep pit was discovered (Lot F). This feature was encountered just below topsoil (Lot A), but had no clear upper boundary. However, the pit did clearly cut through a possible surface (Lot AD) and two layers of redeposited subsoil (Lots E and I), and into sterile glacial subsoil (Lot O)(Fig. 3.15). The soil in the pit appeared dark and organic and had charcoal flecking throughout. The artifacts from this feature suggest a TPQ of 1795 and a mean ceramic date of 1789. The most recent artifact discovered in this feature was multicolored painted pearlware, which was manufactured from ca. 1795 to 1830, although when any of the artifacts from the feature were deposited is unclear.

However, the pit's location along the north wall of the greenhouse suggest that it was contemporary with the building, and its organic-rich fill could indicate that the feature was involved in some type of horticultural activity such as preparing or enriching soil. A similar, though much more shallow, pit was uncovered during the 2008 excavations just north of the brick-floored extension, which may have been used for a similar purpose. The Gores are known to have used the carriage house to produce compost manure, and it is possible that the north yard of the greenhouse, and this pit, was used in a similar fashion, or to incorporate the compost into planting soils. Nineteenth-century manure was composed of a variety of ingredients, primarily decomposing vegetable matter and animal dung, although it could also include ashes, leaves, pulverized or burned bone, and household

Figure 3.16. The south yard wall, as seen in the 2008 excavation area (left), trench 2 (top right) and trench 10 (bottom right). The portion in trench 2 is the only one to have portions of both the foundation and overlying brick wall intact.

trash (Beranek et al. 2011:11).

Another possibility is that the pit was a garden or planting feature. Although the north side of the greenhouse was shaded due to the presence of the building, this may not have precluded planting. The north side of the peach wall at the Vale, for example, was planted despite being shaded by the wall (Pinello 1999).

South Yard Wall

The western end of this wall was discovered during the 2008 excavations, at the southwest corner of the brick-floored extension. In that area, the wall was found to curve south-southeast, and GPR indicated that the wall continued to the south of the greenhouse. This portion of the wall consisted of only a single course of irregularly assorted stones, bricks and mortar.

During the 2012 project, the eastern end of the wall and a central segment were found in trenches 2 and 10, respectively. In trench 2, the wall extends south from the southeast corner of the greenhouse. The foundation of the wall in this area was composed of a single layer of large, dry-laid stones, with courses of brick mortared atop this base. Although the wall curves, the portion exposed in trench 2 has a similar orientation to the greenhouse. It is possible that the south yard wall was physically joined to the greenhouse at the building's southeast corner, but this is unclear as the foundations of the greenhouse are heavily degraded. Approximately 3 m of the south yard wall were exposed in trench 2, and builders trenches (Lot R) cut into subsoil (Lot Q) were visible on both sides of the wall. Both builder's trenches were excavated, and they contained few artifacts.

The central segment of the south yard wall was revealed in trench 10, this time a 2 m portion running slightly west-northwest. Again, builder's trenches (Lot R) were visible on either side of the wall, and both were excavated. The builder's trenches appear to have been cut without regard to the curvature of the wall, leading to thinning and thickening of the trenches in different places as the

wall curves. Overall the south builder's trench is much narrower than its northern counterpart. Both builder's trenches cut through what appeared to be an earlier surface level (Lot H) and subsoil (Lot L).

Excavation of these features revealed that the south yard wall varied in construction across its length (Fig. 3.16). The portion present in the 2008 excavation area was limited to only a single course of irregularly placed stone, brick and mortar, in contrast to the more regular segment in trench 2. That portion of the wall had two courses still in place, with a lower level of large, dry-laid stones capped by a course of mortared brick. The remains of the south yard wall in trench 10 were far more substantial than either of the other two segments, and contained four courses of material still in situ. The lowermost course of this section was comprised of small, densely packed cobbles, set without mortar into subsoil. The next course was made of medium sized cobbles and bricks mortared together. Above this sat two courses of large cobbles, more similar to those seen in the trench 2 segment of the south yard wall, again mortared together with bricks. These bricks were used to fill gaps between the stones, and did not make up a full course as with the wall in trench 2.

It is likely that the two irregularly constructed portions of the wall, present in trench 10 and the 2008 excavation area, represent what remain of the foundation of the south yard wall. It is unclear if the foundation in the 2008 excavation area was originally as substantial as the portion in trench 10, but it is probable that both segments supported a more formal brick wall, seems to be the case in trench 2.

In all three areas, the south yard wall was constructed of the same types of brick, stone and mortar used in the greenhouse. As the north and east foundations of the greenhouse would have needed to be quite robust, to support the weight of tall brick walls, it is possible that they were constructed similarly to the south yard wall, with multiple courses of mortared stone and brick, sealed by regular brick walls. Several of the stones recovered from the greenhouse rubble deposits were small and covered in mortar, suggesting a use similar to the bricks seen in the south yard wall: to fill gaps between larger foundation stones. The foundation stones still in place in the north and east greenhouse walls are also similar in size to those used in the middle courses of the south yard wall.

The 2008 and 2012 excavations and GPR surveys show that the south yard wall forms a semi-circle south of the greenhouse, setting the building off from the surrounding area (Figs. 3.1 and 3.9). Artifacts recovered from the south yard wall's builder's trenches were limited in number, but included small amounts of creamware, pearlware, and redware, as well as several nails. Most were either hand wrought or machine-cut, although a single wire nail was found. The earliest wire nails appear in 1850 (Miller 2000:14), and the presence of one in the builder's trench for the south yard wall is surprising, considering the feature appears to be closely linked to the greenhouse and is likely contemporary with it. However, the builder's trench is present just under topsoil in several places, and the nail was recovered from a portion of the trench that sat adjacent to the Knot Garden. Since there was only one wire nail recovered from the builder's trench, it seems likely that the nail was introduced into the builder's trench by soil disturbances that occurred during the construction or destruction of the modern Knot Garden. Another possibility is that the nail was deposited in the builder's trench when the south yard wall was demolished, although this likely occurred before 1850 (see Chapter 4). Without the nail, the other artifacts from Lot R provide a TPQ of 1790 for the south yard wall.

East Cobble Surface

To the east of the greenhouse in trench 2, a large surface made of rounded cobbles (Lot U) was discovered (Fig. 3.17). The cobbles sat atop a thick layer of redeposited soil (Lot U), filling a trench cut into subsoil (Lot Q). The trench was cut along the same orientation as the Gore Place mansion, and the fill within contained artifacts similar to those recovered from the greenhouse. This cobble surface did not cover the entirety of the trench. Interestingly, the cobble surface sits at approximately the same elevation as the lowermost deposits of the greenhouse, where the floor

Figure 3.17. The cobble surface east of the greenhouse. The feature was probably used to stage potted plants that were moved out of the greenhouse during the summer.

of the building is assumed to have been. This may mean that the cobble surface was built during the same time period as the greenhouse. Historic maps of the greenhouse show a road leading to the east wall of the structure, implying there was an entrance to the building in this area. If this is the case, then it is possible that the east cobble surface represents a formal entranceway to the greenhouse. This, however, seems unlikely, given the limited scope of the cobble surface, and the lack of any cobblestone pathways around the greenhouse.

Another option is that the east cobble surface was a platform intended both as a practical space necessary for proper greenhouse management, and as a stage to show off greenhouse plants. In *The Green-House Companion* (1824), J.C. Loudon recommends moving potted plants out of the greenhouse during the summer, and placing them where they can enjoy abundant sunlight and fresh air (173-174). He also makes a point of specifying that wherever the plants are staged should be "impervious to earth-worms"(151). To accomplish this, he suggests constructing a platform of "gravelly matter," paved flagstones, or "a flooring of broken bricks and Roman cement" (150-151). Although not quite a paved flagstone platform, the east cobble surface falls in line with Loudon's recommendations, and with its location near the likely greenhouse entrance, it would have been an easily accessible place to house potted greenhouse plants in the summer months.

West Cobble Surface

Just north of the greenhouse in trench 4, a second cobble surface (Lot AB) was uncovered. Only a small 75 cm wide by 30 cm long segment was present in the trench, but the GPR results clearly indicate that the feature continues for a short distance north of the excavation area. This cobble surface was uncovered immediately below topsoil (Lot A). Since its underlying deposits (Lot AB) cover parts of the greenhouse rubble, this surface likely postdates the destruction of the building.

The purpose of this feature is unclear, and since only a small portion of it was uncovered it is difficult to draw any solid conclusions about its use. The carriage house lies to the west of this feature, and it is possible that this surface was used as a work area for that building. Another possibility is that this cobble surface was related to the vegetable garden located just to the north, and had some purpose connected to the management of that feature. Further examination of this feature is necessary to determine its exact use.

Gravel Pathways

Two sets of gravel pathways (Lots W, X, and Z) were discovered in trench 3 which precisely match anomalies seen in the GPR results (Figs. 3.1 and 3.9). One of these is part of the circle and spoke pattern seen in the GPR (Lot X), and made up of small rocks and gravel. Given its shape, this path was likely part of an ornamental garden.

Figure 3.18. The east wall profile of trench 10 showing the eastern French drain (the trench filled with bricks and other debris) and the thin gravel path south of it.

The outer circle has a diameter of 11.5 m (37.7 ft) and the inner circle of 2.8 m (9.2 ft). It may have been added in 1835 by Theodore Lyman Jr. at the same time as the curvilinear garden to the east (see Chapter 4).

The circular path intersects a linear pathway (Lots W and Z) made up of similar material sitting atop a layer of larger gravel and cobbles. This second path runs along the edge of the greenhouse yard, and is represented on an 1834 map of the estate as a rectangular enclosure around the building. Hereafter it will be referred to as the "enclosure path." Both paths were discovered under topsoil (Lots A and V), and may have been part of a formal garden landscape around the greenhouse. The circular path does not appear on the 1834 map, but given the locations of the two paths, their matching elevations and intersection, they are almost certainly contemporary with each other. The enclosure path may predate the circular garden feature.

Although the east cobble surface was likely the primary staging area for potted plants in the summer, J.C. Loudon's *The Green-House Companion* states that "[e]ven lining the sides of broad gravel walks with pots of the hardier sorts has a fine effect, and [the plants] will pass their summer there very well" (1824:174-175). The circular and enclosure paths would have made excellent places to show off greenhouse plants, and may have been used for this purpose. The MCD for both paths is the same, 1792, although whiteware present in the enclosure path deposits pushes its TPQ to 1820, while the circular path has a TPQ of 1790. As both paths were surfaces, it is likely that the whiteware was deposited while the enclosure path was in use.

The enclosure path also appears in trenches 7 and 10. In trench 7, there seems to be a gap in the path in the GPR results, although excavation showed the path to be continuous. The portion of the path in trench 10 is cut by the eastern French drain feature (Fig. 3.18), which is described below.

GPR was instrumental in finding and defining these features. During excavation, the edges of the paths were difficult to discern, and the paths' soil matrices were almost identical to neighboring, non-gravel bearing deposits. As a result, it is possible that the paths would have been written off as insignificant gravel lenses within a larger deposit. However, the boundaries and shapes of these deposits were clearly seen in the GPR slices, and showed without a doubt that these paths were real features. Since excavation of the whole area would have been prohibitively time consuming, it is only through the GPR survey that the shape of these paths became apparent.

Eastern French Drain

In trench 10, just south of the south yard wall, was a large French drain (Lot AF)(Figs. 3.18 and 3.19). This drain appeared just under topsoil (Lot A), and ran east-southeast across the middle of the trench. The drain cut clearly through the gravel

Figure 3.19. The bottom of the eastern French drain. The fill in this drain was primarily architectural material that appears to have come from the greenhouse, and included marble tile fragments, bricks, and large foundation stones.

enclosure path (Lot Z), which also appeared below topsoil, indicating that the French drain post-dates the gravel path. The French drain was approximately 45 cm deep and 70 cm wide, larger than the other French drains uncovered during the 2008 excavation. This drain was filled primarily with architectural debris that appears to have originated in the greenhouse. Unlike the highly fragmented rubble deposits in the footprint of the greenhouse (Lot G), the fill of the trench consists of much larger pieces; whole bricks and substantial pieces of marble floor tiles, many of which seem to have come from the edges of the floor. The drain also contained a few very large mortared stones, which likely originated in the greenhouse foundations. Non-architectural artifacts were limited in both number and variety: less than 25 ceramics were recovered from the feature, for example, and all were redware, creamware or pearlware. Similarly, there was almost no bottle glass, bone or shell. The artifacts that were recovered were overwhelmingly brick and stone, with some mortar and plaster. The presence of large architectural debris suggests that this drain was created and filled as or soon after the greenhouse was being demolished.

The drain cut through layers that overlie the south yard wall, the enclosure path, previous surface levels (Lot H), and subsoil (Lot L). Interestingly, the deposits south of the trench (Lot Z) seemed to be more artifact rich than those to the north (Lot H), yielding large amounts of bone, glass, and historic ceramics. This suggests that either the drain, enclosure path, or south yard wall, which are all close together, acted to prevent significant trash deposition within the south yard of the greenhouse.

This feature was not identified during the GPR survey, despite its size and composition. As we conduct more geophysical surveys, we are learning that GPR is not good at detecting bricks because of the similar ways in which bricks and soil at Gore Place absorb and reflect microwaves. This drain was only encountered in trench 10, and thus its full extent is unknown, but it clearly continues to the east and west of the trench.

Planting Holes

Below the circular gravel path in trench 3 (Lots X and Z), a series of planting holes (Lot AA) was discovered cut into subsoil (Fig. 3.20). These planting holes were confined only to the west half of trench 3, and were most clear in its westernmost unit, where the holes were small, circular, and well-defined. In the middle unit of the trench, the holes became more amorphous, and possibly represented plants with more expansive root systems or multiple iterations of plantings. The middle and eastern units of the trench also appeared to have plow scars, indicating the area was farmed at some point in the past. This is unsurprising considering that the Gore Place property had been farmed since its earliest European occupation. Large amounts of highly burned brick, charcoal, and nails were recovered from the planting holes and adjacent soils, perhaps representing repurposed remains from

Figure 3.20. TA Danielle Cathcart and graduate student Julie Powers uncovering a series of small, circular planting holes in trench 3.

a fire. These remains could have originated with the greenhouse furnace or stove, or with the fire that destroyed the original Gore Place mansion in 1799. The planting holes themselves could represent a garden space or nursery for plants to be used elsewhere on the estate. These features are present below the circular gravel path, which was possibly constructed in 1835. Therefore, the planting holes predate the circular gravel path, and either date to the early years of the greenhouse or predate the greenhouse.

In trenches 8 and 9, inside the tall hedge, several amorphous and ephemeral features (Lots AG, AI and AJ) were encountered which appear to have been planting beds, although it is unclear if they are historic features or a part of more recent landscaping. Given the presence of modern beds in that area and the low density of historic artifacts, they are likely recent features.

Historic and Modern Surfaces and Fill Layers

Several historic surface layers were encountered at the site. Lots H and N were located immediately south of the greenhouse (trenches 1, 2 and 10), while lot AD was to the north (trench 4) and lots Y and W were situated to the east and southeast (trenches 3 and 7). Lots H, N and AD all abutted the greenhouse, and were likely cut into during the construction of the building. Lots W and Y were cut into during the construction of the two gravel paths. The mean ceramic dates for all of these historic surfaces was 1792, and the TPQ dates for lot H, N, W and Y were 1820, while lot AD had a TPQ of 1795. All these surfaces had similar artifact assemblages, although lots H and AD contained more bone than the rest.

Lots A, V and B represent the modern surface level of the site. A and V are topsoil layers, while lot B represents the remains of the Knot Garden and its associated modern gravel path. All three layers contain very recent artifacts, including a 1984 US penny, mixed in with the same types of historic artifacts found across the greenhouse site (see Overall Assemblage below). The greenhouse site sits between three well-traveled areas of Gore Place, the parking lot, entrance drive, and tall hedge, and the modern artifacts found in lots A, V and B were assuredly introduced during normal use of the area.

Lots C, K, P and AB are fill layers deposited over the remains of the greenhouse and nearby features, and situated directly under topsoil. As

Figure 3.21. A sample of the artifacts recovered during the 2012 excavations. Architectural material and ceramics made up the vast majority of the artifacts from the greenhouse site, with only a few pipes, buttons, or other small finds.

with the modern surface layers, these lots contain some modern artifacts but the overall artifact assemblage is very similar to that seen across the site. This similarity suggests that the soil found in lots A, V, B, C, K, P and AB originated at the greenhouse site itself, and was not brought in from elsewhere. Modern artifacts in lots C, K, P and AB were likely introduced into these layers during landscaping in the area.

Artifacts with contributions by Kellie Bowers and Casey Layne

The artifact assemblage across the greenhouse site was relatively consistent. Brick, mortar, and architectural stones such as marble and slate were common finds in every excavation area. Slag, charcoal and coal were also fairly common. Due to the large amounts of architectural material and fuel/furnace products, and the relatively limited information that could be obtained from these artifacts, only samples of these items were retained for lab analysis. Only a few smoking pipes, buttons, or other small finds were recovered from the site (Fig. 3.21). Though some gardening tools were found during the 2008 project, these types of artifacts were noticeably absent in 2012.

The ceramic assemblage from the site were dominated by predominantly small fragments of redwares and early refined earthenwares such as creamware and pearlware, although the percentages of each varied across the site. Table 3.5 shows the percentages of coarse earthenware, refined earthenware, stoneware and porcelain across different groupings of lots. Based on this data, two patterns can be seen. The first is that, as previously mentioned, there are far fewer stonewares and porcelains recovered from the site than coarse and refined earthenwares. The second pattern is that lots situated north of the greenhouse, whether contemporary with the structure or not, tend to have greater amounts of coarse earthenware than refined earthenware. The same is true of destruction deposits from within the greenhouse. To the south and east of the greenhouse, refined earthenwares tend to predominate.

The differences in ceramic deposition across the site may be tied directly to the greenhouse. Most of the coarse earthenwares from the site were redwares, which made up the planting pots and utilitarian wares that would have been utilized in the greenhouse. A detailed analysis of the planting pots found during the 2008 excavations can be found in Beranek et al. 2011 and DeForest 2010. The north side of the greenhouse, where coarse earthenwares predominate, would have been behind the structure, and shielded from the eyes of visitors to Gore Place who would have walked along the entrance drive south of the greenhouse. Thus, it would have made a convenient place to dispose of broken redwares from the building.

Redwares are difficult to accurately date, and as a result the mean ceramic dates for the greenhouse site were calculated using the other ceramics from the area. The MCDs for the greenhouse site range from 1789-1803, suggesting that most of the non-redware ceramics were deposited prior to the construction of the greenhouse. The fact that these MCDs are consistent across the site suggests that the same ceramic deposition pattern was present across the entire area at one point. The non-red-

Table 3.5. The relative amounts of different types of ceramic found in various lots, calculated by Kellie Bowers. Lots to the north of the greenhouse tend to have a higher percentage of coarse earthenwares, while those to the south and east have more refined earthenwares. Stonewares and porcelains make up only very small portions of the assemblage.

Location relative to the greenhouse	Lot	% coarse EW	% refined EW	% stone-ware	% porcelain
Inside	D, G, M, S, AK	74	24	1	1
Atop	B	42	53	4	1
	C	43	55	2	0
North	F	70	28	2	0
	AB	56	42	<1	2
	AD	63	35	1	1
	E, I, J	61	38	0	1
	AG, AI, AJ	52	43	2	3
	AC	82	18	0	0
	AE	87.5	12.5	0	0
East	K, P	39	57	2	2
	U	57	39	0	4
South	T	50	50	0	0
	AF	30	70	0	0
Southeast	Y				
	W, X, Z	40.5	54	2.5	3
	AA	25	75	0	0

wares also tend to be highly fragmented and small in size, attributes that indicate the artifacts were subjected to significant damage. This damage may have been caused by plowing, which is known to have taken place at the site before or during the lifetime of the greenhouse, or the transportation and redeposition of ceramics from a midden located elsewhere on the site. Midden deposits could have been moved to the site as part of manure intended for agricultural fields. In contrast, the redwares from the greenhouse area are relatively large, indicating they escaped plow or other post-depositional damage, and are probably located at or near the location they were originally deposited.

Glass was present across the site in a variety of forms and colors, including olive, colorless, blue, solarized, aqua, and several shades of green. Window glass is discussed in detail below (see Window Glass). Vessel glass from the site tended to be highly fragmented, although some larger, more intact pieces were recovered. Due to its fragmentary nature, it was difficult to identify the types of vessels represented at the site, and to date many of the glass shards. However, it is clear that a mix of machine-made and hand-blown bottles and tablewares were present in the area. Lot D contained one notable glass artifact, an embossed bottle base that may have been manufactured using the Ricketts method, invented in the early 1820s and used into the 1900s (Jones and Sullivan 1989:29-30). Other finds from the site include several bottle necks and finishes, patinated decaying glass and a colorless tumbler base.

An apparently worked tumbler base (Fig. 3.22) was found in Lot K in Trench 2, a deposit which post-dates the greenhouse's destruction and covers/seal the greenhouse era deposits (see Tables 3.2-3.4). The tumbler is broken shortly above the base and roughly half of the circumference is uneven and jagged, with an irregular height. The

Figure 3.22. Students Nadia Cline and Phil Cook with a glass tumbler base that appears to have been broken and then bifacially worked to sharpen the edge.

other half of the circumference, however, is broken to a much more uniform height and appears to be bifacially worked, with flakes taken off both the interior and exterior surfaces. The same stratum contained a 1966 penny and a fragment of plastic as well as materials similar to those found in other deposits around the greenhouse such as fragments of planting pots, flat glass, and nails. This mixture means that the glass tumbler cannot be definitively associated with the greenhouse era, making its interpretation more difficult. It is a unique artifact for the site, and not a common artifact type. Another example of a worked tumbler base was identified at the Sarah Boston site in Grafton, Massachusetts, an 18th and 19th-century Nipmuc home (Law 2008), where it was interpreted as evidence of the continuity of lithic working traditions among Native people (Bagley 2013). Flaked glass has also been identified in African-American contexts in the south (Wilkie 1996) and at a leprosarium in Hawaii (Flexner and Morgan 2013), in both cases linked to the availability of glass for re-use and the scarcity or expense of other materials. In the Hawaiian case, the use of bottle glass can also be seen as a development of the tradition of working volcanic glass. Flexner and Morgan (2013: 297-299) also review other studies of worked glass on Native and Aboriginal sites in the American west and Australia.

Audrey Noel Hume also discusses the use of broken, though not worked, bottle bases in garden contexts in Virginia and the West Indies (1974: 15-23) where they were used to top the walls surrounding elite gardens, presumably to help keep the garden secure. None of the bottle bases found at Gore Place were found set in mortar, so there is no evidence that this technique was employed at Gore Place. Broken glass and ceramic fragments were sometimes intentionally included in soil to promote drainage and deter burrowing animals (Beaudry 1995: 33-34), but this function would again not require the glass to be worked. However, bottles may have been intentionally further broken down to create pieces of the right size for this usage. We know that Gore's agricultural soils included small fragments of ceramics and calcined bone, but we did not identify a garden bed deposit with notable concentrations of glass.

It is difficult to posit a specific use for this tumbler base given its presence in a mixed con-

text. Using broken bottle glass to deter rodents in garden beds seems like an appropriate interpretation in the larger greenhouse and garden context, but the bifacial working added a layer of skill to creating this piece that suggests that it had a more specialized function.

Nails were found in three varieties at the greenhouse site: hand wrought, machine cut, and wire. Wrought and cut nails were the most prevalent, with only small numbers of wire nails recovered from the area. Most of the wire nails came from lots with modern artifacts in them, and the lone wire nails found in lots E and R likely originated in overlying modern deposits.

Relatively little intact bone was found at the greenhouse site in 2012, especially compared to what had been recovered in 2008. Much of the 2012 material was highly fragmented and difficult to identify, and due to this no in-depth analysis of the faunal material from 2012 was carried out. The 2008 faunal material, however, was analyzed in detail, and the results of this analysis can be found in Beranek et al. 2011. In brief, the 2008 faunal material was made up of bones from three mammalian taxa: cow *(Bos taurus),* caprine (goat/sheep), and pig *(Sus scrofa)*. The rubble layers associated with the brick-floored extension held 383 bones, the most from any area, and far more than the 167 fragments recovered from the greenhouse destruction deposits in 2012. Other features from 2008, such as the drains and nearby roadway, also contained significant deposits of bone. These bones were likely used to make bone manure, as recommended by several authors in the mid-19th century. Although using bone manure was not common in the United States in the early 19th century, it was being used in Great Britain at that time (Beranek et al. 2011:73-82). Christopher Gore is known to have had interest in seeing a bone mill (Letter to Rufus King, February 29, 1820), which would have been a useful implement in manufacturing bone fertilizer. Having lived in England for several years it is possible that Gore was aware of the utility of bone manure, and used the material at his own farm.

In general, the artifact assemblage from the 2012 excavations was very similar to those from the previous two projects, with a few exceptions. The amount of bone was notably smaller, and there was a distinct lack of specialized equipment recovered from the 2012 project. The 2008 excavations, on the other hand, offered a wide variety of tools and other items that were likely used in the greenhouse. Shovels, knives, a colander, and lead tags for plants were all found during the earlier project, as was a bell jar to protect delicate plants and pieces of wire which may have been used to hold plant stalks to wooden supports. The lack of this type of material from the 2012 excavations is both striking and surprising. One possible explanation is that these items were stored in the brick-floored extension and were simply deposited nearby when the greenhouse was demolished. This difference points to the different functions of the extension and the greenhouse and potentially to different demolition practices. When the greenhouse was demolished, any items of value, such as the glass and the plants, were removed. Stockpiled bone, probably stored near the extension, and tools, possibly no longer usable, seem to have been left in place when the extension was demolished.

Window Glass

Window glass from the greenhouse site came in three types: colorless, aqua, and solarized, which ranges from light pink to light purple in hue (Fig. 3.23). The types of glass are defined by their impurities: aqua glass gets its light blue-green tint from iron impurities in the sand used to manufacture the glass. Solarized glass is formed when manganese dioxide, added to glass during manufacturing as a decolorant, begins to break down due to exposure to the sun's ultraviolet radiation. Eventually, the originally colorless glass takes on a pink or purple tint, becoming "solarized" (Lockhart 2006). Although it became common in the late 19th and early 20th centuries, manganese was used as a glass additive in England as early as 1823, and early 19th-century American glassmakers were aware of its use as a decolorant (Lockhart 2006:49-50; Jessen and Palmer 2005:145-146). Some French glasswares contained manganese as early as the 18th century, as well (Jones and Sullivan 1989:13). Although it is unlikely to have been original to the building, the Gores or subsequent owners of the estate could have used solarized

Table 3.6. The surface area for the different colors of window glass recovered during the 2012 project, as well as the estimated surface area for the glass from the 2008 project. All numbers are in square feet.

Color	Surface area (2012)	Estimated surface area (2008)	Total by color
Aqua	6.08	4.04	10.12
Colorless	0.48	0.85	1.33
Solarized	1.02	0.43	1.45
Total (year)	7.58	5.32	12.9

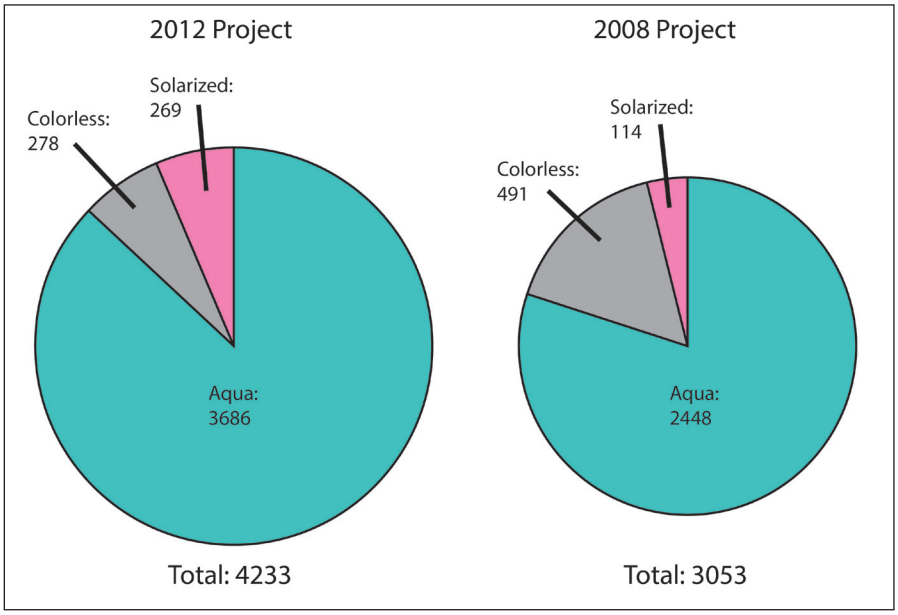

Figure 3.23. The amount of aqua, colorless, and solarized glass shards recovered during the 2012 (left) and 2008 (right) projects.

Table 3.7. The window panes used at the greenhouse site could have come in a variety of sizes. The table above uses the surface area of glass recovered during 2012 to calculate the minimum number of different size window panes that could be represented by the greenhouse glass assemblage, keeping in mind that only a small amount of the total glass present entered the archaeological record.

Pane size (inches)	Aqua	Solarized	Colorless
6×8	18	3	1
10×8	11	2	1
7×9	14	2	1
4×6	37	6	3
4.5×6	32	5	3
33×15	1.77	0.3	0.14

glass in replacement windows for the greenhouse.

The exact sources of the window glass for the second Gore Place greenhouse are unknown. Among the expenses for building the greenhouse are two lines for glass in 1806 for a total of $547 paid to "the proprietors of the Glass House" (Gore Account Book, July 31, 1806 and December 9, 1806). No other details about the quantity of the glass or whether it was intended for the house or the greenhouse are given. Assuming that the order was for window glass, two local manufacturers were in operation in 1806: the Boston Crown Glass Manufactory (1787-1827), of which a John Gore was a proprietor, and the Chelmsford Glassworks (1802-1827) for which Samuel Gore was a proprietor (Wilson 1972:77, 85). The latter company produced window glass using the cylinder method. Gore may also have imported glass, though an 1806 embargo favored domestic products (Wilson 1972:91). Without documentary sources, it is difficult to determine the origin of the glass used in the greenhouse.

Figure 3.24. Lean-to style greenhouse at the Vale in Waltham. Note how almost the entire south façade is glazed, except for the short front knee wall. Lean-to style greenhouses like this used far more glass in their construction than the older conservatory style greenhouses.

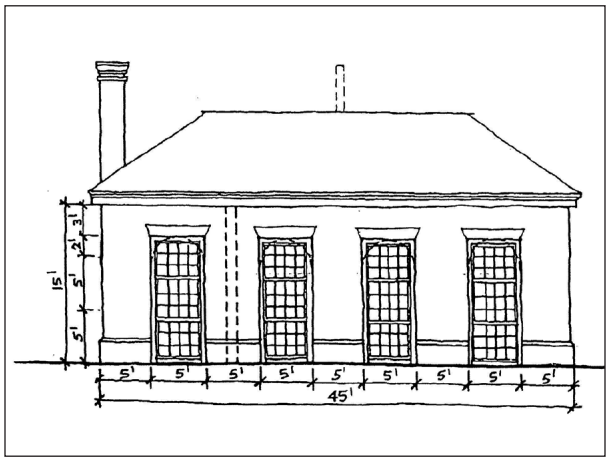

Figure 3.25. A conjectural sketch of the ca. 1740 greenhouse at the Green Spring Plantation in Virginia (Brinkley 2004:144), a conservatory style building similar in size to the second greenhouse at Gore Place.

Most window glass fragments from the greenhouse site were very small in size, with an average surface area of 0.26 square inches (168 square millimeters), although the largest shards could have surface areas of over 5 square inches (over 3226 square mm). By count, aqua colored glass made up the vast majority of window glass recovered from the site in both 2008 and 2012, with colorless and solarized glass far less of the assemblage (Fig. 3.23). The surface area of all the window glass recovered from the 2012 project was also calculated, in addition to the number of fragments present. This was done by measuring the volume of glass from the site using water displacement, and then dividing the volume by the average thickness of the window glass shards. The total surface area of glass recovered during the 2012 excavations was 1091.77 square inches, or 7.58 square feet (704366 square mm). Table 3.6 shows the different surface areas for each of the window glass types. Again, aqua window glass was by far the most prevalent find at the greenhouse site, with solarized and colorless glass making up a far smaller amount of the total surface area. Interestingly, despite recovering roughly the same number of shards, solarized glass had a larger total surface area than the colorless glass from the site.

During the 2008 excavations, one pane of glass was complete enough to provide a measureable dimension. The pane, found within greenhouse rubble deposits, had one side measuring 6 inches (15.3 cm). Records of the Cambridge Botanical Garden in the MSPA files mention glass panes of 6 by 8 inches, 10 by 8 inches, 7 by 9 inches, 4 by 6 inches, and 4.5 by 6 inches specifically for the hot beds. Repairing these panes was one of the most common ongoing expenses. The greenhouses at the Vale used somewhat larger panes of glass, measuring 33 by 15 inches. As we know the surface area of glass recovered in 2012, the minimum number of individuals (MNI) for each pane size can be calculated. The results of this calculation are presented in Table 3.7. It is important to note that the MNIs are based solely on overall surface area; no attempt at mending the window glass recovered in 2012 was made.

Without clear historical or archaeological evidence, it is impossible to know exactly what size window panes were used in the second Gore Place greenhouse. However, it is possible to estimate the amount of glazed area the building would have had. If the greenhouse was a lean-to style greenhouse, like those at the Vale, it would have had a significant amount of glazed surface area (Fig. 3.24). For a building the size of the second Gore Place greenhouse, with a probable height of 14 feet (See Greenhouse above), a lean-to style building with a short (3 foot) knee wall would

have a glazed surface area of at least 836.8 square feet or 120499.2 square inches (77741263.9 square mm). If the structure was a conservatory style building with tall front windows, the surface area would have been far less. The conservatory style greenhouse at Green Spring Plantation, in Virginia, is similar in size to the second Gore Place greenhouse, and is believed to have had several 12 foot tall by 5 foot wide windows spaced about 5 feet apart (Fig. 3.25). That building would have had a glazed surface area of 240 square feet, or 34560 square inches (22296729.6 square mm). This surface area may be a low estimate for the greenhouse at Gore Place; the Green Spring greenhouse dates to around 1740 (Brinkley 2004:115), but by 1806 horticultural authors were recommending front windows spaced only two feet or less apart (M'Mahon 1806:79), leaving more room for the windows and increasing the amount of glazed area.

Using these approximate surface areas, 836.8 square feet if the Gore Place greenhouse was built in the lean-to style, 240 square feet if it was conservatory style, the percent of glazed surface actually recovered in 2012 can be calculated. The 2012 window glass assemblage, measuring 7.58 square feet in area, represents only 0.91% of what would have been used in a lean-to greenhouse, and only 3.2% of what would have been used in a conservatory style building. Even if these numbers are doubled, working under the assumption that the 2008 window glass assemblage would have a similar total surface area to that found in 2012, they still come to only a small fraction of the glass that would have been used in any style of greenhouse at Gore Place. Thus, it can be inferred that when the greenhouse was destroyed, the majority of its window glass was either recycled or disposed of elsewhere.

Burned Material

A small subset of artifacts from the greenhouse site were burned or otherwise affected by intense heat. Several bricks showed blackened surfaces, which may have been caused by burning or exposure to smoke and soot. The latter scenario would be likely if the second Gore Place greenhouse utilized a flue heating system, which would have moved hot air and/or smoke through the walls to warm the building. Coal, charcoal and slag were very common finds across the site, implying the presence of a stove or furnace.

In addition, a total of 216 burned ceramics, bone, nails, and glass shards were found across the site, in both the 2008 and 2012 excavation areas. Burned artifacts were any that had clear evidence of exposure to extreme heat, such as surface blackening or melting, although the extreme heat of a fire affects different artifact types in different ways. Studies of fire-damage to ceramics have found that they can exhibit cracking, spalling, soot discoloration, and blackening, although the internal structure of ceramics remains intact. Damage can occur to ceramics exposed even to lower-temperature fires, and if heated to temperatures higher than those used in their manufacture ceramic sherds can split into pieces or have their glazes burned off entirely (Haecker 2012:132, 138-140; Lambert 2005:488).

Glass exposed to fire can become stained by smoke, exhibit surface damage or cracking, or melt if heated enough. The glass found in historic bottles, tablewares and windows melts at around 695˚ C (1283 ˚F). Glass which contains lead oxide, and which is normally used for glazing or enameling, will melt at around 380˚ C (716 ˚F). Interestingly, the amount of soot and smoke staining on a sherd of glass is inversely proportional to the temperature of the fire the sherd was in. Lower-temperature fires cause more surface staining, while higher-temperature fires cause less. This fact can help in analyzing burned glass fragments: "A heavy soot buildup on a glass surface suggests that the item was far from the fire's point of origin. However, a light soot buildup suggests that the item may be at or near the point of origin" (Haecker 2012:138).

Bone goes through several morphological changes when burned. At temperatures below 200˚ Celsius (392 ˚F), it will turn brown, and between 200 and 300˚ C (392 to 572 ˚F) it will blacken. As the heat increases from 300 to 600˚ C (572 to 1112 ˚F), burning bone will turn progressively lighter, from black to grey and then light grey, before turning white at temperatures above 700˚ C (1292 ˚F) (Nicholson 1993:414). Bone heated to 600˚ C or

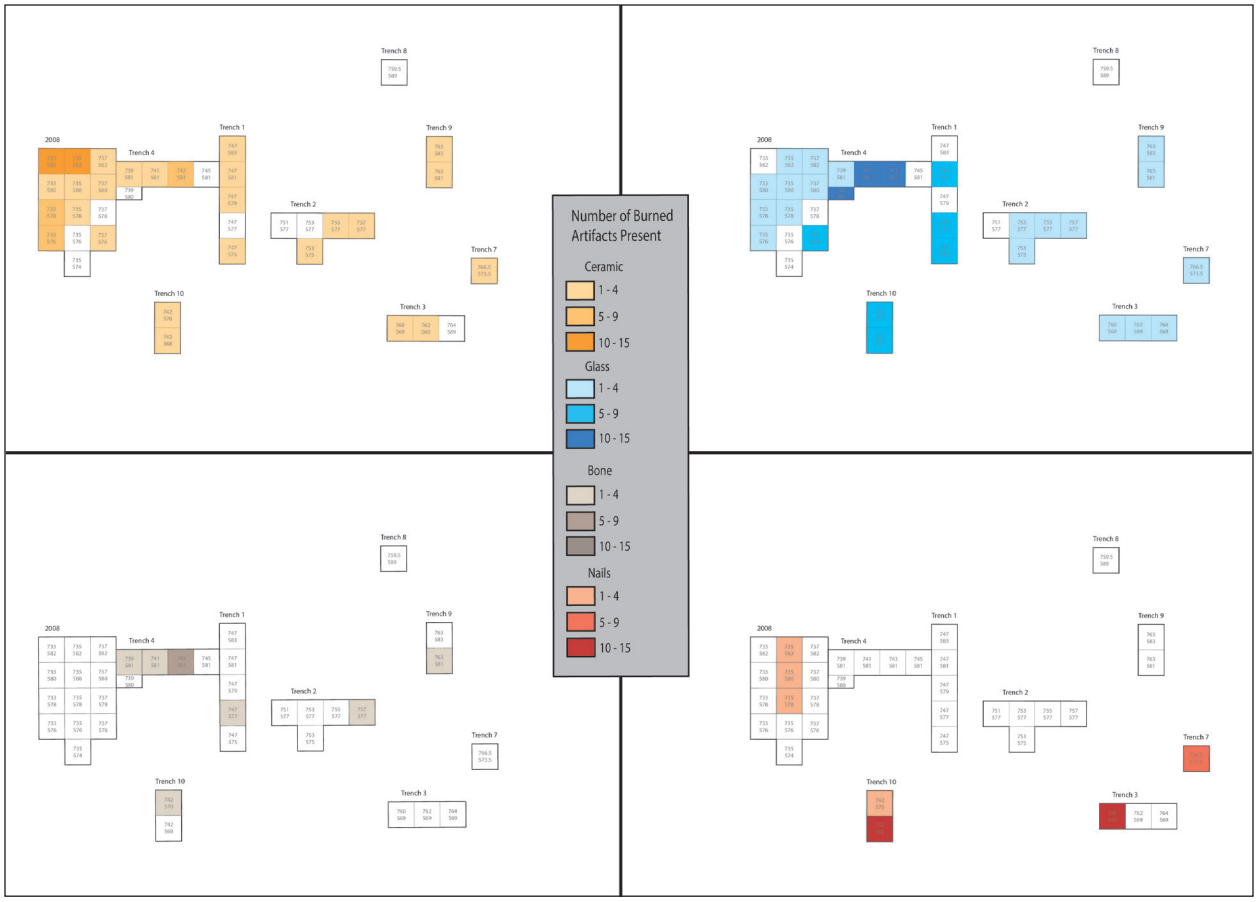

Figure 3.26. The locations and amounts of different types of burned artifacts found across the site.

below is referred to as 'charred.' Above 600° C, bone is 'calcined.' The major difference between these two states is that charred bone contains carbonized collagen, fats, and proteins, while calcined bone contains none of those components. Calcined bone also exhibits a more robust internal structure than charred bone, helping to preserve it even in acidic environments (Lanting et al. 2001:250).

Iron-bearing (ferrous) artifacts such as nails normally oxidate when exposed to the elements. Typically, oxidation leads to the corrosion and degradation of iron artifacts, although this is not always the case. Magnetite (Fe_3O_4) can form on the surface of ferrous materials that have been subjected to heating or burning, or in dry environments (Pelikán 1966:109; Chervenka 2014). This stable type of rust can prevent further corrosion (Chervenka 2014). Uncorroded ferrous nails from the greenhouse site are believed to have a magnetite coating, formed by burning, which helped prevent corrosion. These nails were found in the same deposits as other heavily corroded and degraded nails, with no clear differences in nail type, manufacture method, or constituent materials. This suggests that the differential corrosion of the nails was not caused by a variation in soil microclimate or by differences in manufacture method among the nails. As a result, it seems likely that the variations in nail corrosion were due to some nails having been burned prior to deposition, and forming a protective magnetite coating. It is possible that another process led to the different levels of corrosion seen on the nails from the greenhouse site; however, for the purposes of this report uncorroded hand wrought and machine cut nails are assumed to have been burned.

Burned artifacts need not have actually been in a fire; heat-damage can occur by only being near a

Table 3.8. The 14 lots with 5 or more burned artifacts. Most lots are dominated by one type of burned artifact, the counts and percent by lot are in bold.

Lot	Ceramics	Glass	Nails	Bone	Total
A	5	**19 (70.4%)**	1	2	27
Z	5	5	**13 (56.5%)**	0	23
BB	**19 (86.4%)**	3	0	0	22
AD	3	**13 (68.4%)**	0	3	19
AB	2	**12 (66.7%)**	0	4	18
H	4	**8 (47.1%)**	1	4	17
BA	**10 (90.1%)**	1	0	0	11
D	1	**7 (87.5%)**	0	0	8
BT	0	0	**8 (100%)**	0	8
G	1	**6 (85.7%)**	0	0	7
BE	**4 (57.1%)**	3	0	0	7
BS	**6 (87.5%)**	1	0	0	7
X	1	**4 (80.0%)**	0	0	5
W	0	1	**4 (80.0%)**	0	5

fire. Depending on the fuel type, access to oxygen, and environmental conditions, fires can reach temperatures approaching or above 1000 ˚C (1832 ˚F), and radiating heat can burn nearby objects (Ryan and Koerner 2012:17-23).

Glass and ceramics were by far the most common burned artifacts at Gore Place, with 96 and 72 specimens, respectively. Burned nails were somewhat less common, with 37 recovered, and burned bone was even rarer, with only 15 specimens present. Six of the 37 units excavated between 2008 and 2012 contained no burned ceramics, glass, nails or bone. Of the 76 lots excavated between 2008 and 2012, 32 contained at least one burned artifact.

In general, burned artifacts were deposited in a thin scatter across the site, with some areas of denser concentration (Fig. 3.26). Burned ceramics were most common in the northwest and southwest corners of the 2008 excavation area, and in trench 10. Moving east from these concentrations the numbers of burned ceramics drop off steeply, with only 1 or 2 present in most units. Burned glass shows a distinctly different pattern. Trenches 4, 1 and 10 all contained large amounts of burned glass, as did the southeast corner of the 2008 excavation area. Outside of these concentrations most units held only 1 or 2 shards of burned glass. Burned nails had a much more limited scope, with only 5 units having any amount of these artifacts. Finally, burned bone had only two areas of concentration, despite being found in 7 units across the site. Trench 4 held the most burned bone, although trench 10 had a light concentration as well. It is worth noting that all of the burned bone from the site appears to have been calcined bone. Although the absolute numbers of burned artifacts varied across units, no more than 5% of the combined ceramics, glass, bone and nails for any unit was burned. This was generally the case for the individual ceramics, glass, bone and nail assemblages for the various units, although there were some outliers. Surprisingly, the areas with the highest number of burned items did not always correspond to the areas with the highest percent of burned material. For example, the highest amounts of burned ceramic were found in units E735/N582 and E733/N582. Those units contained 15 and 10 burned ceramics, making up 1.79% and 4.11% of their total ceramic assemblages, and unit E733/N582 had the highest percentage of burned ceramics for the site. Unit E763/N583 had a total of 3.49% of its ceramic assemblage burned, making it the unit with the second highest percentage of burned ceramics, but it contained only 2 burned sherds.

Distinct variations in the number of burned artifacts recovered from the many lots were also

Table 3.9. The 14 lots with 5 or more burned artifacts. This table shows that burned artifacts tended to originate from single contexts within the lots, and were not evenly spread out.

Lot	Number of contexts in the lot	Context with the most burned artifacts	% of burned artifacts contributed by that context
BT	1	684	100.00
W	8	989	100.00
AB	5	932	94.44
D	5	809	87.50
G	11	820	85.71
BS	11	637	85.71
X	4	882	80.00
Z	6	977	78.26
AD	6	979	52.63
BA	15	727	45.45
A	23	924	40.74
BB	8	633	31.82
BE	12	639	28.57
H	8	816	23.53

seen. Lot A held the most burned artifacts, with 27 specimens, followed by lot Z with 23. Lots BB, AD, AB, H, and BA all held over 10 burned artifacts as well. As with the units, burned material made up less than 5% of the total ceramics, glass, bone and nails for each lot. Interestingly, individual lots tended to contain a very large amount of one type of burned artifact, with far fewer examples of other artifact types. Lot A, for example, held 19 shards of burned glass, making up 70.4% of the lot's burned artifact assemblage. Similarly, lot Z's 13 burned nails made up 56.6% of its burned artifact assemblage. Table 3.8 shows the breakdown of burned artifacts for the 14 lots that contained at least five specimens.

Despite the variation in artifact assemblages, these 14 lots seemed to show a similar deposition pattern for their burned material. For lots Z, X, BS, G, D, AB, W and BT, between 78 and 100% of their burned artifacts came from single contexts. Burned artifacts from lots H, BE, BB, A, BA, and AD, were spread slightly more evenly across several contexts, although there were still distinct areas of very high artifact concentration (Table 3.9). For all 14 lots, single contexts contributed anywhere between 23 to 100% of the total burned artifact assemblage.

A few observations can be made from this data. First, the consistently low concentrations of burned material at the greenhouse site imply that the artifacts did not originate with a fire at or near the building. This is corroborated by the lack of documentary or archaeological evidence for a fire in the area. The structure itself does not appear to have burned, and no heat-related discoloration was observed in the soils within or near the building. Second, there does not appear to have been any central area where burned material was disposed of. If there had been, then the concentrations of the different burned artifacts should overlap far more than they do, and certain units or lots should show marked upticks in the percentage of their artifact assemblages that had been burned. Thus, there was not likely to have been a midden or trash pit where burned material was normally dumped. Finally, the low overall numbers and low burned artifact density, along with the relatively circumscribed areas of concentration for the different artifact types suggests that the deposition of burned material at the greenhouse site was the result of only one or a few short-term, sporadic depositional episodes. If burned material had been dumped at the site as part of a long-term depositional strategy at Gore Place, one of two patterns should have

emerged. If the artifacts were deposited together, then the ratios of burned ceramics, glass, nails and bone should be relatively homogenous across the site. Individual depositions might produce patterns similar to what exists at the site, but repeated depositions over the long-term would layer on top of one another and should eventually produce a homogenous pattern of burned material across the area. This homogenous pattern is clearly not present at the greenhouse. If the artifacts were deposited in separate areas, then a long-term deposition pattern should produce either denser areas of artifact concentration, or concentrations of artifacts spread out over larger areas. However, the concentrations of burned glass, ceramic, nails and bone present at the site are very circumscribed and are no more densely packed with burned material than anywhere else. Thus, it appears that the burned artifacts at Gore Place originated with one or a few short-term depositional events, but did not come from a fire at the site.

Some of the artifacts may have originated with a fire on a different part of the estate, however. The first greenhouse at Gore Place burned down in 1799, destroying the estate's original mansion in the process. Historically, ashes were occasionally added to manure, and the burned refuse from the 1799 fire, which would certainly have contained glass, nails and ceramics, could have been spread throughout the agricultural fields at Gore Place as fertilizer. The discovery of plow scars at the site of the second greenhouse (see Planting Holes above) indicates that the area was farmed prior to 1834, by which point the enclosure path is known to have been in use, and certainly prior to the construction of the greenhouse. The deposition of burned material from the original greenhouse and mansion would have been a one-time event, resulting in the fairly random pattern of burned artifact distribution across the site. The low-density scatter of burned material at the site is also consistent with the wide-area deposition of soil and artifacts that would be expected from the spreading of ash or an ash and manure mix.

It makes sense that burned material from the first greenhouse and mansion would include ceramics, glass and nails. All three artifact types would have been expected to be found in those buildings in large quantities. The burned bone at the second greenhouse site may have also originated with the 1799 fire: the bone is present in very small amounts at the site, and would have made up a similarly small amount of the artifact assemblage from the two burned buildings, especially compared to ceramics, glass and nails. However, a stronger possibility is that the burned bone came from the second greenhouse itself.

Like ash, burned bone was occasionally added to manure in the 19th century, although its use was relatively uncommon in the United States. However, bone manure was commonly used in Great Britain at the time, and Christopher Gore is known to have been aware of bone's use as a fertilizer. Burning bone was one way to process the material for use in the fields, and calcined bone has been found throughout the agricultural fields at Gore Place (Beranek et al. 2011:82). This suggests that either the Gores or later owners were using burned bone as a fertilizer on the estate. Large amounts of bone were found at the greenhouse site in 2008, indicating that the area was used to stockpile the material. It is probable that the greenhouse contained a stove or furnace of some sort, and this feature would have been well-suited to processing (i.e. burning) bone for use in manure. Additionally, the nearby carriage house was used to make manure, and it is possible that the north yard pit was as well. Thus, the second greenhouse was located near manure-producing areas, held a large stockpile of bone at some point, and almost assuredly contained a means of burning bone for use as fertilizer. Thus, it seems highly likely that the burned bone at the greenhouse site originated with the processing of bone and manure at and around the building, and did not come from the debris from the 1799 fire.

It is of course possible that the burned glass, nails and ceramics at the site also came from the burning of material to make manure. If this were the case, then trash deposits from elsewhere on the property were likely moved to the greenhouse and burned there. However, the artifact deposition pattern seen at the site seems to argue against this possibility. Bone is the least represented burned artifact at the greenhouse site, yet the greenhouse held a large stockpile of faunal material at one

point and was very likely used to manufacture burned bone and bone manure, in conjunction with the carriage house. This suggests that there was limited deposition of bone manure at the greenhouse site, although it may have been used inside the building. If this is the case, then manure produced with burned household trash, containing nails, ceramics and glass, was unlikely to have been deposited at the site either. Thus, if they were used in manure then burned ceramics, glass and nails should be present at the site in far smaller quantities than they are.

The presence of burned brick and other material in lot AA also complicates the idea that the site's burned ceramics, glass and nails originated with manure production. Lot AA is made up of planting holes and plowscars that predate the circular gravel path. The plowing suggests that the area was used for agriculture, possibly prior to the construction of the greenhouse. In this case, the burned material may have originated with the 1799 fire, especially given the architectural nature of the burned artifacts. A single piece of burned glass was found in lot R, the builder's trench for the south yard wall, as well. The wall was likely constructed at the same time as the greenhouse. If the burned glass piece was in situ, and does not represent an intrusion from an overlying modern layer, it indicates that burned artifacts were present prior to the construction of the greenhouse.

At this point it is not possible to say definitively where most of the burned material at the greenhouse originated. The burned ceramics, glass, nails and bone could be debris from the 1799 fire, repurposed as fertilizer for agricultural fields, or be the product of manure production at the greenhouse itself. However, circumstantial evidence strongly implies that the burned bone at the site originated with manure production at the greenhouse. The presence of potentially pre-greenhouse burned artifacts in lots AA and R, and the larger pattern of artifact deposition around the building also indicate that the 1799 fire is the probable origin for the burned ceramics, glass, and nails at the site.

Marble Tiles, with contributions by Dennis Piechota

White marble tiles were found throughout the greenhouse rubble deposits in both the 2008 and 2012 excavation areas (Lots D, G, M, S, and AK). These tiles were also found in nearby features, such as the eastern French drain (Lot AF). Some of these tiles were mortared, and had many had varying amounts and types of wear. The use of very similar tiles in the Federal-style mansion as flooring strongly implies that the marble from the greenhouse was used in the same way.

One of the more surprising discoveries at the greenhouse site was that some of the marble tiles were very friable and had rough, granular textures unlike normal white marble flooring. These traits are characteristic of marble that has been submerged or soaked in water for significant amounts of time. Not all of the tiles from the site exhibited these traits, nor were the soaked tiles concentrated in one feature or another, which suggests that these artifacts were not water-damaged after the greenhouse was destroyed. Rather, it is more likely that the tiles were damaged while they were in use in the greenhouse. As a result, it is probable that the tiles originated from parts of the greenhouse where water was allowed to pool, keeping the nearby marble constantly soaked. These areas may have been low spots in the greenhouse floor, or the tiles could have been part of an internal drainage system for the structure. Either way, the tiles suggest that greenhouse was a relatively damp place.

The eastern French drain (Lot AF) held another unusual marble tile (Fig. 3.27). This large tile, measuring 12.8 inches by 8.94 inches by 2.28 inches (32.5 cm by 22.7 cm by 5.8 cm), has a grey discoloration and charred organic material on its surface that suggests it was in a fire at one point. Part of the upper surface of the tile is raised and unworn, with the original manufacturing saw-cut pattern still visible. The charred organic material is only present within a shallow channel that parallels this raised area. The raised area is partially mortared, suggesting it was covered by a wall or other, attached feature. The area also abuts a well-finished, manufactured edge; the other edges of the tile are much more crudely finished. The lower surface of the tile is extensively mortared and shows relatively little wear. The underlying mortar exhibits significant cracking; this may have been caused by shrinkage during the initial setting of

Figure 3.27. A large marble tile recovered from the eastern French drain (Lot AF). This artifact may have originated in the first greenhouse, before being repurposed for use at the 1806 building or dumped as trash at the site.

the mortar, or exposure to high temperatures.

The surface of the tile exhibits evidence for three kinds of wear. Portions of the surface have been smoothed, likely caused by being walked on, a type of wear that would be expected in a floor tile such as this. A second type of wear is much more unusual. Organic acid has eaten into portions of the marble surface, leaving behind a sponge-like pattern of alternating ridges and eroded indentations. The acid would have taken a significant amount of time to act upon the tile and create this erosion pattern; as a result, it is likely that the acid originated with living plant material that covered the tile for a significant amount of time. Moss seems to be the most likely type of plant covering, and under damp conditions its organic acid-secreting roots would have been dense and persistent enough to develop this type of low-energy erosion pattern. The second greenhouse appears to have been damp enough to encourage moss growth on the tile, though it is unclear where this tile originated.

The third type of erosion was caused by scraping by pointed and broad tools which destroyed the organic acid erosion pattern in some places. This may have been caused by periodic cleaning to remove the tile's moss covering.

Based on its attributes, a possible timeline of the tile's life can be formulated. It likely was manufactured or repurposed for use in a greenhouse, where damp conditions encouraged the growth of a mossy covering. The moss's roots secreted organic acid over a long period of time, eroding the surface of the tile. The tile was periodically cleaned during this period, removing portions of the moss and organic acid erosion pattern. The tile was also consistently walked on, leading to a smoothing of some portions. Eventually, it was exposed to a fire, causing a grey surface discoloration and leaving behind charred organic material.

Most of this sequence of events would make sense if the tile was used in the second Gore Place greenhouse. Its location in the eastern French drain, which is filled with rubble from the second greenhouse, supports the idea that it was used in that building. The only anomaly is the fact that the tile was burned. There is no record of a fire in the second greenhouse, nor do the other arti-

facts from the site indicate that a large-scale fire took place there. However, there was a fire in the first greenhouse, and it is possible that the tile originated there. If the tile originated with the first greenhouse, it may have been reused in the second greenhouse. In that case, it was likely in a protected-enough location that the charred organic material and sponge-like erosion pattern on its surface were preserved. It is also possible that the tile was not used in the second greenhouse at all, and was deposited at the site at some point along with the other burned artifacts found in the area. A second, smaller tile with similar attributes was also found in the eastern French drain. This tile seems to have had a life-history similar to that of its larger cousin.

Soil Samples, with contributions by Courtney Williams

Both pollen and flotation samples were collected for laboratory analysis during the greenhouse excavations. A total of 24 pollen and seven flotation samples were taken from sealed historic contexts in and around the greenhouse. In order to prevent the introduction of modern pollen or macrobotanical remains, pollen and flotation samples were collected with tools cleaned with distilled water and stored in sterile plastic bags (Fig. 3.28). After collection, the samples were removed to the palynology lab at the University of Massachusetts Boston for processing.

Pollen and flotation samples are both used to identify plants grown during historic time periods, although they focus on different types of remains. Flotation samples are used to collect and analyze macrobotanical remains; those floral remains visible with the naked eye. These comprise things like fragments of charred wood and seeds. Pollen analysis obviously focuses on identifying pollen, the microscopic products of certain plants' reproductive systems. The examination of these types of botanical remains can shed light on the types of plants grown during a particular time period, and how the flora at a site changed over time. The goal of collecting botanical samples from the greenhouse site was to identify the types of plants grown in the building, if possible.

Graduate student Courtney Williams processed and analyzed the flotation samples from the 2012 excavations. She used a Flote-Tech flotation machine to separate organic and inorganic material within samples, and then examined and identified the organic material using a microscope. The seven flotation samples yielded 19 seeds and two fragments of wood. Both fragments of wood were charred, although only three of the seeds were (15.8%). The distinction between charred and uncharred floral remains is an important one in macrobotanical analysis. Uncharred plant material has a very limited lifespan once deposited at a site, due to its susceptibility to decomposition and value as a foodstuff for animals. Charred material, on the other hand, has little to no value as animal food, and the chemical changes that take place during burning allow it to survive for long periods of time without damage. Thus, charred material deposited in historic times is much more likely to

Figure 3.28. Dr. David Landon and graduate student Allison Conner taking a pollen sample from one of the planting holes in Lot AA.

survive to the present day than uncharred material is. Furthermore, the process that creates charred material is normally related to human activity, making charred plant remains more likely to be cultural items. Due to their value as food, modern uncharred plant remains are often found as intrusive items in historic contexts, deposited there via bioturbation or accident (Ford 1979:299; Miller 1989:50; Pearsall 1989:224). As a result, charred material is normally assumed to be cultural in origin, while uncharred plant remains are assumed to be natural.

Williams found that the uncharred seeds from the greenhouse site originated from several genera, including *Portulaca, Chenopodium,* and *Polygonum*. Species from the first two genera tend to be flowering plants or weeds, and species of the genus *Polygonum* are primarily weeds (Lady Bird Johnson Wildflower Center 2012). Weeds in general, and thus plants from these three genera, have thin-walled seeds which do not preserve well over long periods of time (Miller 1989:51-52), suggesting that the uncharred seeds from the greenhouse site were deposited relatively recently. Unfortunately, the charred seeds from the site were fragmented and unidentifiable.

The burned wood, however, was identifiable. One fragment came from a Red Oak *(Quercus rubra)* while the other was from an American Beech *(Fagus grandifolia)*. Both are hard woods good for burning. Their presence at the site likely represents the historic use of these trees as fuel in a stove, furnace or fireplace.

Pollen is prepared for analysis by subjecting soil samples to a series of acid baths and distilled water rinses. These actions break down and remove most of the soil and non-pollen plant matter, leaving behind concentrated pollen remains and a limited amount of other organic material. Slides are then made from the processed pollen sample and placed under a microscope, where pollen grains can be counted and identified.

The University of Massachusetts Boston palynology lab adds fungal spores to pollen samples during processing in order to aid in analysis. By adding in known quantities of spores and counting the relative amounts of spores to pollen grains present on a slide, researchers can make a statement about the pollen preservation in a given sample. If a sample has many fungal spores but only a few pollen grains, then preservation is likely poor for the sample.

Pollen lab analyst Susan Jacobucci performed a preliminary examination of two pollen samples taken from different features: a planting hole (Lot AA) and the north yard pit (Lot F). These features were believed to offer the best chance of finding large amounts of preserved pollen. She found that the pollen preservation in these samples was passable, and identified pollen grains from several plant genera, including *Alnus* (Alder tree), *Ambrosia* (ragweed and related plants), *Aster* (flowering plants), *Chenopodium* (flowering herbs and weeds), *Juglans* (Walnut tree), *Juniperus* (Juniper tree), and *Tsuga* (conifer), as well as grains from the family *Liliaceae* (herbs and bulbous plants).

While interesting, this information is of limited historical use. Several of the identified genera include wind-pollenated plants, whose pollen can travel great distances. Thus, it is impossible to say whether the plants were growing at Gore Place or simply elsewhere in Waltham. Furthermore, few, if any, of these types of plants would have been grown in a greenhouse. Many of the plants are also currently growing at Gore Place, offering the possibility that the pollen samples contained recently deposited, and not historic, pollen. As a result of the limited significance of these pollen samples, no further palynological analysis was performed.

Overall, the botanical remains from the greenhouse site were of limited use. The flotation samples held only small amounts of macrobotanical remains, and only two specimens were likely deposited in the greenhouse-era. These burned wood fragments were likely used as fuel for a fire, though whether it was in the greenhouse itself or elsewhere on the site is impossible to say. The fragments could easily have originated at another location at Gore Place and been redeposited at the greenhouse site, as likely happened with other burned artifacts. Examination of the two pollen samples most likely to offer large amounts of preserved pollen yielded only limited information, as well. None of the pollen present in the samples could be definitively tied to the greenhouse, and much of it may have been deposited recently.

Chapter 4: Discussion and Interpretations

The Greenhouse

When the Massachusetts Society for Promoting Agriculture formed a committee to secure plans for their greenhouse buildings in 1810, they were unable to fix a budget because there were no builders with sufficient experience with that sort of structure who would undertake the project for a set fee (MSPA Records, Folder 30, Doc. 28). This uncertainty indicates the degree to which greenhouses were still a novel, unfamiliar and individually designed building type at this time. Yet Christopher Gore, in commissioning his new greenhouse in 1806, was not working without any knowledge of this type of structure. An earlier greenhouse had been present at Gore Place since at least 1793, and the Gores would have had ample time to explore the building before they left for England in 1796. Although its appearance is not known today, this earlier greenhouse could have provided a template for the Gores when they built their new building in 1806.

Other local greenhouses would have been easily accessible to the Gores as well. At the Vale, an estate just a short distance from Gore Place, Theodore Lyman Sr. built several greenhouses, and the two earliest date to 1798 and 1804. The Lymans and Gores were well-acquainted with each other and moved in the same social circles, and both Theodore and Christopher were founding members of the MSPA (Parson 2009:97-107). As a result, it is very probable that the Gores were able to see the Vale greenhouses prior to constructing their own in 1806. Essex county merchants John Tracy and Elias Haskett Derby owned greenhouses by 1782 and 1790, respectively, and Bostonian Kirk Boott built his greenhouse in 1805 (Moore 1988:129, 135-136; Emmet 1996:34-37). The Gores maintained a residence in Boston, and they would not have had to travel far to view these structures. While residing in Europe, Christopher Gore visited the estates of prominent agricultural improvers, and it is likely he was able to see at least a few English and French greenhouses (Thornton 1989:29). Horticultural manuals (Abercrombie 1789; Loudon 1805; M'Mahon 1806) also offered advice on how to build and maintain greenhouses, and the MSPA published information on the latest advances in horticultural techniques from the United States and Europe. These materials would have been easily available to the Gores and useful to anyone attempting to construct a greenhouse. Thus, Christopher and Rebecca Gore would have had a large number of examples to draw on when building their new greenhouse.

Unfortunately, there do not appear to be any extant descriptions of the 1806 greenhouse, and excavations at the greenhouse site in 2008 and 2012 showed that much of the building had been destroyed. Only small portions of the structure were still preserved in situ. These limitations make it difficult to definitively state what the greenhouse looked like, or how the interior was arranged. Nevertheless, the artifacts and features uncovered at the site do provide us with some information.

Date

Based on the results of the 2008 project, Beranek et al (2011:98-99) posited that the greenhouse was constructed in 1806, at the same time as the Federal-style mansion on the site. This inference was based on the predominance of late 18th- and early 19th-century ceramics on the old ground surfaces around the greenhouse, as well as the presence of marble floor tiles in the greenhouse destruction deposits. These tiles appear to be the same type as those used in the Federal-style mansion, linking the buildings aesthetically and providing circumstantial evidence that the two structures were constructed around the same time.

Analyses of the material recovered from the 2012 project support this assessment. Most of the lots from the site have mean ceramic dates (MCD) that date to between 1789 and 1805, a 16-year span. The terminus post quem (TPQ) dates for these same lots tend to stay between 1780 and 1820, with many lots dating to between 1780 and 1795. Even the greenhouse destruction deposits have a TPQ of only 1795. Taken together, these dates suggest that most of the dateable artifacts at

the site were deposited prior to 1805, with a few more recent items deposited later in the 1800s. These dates support the idea that the artifact deposition pattern at the site changed in the early 1800s, exactly when the greenhouse is believed to have been constructed. Overall, it seems highly likely that the greenhouse was built at the same time as the Federal-style mansion, in 1806.

The date that the greenhouse was demolished is slightly more difficult to narrow down. Again, the MCDs for the site are almost universally early, with several of the fill layers which seal the greenhouse dating to between 1789 and 1805. A few artifacts from the greenhouse destruction deposits excavated during the 2008 project date to after the mid-1830s, but most of the other artifacts from those deposits have earlier TPQ dates. As a result, the artifacts from the site are of little use in determining the date the greenhouse was demolished.

However, the greenhouse does appear on two historic maps of Gore Place, one from 1834 and the other from 1841 (Figs. 4.1 and 4.2). This shows that the building was standing until at least 1841, and possibly later: the 1841 map was used in an advertisement for the 1853 sale of the estate by J.S. Copley Greene. If the map was reused in 1853 because it still accurately showed the buildings on the estate, then the 1806 greenhouse must have still been standing at that time. Of course, it may have simply been reused in 1853 for convenience and not accuracy, but regardless the greenhouse was standing until at least 1841. By 1900, the greenhouse had been demolished, as it is missing from a map of the estate in the Atlas of Middlesex County (Anon.)(Fig 4.3).

The grapery/fruit wall was expanded into a series of greenhouses sometime between 1834 and 1841 and it is possible that the 1806 greenhouse was deconstructed in order to provide architectural material for the expansion of the grapery/fruit wall complex. The site of the 1806 greenhouse yielded a suspiciously small amount of window glass, far less than would have been necessary to glaze the building properly. This suggests that the glass was repurposed for use elsewhere, and the new grapery greenhouses would have been the likely place for the recycled windows to end up. This reuse of window glass is not surprising: it would have been far cheaper to reuse the old windows than to buy new ones, and other parts of the 1806 greenhouse were repurposed for the construction of the nearby French drains.

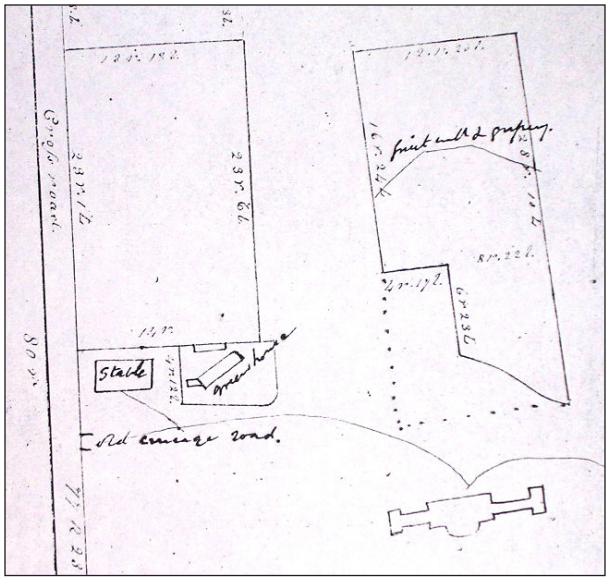

Figure 4.1. Detail from the 1834 plan of Gore Place. The greenhouse appears in the lower left corner, encircled by the enclosure path. Just north of the building is a rectangular structure that may have been a hothouse. The fruit wall/grapery does appears to be solely a wall on this plan.

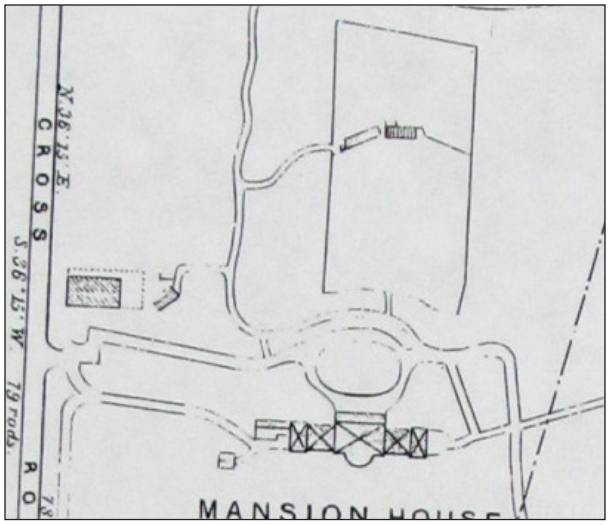

Figure 4.2. Detail from the 1841 plan of Gore Place. The greenhouse appears again on this map, indicating it had not yet been dismantled. By this time parts of the fruit wall/grapery appear to have been expanded into a set of new greenhouses.

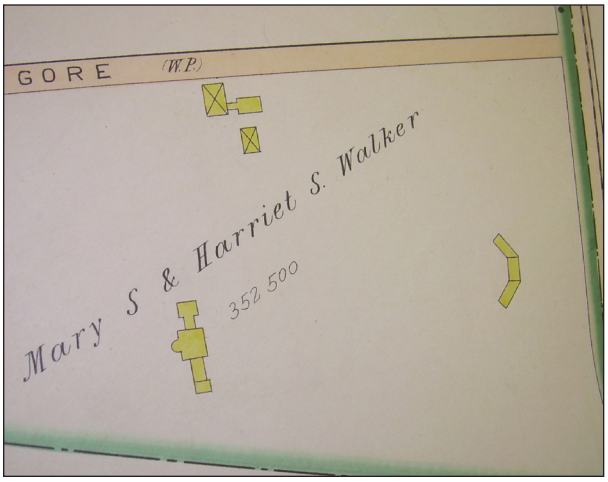

Figure 4.3. Gore Place as it appears on a map from 1900. The 1806 greenhouse is missing by this point, although the fruit wall/grapery greenhouses are still standing. A shed has been built just north of the site of the 1806 greenhouse.

It seems likely that the demise of the 1806 greenhouse coincided with the expansion of the grapery complex, but neither the 1834 or 1841 map indicates what shape either feature was in. Thus the 1841 map could depict a greenhouse that was still actively used, or one that was only the shell of a building, already in the process of being deconstructed. Similarly, the grapery complex could still have been undergoing expansion in 1841, or already have been completed. If the 1841 map was still accurate in 1853, it is possible that both the earlier greenhouse and the grapery greenhouses were in use up until that point, and the former building was deconstructed to further expand the grapery complex at a later date, or that the 1806 building was a still standing but empty shell, not yet demolished but not in active use. The Walker family owned Gore Place from 1856 to 1907, and the map of the estate from 1900 shows the second greenhouse had been demolished by that point. The Walkers are known to have expanded the grapery complex during their tenure, and it is possible that the second greenhouse was recycled for that project, and not during the initial erection of the grapery greenhouses. President of the Massachusetts Horticultural Society Marshall P. Wilder described Gore Place in 1881 as being "distinguished for numerous glass structures, for the growth of fruits, glowers, and vegetables," which suggests that the Wilders had several greenhouses at that time (58). Wilder does not discuss these structures further, however, leaving it unclear whether the 1806 greenhouse was one of the "glass structures" he was describing.

Without further excavation or new documentary evidence, the destruction of the second Gore Place greenhouse can only be definitively stated to have occurred sometime between 1841 and 1900. The almost complete absence of mid-19th-century artifacts of any kind from the deposits in the greenhouse area suggests that it was probably demolished earlier in this period. However, the building was almost certainly constructed in 1806, at the same time as the Federal mansion.

Exterior Appearance

Excavation of the greenhouse indicated that the main body of the building measured 14 feet wide by 47 feet long. A smaller, brick-floored extension was built off the western end of the building, measuring 10 ft. by 10 ft., bringing the overall size of the structure to 14 ft. wide by 57 ft, long. Although it is impossible to say for certain, the height of the main body of the greenhouse would likely have been around 14 feet. This estimate is derived from recommendations found in greenhouse manuals that suggest 14 ft. is the appropriate height for a building the size of the 1806 Gore Place greenhouse (Abercrombie 1789:22; M'Mahon 1806:79, 84). The long axis of the building faces south, though the two sections of the building are not on the same alignment. The main body is closely, though not exactly, aligned with the cardinal directions, while the brick-floored extension is set on a slightly different axis, matching the Federal-style mansion, 1793 carriage house and other historic features on the property. The plan of the greenhouse closely matches the depiction of the building seen on historic maps of the estate.

The different orientations seen in the building are unsurprising, considering the two sections were likely used for different things. The main body of the greenhouse was where the plants were grown, and having the long axis of the structure facing approximately south allowed this part of the building to receive the greatest amount of sunlight

Figure 4.4. The brick-floored extension. This was the most intact portion of the 1806 greenhouse. View facing west.

Figure 4.5. What is left of the main body of the greenhouse in trench 1. All that remains of the north foundation is a line of unmortared fieldstones, visible at the top of the image. The south foundation is entirely absent. View facing north.

during the day. By the early 1800s, gardeners understood the importance of sunshine to plant growth, and horticultural manuals universally recommended that greenhouses face south for maximum productivity (Abercrombie 1789; Loudon 1805, 1817, 1824; M'Mahon 1806; Woods and Warren 1988; Hix 2005:22-27).

These same manuals normally recommended that greenhouses have an attached shed for the storage of tools and other gardening materials. The sheds, which were usually located behind the greenhouse or at one of its ends, would also have held furnaces for heating the structure. Large amounts of coal were found at the greenhouse site, though this type of artifact was especially concentrated in and around the brick-floored extension, suggesting it held a stove or furnace of some sort. Jacob Farwell's accounts mention helping the gardener Heathcot at a "hot house" somewhere at Gore Place, though it is possible that Farwell was referring to an element of the fruit wall/grapery complex. Still, the 1806 greenhouse would have needed a heating system of some sort if it was used throughout the winter, especially if the Gores grew cold-sensitive plants in the building. A sale advertisement from 1834 indicates that the family did just that, growing citrus trees on the property (Brockway 2001:26, 28). These plants would have needed to be grown in a greenhouse in order to survive the frigid Massachusetts winters (Woods and Warren 1988:4-5). The nearby Lyman greenhouses at the Vale all had built-in heating systems, as did many American greenhouses as far south as Virginia (Chesney 2005). The 1799 fire at the estate began in the first Gore Place greenhouse, indicating that structure probably had a stove or furnace as well. Taken together, this information makes it extremely likely that the second greenhouse had a heating system of some sort. This system would have pumped hot air, steam, or smoke through flues or pipes running throughout the greenhouse, though the specific details of the building's heating system are unknown.

The brick-floored extension would have been the likely place to house a furnace or stove. It was in the right location to be the shed recommended by gardening manuals, and the heavy coal deposits from this feature indicate the furnace was nearby. Furthermore, no other location near the greenhouse has shown evidence for the presence of a furnace or stove. As a result, it is likely that the furnace for the heating system was based in the extension. The extension also probably acted as a storehouse for tools and other materials used in the greenhouse, although the 1793 carriage house

Figure 4.6. The foundations of the Robert Murray farmhouse. The top of the brick foundations is visible at the right of the image. View facing north.

could also have fulfilled this function. Regardless, the extension would not have been used to grow plants, and thus did not need to face directly south. Instead, the extension could be built on the same orientation as the rest of the estate, and act as a visual bridge between the conspicuously different main body of the greenhouse, and the adjacent carriage house, entrance drive, and other features.

The two sections of the building were constructed of the same types of material. The brick-floored extension has mortared fieldstone foundations supporting thin brick wall only a course thick, and a brick floor. Although only the lowermost courses of brick are still in place, the extension is overall fairly intact. The main body of the greenhouse, in contrast, is severely degraded (Figs. 4.4 and 4.5). None of the walls remain in place, and the north and east foundations are highly fragmented. The south foundation is entirely missing. Despite this damage, some inferences can be made about the construction of this part of the greenhouse.

Unmortared fieldstones make up all that remains of the foundations of the main body of the greenhouse and show that at least part of the foundations were dry-laid. The rubble fill from the interior of the greenhouse and the southern French drain contained medium and large sized fieldstones which probably originated in the greenhouse foundations. None of the other features built with fieldstone, which include the south yard wall, stone drain, and brick-floored extension, had enough of their foundations robbed out to have provided the high volume of stone recovered from the greenhouse site. The stones were normally found mixed in with brick, mortar, slate, and other architectural materials, most of which also appears to have originated in the greenhouse.

The high volume and large sizes of the recovered fieldstone suggest that the foundations for the main body of the greenhouse were very robust. This is to be expected, as the north, east and west walls of the building would have been thick, in order to support the structure's roof and provide insulation. In The American Gardener's Calendar, Bernard M'Mahon recommends the north wall of a greenhouse be just over two feet thick (1806:79). All of the walls were probably made of brick. This interpretation is supported by the large amount of brick rubble present at the site, as well as the building pattern of other features at and around Gore Place. The south yard wall, which abuts the greenhouse and was likely contemporary with it, has a fieldstone foundation supporting courses of brick, as does the brick-floored extension. The Robert Murray farmhouse, built prior to 1825 and eventually incorporated into Gore Place, also had brick walls sitting atop fieldstone foundations (Fig 4.6), as did the peach wall at the nearby Vale estate (Smith 2007; Pinello 1999).

These other features also provide examples for the appearance of the greenhouse foundations. Like the south yard wall, the greenhouse foundations were likely comprised of larger fieldstones interspersed with smaller cobbles and bricks and partially mortared together (Fig 4.7). Mortared slate fragments found in the greenhouse rubble deposits may have been used to help level the foundation, as well as to prevent water damage to the brick walls of the structure. Slate was used in this fashion at the Vale, where tiles were set between the stone foundation of the peach wall and the overlying bricks to "shed surface water away from the wall and to prevent the 'rising damp' from moving into the bricks and mortar above" (Pinello

Figure 4.7. The foundations of the south yard wall in trench 10. The greenhouse foundations may have originally resembled those of the south yard wall.

1999:9). The brick walls of the greenhouse would have been mortared to the uppermost course of the foundations.

The south wall of the greenhouse would have been far less robust than the other three. Depending on the overall style of the greenhouse, the south wall may have been a short knee wall of around three feet, or a wall of normal height interspersed with tall windows. If the latter, the windows could be as close as two feet apart. Unfortunately, nothing was left of the south wall or foundation in the areas excavated at the greenhouse site. This severely limits what can be said about the south wall's form. However, the lack of evidence for post holes or other wooden supports suggest that the wall was made of brick and not wood.

The 1841 map of the estate shows a road leading to the east end of the greenhouse. It is highly likely that an entrance to the building was located here. 18th- and 19th-century English greenhouses traditionally had entrances at the east or west ends of the building, and horticultural manuals recommended that type of layout (M'Mahon 1806:79; Loudon 1824:19-20; Beaudet 1990:101). British agricultural and horticultural practices were studied by many in the United States during that time period, and it would not have been unusual for the Gores to have followed their lead when building a greenhouse. Additionally, the east cobble surface, which was probably a workspace used in conjunction with the greenhouse, would likely have been located close to an entrance. Doors could also have been located in the brick-floored extension or along the south wall of the greenhouse. The former would have allowed easy access to the building's heating system, and helped to prevent cold air from entering the main body of the greenhouse. A western door would also have been located near the carriage house and the road between the two buildings. A fence located just west of the greenhouse may have had a gate adjacent to the brick-floored extension. If that was the case, then it seems likely the greenhouse had a door nearby. Some authors recommended placing a door in the south wall as well (M'Mahon 1806:79), and this location would have allowed entry to the semi-circular yard formed by the south yard wall. An entrance on the north side of the building would have been very unlikely (Loudon 1824:19).

Although doors could have been located on the east, west or north walls, the main entrance was likely located at the eastern end of the building. This entrance was the only one to have a road depicted as leading directly to it, and it would have had easy access to nearby features, such as the east cobble surface and enclosure path, both of which may have also housed plants during the summer. If there was a door in the brick-floored extension, it is unlikely it would have been used for anyone other than people working at the building; visitors would not have entered through a storage area or furnace room. Doors on the south, east and west walls are all plausible, though there is no direct archaeological evidence for an entrance in any location. Still, a main entrance at the east end of the building and a secondary door at the west end seems likely.

The 1806 greenhouse could have been built in one of two broad types. The "conservatory" style had a rectangular profile, and was an ornamental structure of brick or stone with tall front sash windows between piers. The windows could extend almost the entire height of the building, though the entirety of the south façade would not be glazed. Examples of this type of structure were built at Mt. Clare in Baltimore, Mt. Vernon in Virginia, the Wye Plantation in Maryland, and at the Derby House in Salem, Massachusetts.

The "conservatory" was an older type of greenhouse, popular in the 18th century, but a new

style emerged in the latter part of the 1700s: the "lean-to" style. This type had a sloped roof and front made almost entirely of glass, with a substantial back wall and a shorter front knee wall. In contrast to the more ornamental conservatory, the lean-to greenhouse was developed as a more practical, productive space for growing plants, and the sloped glass front was designed to let as much sunlight as possible into the building. Examples of this type of greenhouse were built at the Lyman estate in Waltham, Massachusetts, and Oatlands Plantation in Virginia.

Unfortunately, it is unclear what style the 1806 greenhouse was built in. Both types were built in similar sizes, although conservatory-style structures were sometimes wider than their later cousins. For example, the Mt. Clare greenhouse, built between 1760 and 1770, was 24 ft 8 in wide by 26 ft 8 in long, and the 1787 Mt. Vernon greenhouse was 27 ft wide by 42 ft long (Chesney 2005:26-33). Lean-to style greenhouses tended to be thinner, as evidenced by the mid 1800s Highlands greenhouse, which was 16 ft wide by 68 ft long (Bescherer, Kratzer, and Goodwin 1990:68-91) and the similarly thin greenhouses at the Vale. These patterns did not always hold, however. An 1815 lean-to style greenhouse in Quebec City was 26 ft wide by 65 ft long (Beaudet 1990:97-104), and the 1790 conservatory style Derby greenhouse in Salem, Massachusetts was 16 ft wide by 61 ft long (Woods 1988:85). The 14 ft width of the 1806 Gore Place greenhouse seems to suggest that it was built in the lean-to style, but the dimensions alone do not provide definitive evidence of the form.

Among the greenhouse destruction debris were several unmortared slate fragments with nail holes. These artifacts represent slate roofing tiles. The tiles were likely used to roof the brick-floored extension, and may have also been used along part of the main body of the greenhouse, depending on how the building was constructed. A conservatory style building could have utilized slate tiles across the entire roof, but even lean-to greenhouses might have had tiled roofs. In describing the latter style, Bernard M'Mahon suggests that "one third or one half" of the roof "may be made of glass-work," with the rest of the ceiling built of wood or stone (1806:80). Still, the Lyman greenhouses are lean-to style buildings with the entirety of their roofs glazed, and the recommendations in greenhouse manuals were not always followed.

Due to its mostly or fully glazed roof and front wall, a lean-to style greenhouse would have utilized far more window glass than a similarly sized conservatory. If the 1806 greenhouse was built in a conservatory style, it would have used least 240 square ft of glass. If it was built in the lean-to style, it would have used at least 837 square ft of glass. However, only 7.58 square ft of glass was recovered during the 2012 project. The 2008 and 2012 excavations yielded similar numbers of glass shards, and we can assume the surface area of glass recovered in 2008 was approximately the same as in 2012. Thus, an estimated 15 square ft of glass was excavated between the two projects. This number only amounts to 1.82% of what would be needed for a lean-to style greenhouse, and 6.4% of the glass that would have been used in a conservatory type building. Considering the greenhouse at Gore Place stood for over 30 years and its windows probably needed periodic repair or replacement, 15 square ft is a very small amount of glass to have excavated. If a large surface area of glass had been recovered, it might have pointed to one or another style of building; as it stands, the amount of window glass cannot be used to make a case for either type of greenhouse.

However, the glass can tell us something else about the appearance of the greenhouse. Most of the shards were aqua-colored, as would be expected on and early 19th-century site. Much smaller amounts were colorless or solarized, but these fragments indicate that the Gores, Lymans or Greenes were experimenting with different colors of window glass. Depending on when the colorless and solarized window glass was installed, it is possible that the greenhouse had three different colors of window simultaneously. Solarized glass was not common until the late 19th century, although it could have been available to the Gores as early as the 1820s, and certainly would have been obtainable by later owners (Lockhart 2006:49-50; Jessen and Palmer 2005:145-146). In all likelihood, the greenhouse was built using aqua-colored windows, and colorless and solarized windows were added

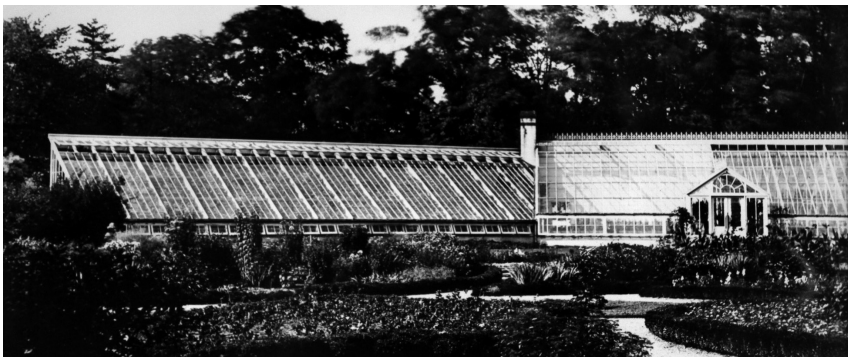

Figure 4.8. The greenhouses along the fruit wall at Gore Place, as they appeared in the early 20th century. They were built in a lean-to style, and may have reused architectural material from the 1806 greenhouse.

Figure 4.9. The brick channel built into the south edge of the brick-floored extension. This channel connects to the stone drain at the southwest corner of the extension, and would have been used to drain excess water from the greenhouse. View facing east.

later on. Architectural hardware recovered from the site indicates that at least some of the windows in the greenhouse were sash windows, as well.

As discussed above, the window glass from the 1806 greenhouse may have been recycled for use in the grapery greenhouses. Those structures, which were photographed in the early 20th century, were built in a lean-to style (Fig 4.8). The grapery greenhouses also had relatively large window panes, similar in appearance to the ones used at the Lyman greenhouses, which measured 33 by 15 inches. If the glass from the 1806 Gore Place greenhouse was recycled for use in the grapery complex, then some of the panes seen in the photograph may have originated with the earlier greenhouse. This might point to the 1806 greenhouse having been constructed in a lean-to style, as window pane sizes for conservatory style buildings tended to be far smaller. Unfortunately, no intact window panes were recovered from the 1806 greenhouse site, and the grapery complex has not been fully investigated archaeologically, leaving this hypothesis untested.

Internal Arrangement

The floor of the main body of the greenhouse was at least partially constructed of marble tiles. Although none were found in situ, fragments of these tiles were found in abundance in the rubble deposits in the greenhouse, as well as in nearby features. These tiles closely match those used in the Federal-style mansion at Gore Place, built in 1805-1806. The tiles link the two buildings aesthetically, and suggest the greenhouse was partially a public space. This inference comes from the fact that a more utilitarian, private workspace would have been unlikely to have a fancy marble floor; the brick extension, for example, was used as a storage shed and furnace room and had a cheaper brick floor. It is important to note, however, that the marble tile floor would still have been in line with paving recommendations from the authors of greenhouse manuals (M'Mahon 1806:81; Loudon 1817:73).

A layer of light-colored sand was found below the rubble deposits in the main body of the greenhouse, at close to the same elevation as the nearby east cobble surface. The greenhouse and the east cobble surface were likely contemporary, and the latter feature can be used to approximate the historic ground level outside the building. The floor of the brick extension also sits at a similar elevation. As the sand sits at the same elevation as the ground surface around the greenhouse, and close to that of the floor of the extension, it probably represents a bedding layer put down to support the marble tile floor. This type of floor construction was not unique; the mid-18th century Wye greenhouse in Maryland had a brick floor sitting atop a base layer of sand (Chesney 2009:41). It is also possible that the sand is actually the severely decayed remnants of sub-floor mortar, which would have kept the marble tiles securely in place. A mortared floor would link the main body of the greenhouse with the brick-floored extension, which has just such a sub-floor mortar layer. Either way, the marble floor of the main body of the greenhouse likely sat directly atop this sand/decayed mortar layer.

Naturally, the brick-floored extension had a brick floor, which excavation showed to be largely intact. Beneath the floor and walls was a layer of mortar, and a fieldstone foundation supported the walls. Built into the extension's floor was a small channel, which ran along the south wall and joined with the stone drain at the southwest corner of the room (Fig. 4.9). The location of the channel, and its connection to the stone drain strongly indicates that the features acted in concert to drain excess water from the brick-floored extension. This channel was probably part of a larger, greenhouse-wide drainage system as well. Two circular pits, lined with stone, were found in the northwest and southeast corners of the main body of the greenhouse. These pits cut into well-drained glacial subsoil, providing a convenient outlet for excess water. Several marble tiles from the greenhouse site show damage consistent with being submerged in water consistently, or over long periods of time. Taken together, these finds suggest that the marble greenhouse floor had built-in drainage channels, which probably emptied into the circular pits and/or connected with the drainage channel in the brick-floored extension. The marble tiles in the channels would have been exposed to water often enough to have become damaged, and the stone lining of the pits would have kept them from collapsing as water flowed in and drained out through the underlying glacial subsoil.

This scenario seems the most likely explanation for the water-damaged marble tiles and the stone-lined pit features, though it is difficult to verify without in situ floor remains. Still, if the brick extension needed an outlet for water, then the main body of the greenhouse certainly would have as well. The latter part of the building was where plants would have been stored, watered and managed, and thus would have been far wetter than the brick extension. The only water management feature to connect to the greenhouse was the stone drain, and no other candidates for internal drainage features besides the stone-lined pits were found in the main body of the structure. In the absence of other evidence, the use of marble tile drainage channels that flowed into the stone-lined pits seems the most plausible set-up for the water management system in the main body of the greenhouse.

Besides a water management system, the greenhouse definitely required a method of heating the building. As discussed earlier, a furnace or stove for this purpose was likely located in the brick extension. The furnace would have connected to a system of flues or pipes that would have moved hot air, steam, or smoke throughout the greenhouse, warming the building. Greenhouse manuals of the late 18th and early 19th centuries recommended a few possible layouts for these flues, which could have run through the north wall of the greenhouse, in or under the floor of the building, or been coiled around raised planting beds (Abercrombie 1789:26-28; M'Mahon 1806:86; Loudon 1824:25). The greenhouses at the Vale show some of these recommendations in action: the 1798 greenhouse at that estate has flues built around planting beds, while the 1804 structure has flues running through its north wall. Due to the severely degraded nature of the second Gore Place greenhouse, it is unclear how the heating system was arranged in the building, or whether

steam, hot air or smoke was the method of choice for warming the structure. Even so, a few things can be inferred about the system.

First, the large amount of coal present at the greenhouse site strongly suggests that the building's furnace was coal-fired, at least toward the end of the structure's lifespan. Fragments of burned wood from Red Oak and American Beech trees found at the site may represent the remains of earlier fuel sources for the furnace. The presence of burned bone at the greenhouse site suggest that the furnace was used for more than just heating the greenhouse, and was probably involved in the production of bone manure for use in the agricultural fields at Gore Place. Some of the bricks recovered from the greenhouse site showed soot blackening, which adds further support to the existence of a furnace at the site, and these bricks could have originated with a chimney or flue, if the greenhouse was heated by smoke. The brick extension did not show any evidence for the presence of sub-floor flues, and no trenches were observed to have cut into subsoil within the footprint of the main body of the greenhouse. As the floor for that part of the building was likely built just over subsoil, atop a layer of sand or decayed mortar, this suggests that there were no sub-floor flues in the main body of the structure. However, if the floor was sufficiently thick, flues or pipes could have been contained within it, although this seems unlikely. As stated above, the north wall of the structure or the walls of raised planting beds could also have been home to a series of flues, but without further information it is not possible to fully identify the layout of the heating system for the greenhouse.

A relatively common find at the greenhouse site were planting pot fragments. In 2008 alone over 2,000 pot sherds were recovered, from at least 150 distinct vessels (DeForest 2010:iv). This material was analyzed by Rita DeForest in 2010. DeForest found that the planting pots from the greenhouse site ranged in size from "thumb pots" only an inch wide, to vessels 12 inches in diameter. The thumb pots would have been used to grow plants from seeds or cuttings, and were only used by those interested in serious horticultural pursuits. The 12 inch pots, which would have needed to be specially ordered, were large enough to hold small trees, and may have been home to the citrus trees advertised for sale at Gore Place in 1834 (DeForest 2010:51, 94-112). Several of the pots appear to have been used in conjunction with glass bell jars, which would have been used to maintain a constant level of warmth and humidity for delicate plants. Overall, DeForest found that the planting pots from the greenhouse site indicated the horticultural activities taking place in the building were very sophisticated; the greenhouses' owners did not have a merely casual interest in gardening (DeForest 2010:115-121).

The planting pots could have been arranged in two different ways. In some greenhouses, pots were placed in beds of bark or manure, materials which provided warmth as they decayed. In greenhouses heated by furnaces, potted plants were typically arranged on tiered shelves (Beaudet 1990:95). Considering the presence of a furnace in the brick extension, potted plants at the 1806 Gore Place greenhouse were likely arranged on shelves, and not situated in bark beds. That does not preclude the presence of soil beds in the greenhouse for plants not grown in pots, however. Two shallow depressions, found beneath the southernmost rubble deposits within the greenhouse footprint, may have been the remains of planting beds built into the floor of the structure, although this is far from certain. Having some plants grown in pots and others in built-in planting beds would not have been unusual for greenhouses in the late 18th and early 19th centuries, and a 1781 greenhouse from Québec City was arranged in just that fashion (Beaudet 1990:96-97). Although there is some uncertainty about the presence of planting beds in the 1806 Gore Place greenhouse, the structure would have contained potted plants arranged on shelves.

Some or all of the interior of the 1806 greenhouse was likely whitewashed. This is indicated by the presence of plaster fragments found in destruction deposits associated with the building. Plastering the interior of a greenhouse was a commonly recommended practice; for example, authors Hibbert and Buist (1834:300) and Bernard M'Mahon (1806:81) suggested whitewashing to help reflect sunlight throughout a greenhouse. Some of the plaster from the greenhouse site had lath impressions, indicating portions of the interior walls or

Figure 4.10. Keys found during the 2012 excavations.

Figure 4.11. Two lead tags recovered during the 2008 project. The larger has the number three on it, and tags like these were likely used to label items and plants in the greenhouse.

ceiling for the building were made of plastered wood. However, very little lath-impressed plaster was found in the destruction debris from the greenhouse, implying that only a relatively small area of the building's interior was wood. If the main body of the greenhouse had a partial slate roof, it is possible that the lath-impressed plaster was a part of the ceiling in this area.

Several other finds help to fill in details about the greenhouse. Keys (Fig. 4.10), latches and lock parts attest to the presence of locked doors or containers, and suggest the high degree of value placed on the plants and tools housed at the greenhouse. Greenhouse plants could be expensive and rare, so access to the building would have been more limited than entry to other agricultural spaces. Four partial knife blades were also recovered from the site, which may have been used as pruning knives in the greenhouse. Small pieces of copper alloy or ferrous wire from the site may have been used to tie plant stems to wooden supports; similar artifacts from the mid-19th-century Highlands greenhouse in Pennsylvania were believed to have been used for the same purpose (Besherer, Kratzer, and Goodwin 1990:89; Beranek et al 2011:89-91). Various items within the 1806 Gore Place greenhouse appear to have been labeled: some planting pots have letters or numbers scratched into them, and rectangular lead tags, one impressed with the number three, were probably used to label specific plants or chemicals used in the greenhouse (DeForest 2010:76; Beranek et al 2011:89-91)(Figs. 4.11 and 4.12). The presence

Figure 4.12. Scratched letters and numbers on a planting pot from the 1806 greenhouse site. The scratches include an X and a sequence which may read "1716g."

of these items in the greenhouse reinforce the idea that gardening activities at the site were far from casual.

Possible Plants Grown in the Greenhouse

We do not know for certain what types of plants were grown in the greenhouse. Pollen samples from the site yielded little information, and no extant documents specifically reference the 1806 greenhouse. The presence of a possible bulb pot at the site suggests that bulb flowers were grown in the greenhouse, and the Gores are known to have grown oranges, limes, roses, geraniums and pears at the estate (Brockway 2001:26, 28; DeForest 2010:108-109). All of these items could have been grown in the 1806 greenhouse, and the citrus trees would have needed to be grown in such

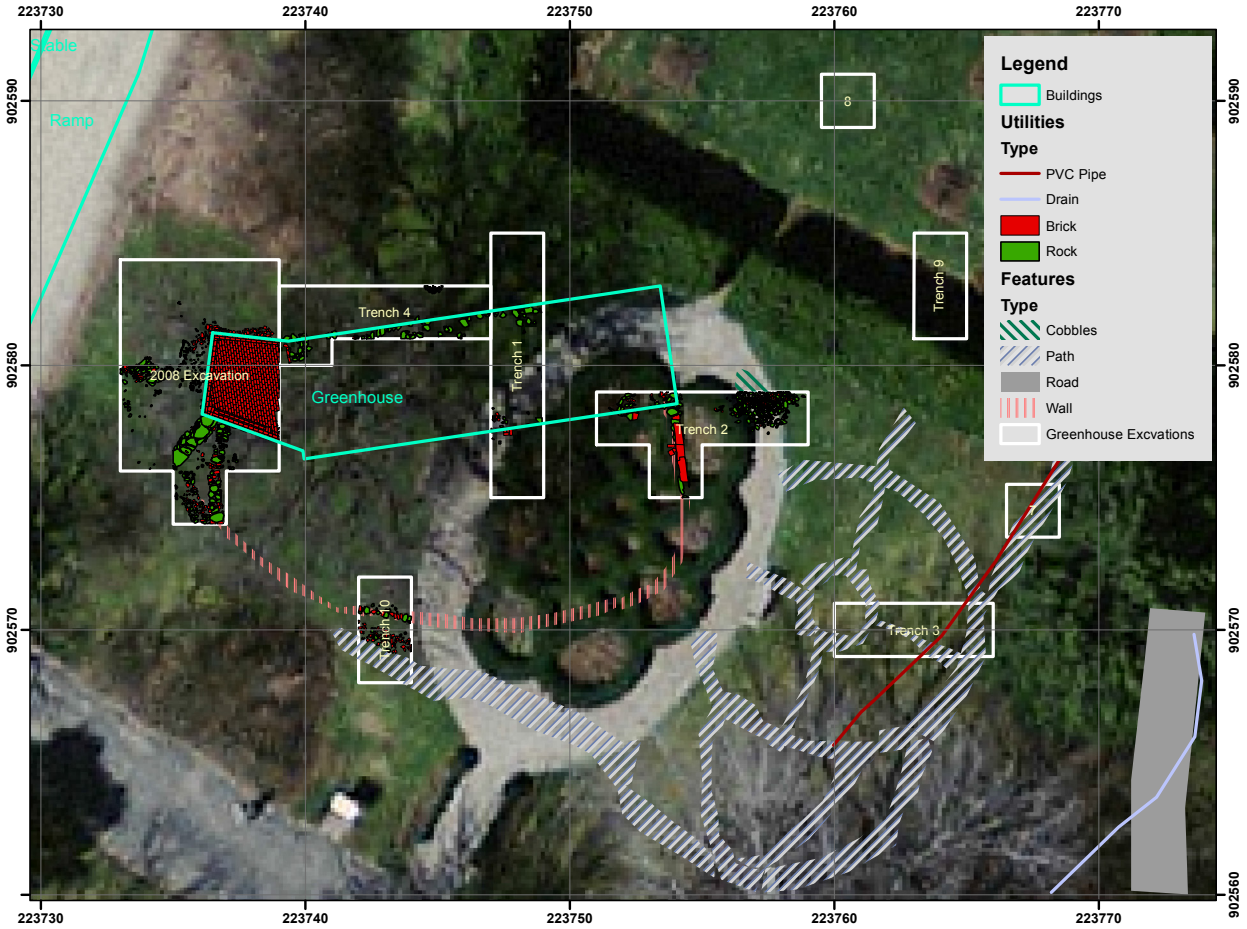

Figure 4.13. A map of the greenhouse site, showing features identified during the 2008 and 2012 projects. Many of these features were contemporary with the greenhouse, although the site changed significantly over time. Grid in meters; north is to the top.

a structure, due to their inability to withstand cold temperatures (Woods and Warren 1988:4-5). The Lyman family grew pineapples, figs, lemons, limes and bananas at their greenhouses on the Vale estate in Waltham, in addition to flowers such as camellias (DeForest 2010:108-109). As the Gore and Lyman families moved in the same social circles, and Theodore Lyman Jr. owned Gore Place from 1834 to 1838, it is distinctly possible that some of the same plants were grown in the second Gore Place greenhouse. An 1831 Massachusetts Horticultural Society exhibition was the first of its kind to include greenhouse plants, and Wilder (1879:7) records that camellias, Musa coccinea (ornamental or scarlet bananas), Hoya carnosa (the wax plant, native to Asia and Australia), and Maranta zebrine (a tropical plant with ornamental foliage) were among the greenhouse flora on display (Note these are the scientific names used by Wilder in 1879 and do not correspond to current scientific names). All of these plants, and more, could have been grown in the 1806 Gore Place greenhouse, though at this time there is no way to definitively state what grew in the building.

Summary

The greenhouse was likely constructed in 1806, and was built in two sections: the main body, where the plants would have been grown, and the brick-floored extension, which functioned as a storage area and furnace room. The main body measured 47 feet long by 14 feet wide, while the extension was 10 feet by 10 feet. The structure was probably around 14 feet tall. The two seg-

ments were built on different axes, with the main body closely aligned with the cardinal directions, so as to let the maximum amount of sunlight into the building, and the brick extension on the same orientation as the Federal mansion, 1793 carriage house, and other features at Gore Place. Both parts of the building had brick walls that sat atop fieldstone foundations. A road led to the eastern end of the greenhouse, where there was likely a door, although other entrances may have been located in the western and southern sides of the building. The brick extension would have had a slate tile roof, and it is possible this roof extended over portions of the rest of the building. The main body of the greenhouse could have been built in one of two forms: the lean-to style, with a sloped south façade comprised almost entirely of glass, or the conservatory style, with a flat south wall with tall windows set between masonry piers. At this juncture, there is insufficient evidence to determine which form the 1806 greenhouse took.

The interior of the main body of the structure had a marble tile floor, similar to that of the Federal-style mansion at Gore Place. This floor probably had built-in drainage channels that directed water to pits located in the northwest and southeast corners of the building. The walls were at least partially whitewashed, and parts of the ceiling or walls appear to have been lathed. The brick extension had a brick floor, with a built-in drainage channel that connected to a stone drain at the southwest corner of the building. The extension was probably a storeroom that also the furnace for the greenhouse, which would have provided heat for the structure. Flues or pipes, carrying steam, hot air, or smoke from the furnace, would have been radiated this heat throughout the main body of the greenhouse. These flues could have been present in the floor and/or north wall of the greenhouse, or been built around raised planting beds. Depending on the type of heating system, there could have been one or more chimneys at the greenhouse, located in the brick extension, the wall between the greenhouse and extension, and/or at the east end of the structure.

The main body of the greenhouse likely held potted plants arranged on tiered shelves, although there may have also been built-in planting beds. The planting pot fragments and other finds from the greenhouse suggest that it was home to a sophisticated gardening operation, and locks from the site speak to the value of the plants it contained. What exactly was grown in the building is not known, although records of the plants grown at the Vale, a neighboring estate, provide some ideas. The 1806 Gore Place greenhouse appears to have been demolished sometime between 1841 and 1900, and parts of the building may have been used to expand the fruit wall/grapery at Gore Place into a series of lean-to greenhouses.

The Greenhouse Yard through Time

Pre-Greenhouse

The second Gore Place greenhouse appears to have remained relatively unchanged from its construction in 1806 until its demise after 1841. The same cannot be said for the yard around the structure, which underwent significant changes from the beginning of the Gore family occupation until the present day (Fig 4.13). When Christopher and Rebecca Gore bought their Waltham estate in 1786, the area around the 1806 greenhouse appears to have been empty farmland based on the absence of any artifact deposits or features that pre-date the Gores. Plowscars, along with small fragments of refined earthenwares, probably deposited at the site as a part of manure or redeposited midden soils, attest to the farming activities in the area. The space east of the greenhouse may have already been used as a nursery or garden, as orderly rows of small planting holes were found below the circular garden paths. These planting holes either predate the greenhouse or are contemporary with its earliest period. The mean ceramic dates for the greenhouse site, almost entirely based on the refined earthenware fragments, range from 1789 to 1803, suggesting deposition of these artifacts slowed drastically in the early 19th century, around the time the greenhouse was built. The Gores constructed a carriage house just west of the future greenhouse site in 1793, and Rebecca's brother William Payne may have laid out the entrance drive to the south sometime prior to 1804. A vegetable garden was installed to the north of the greenhouse site between 1786 and 1806 as well.

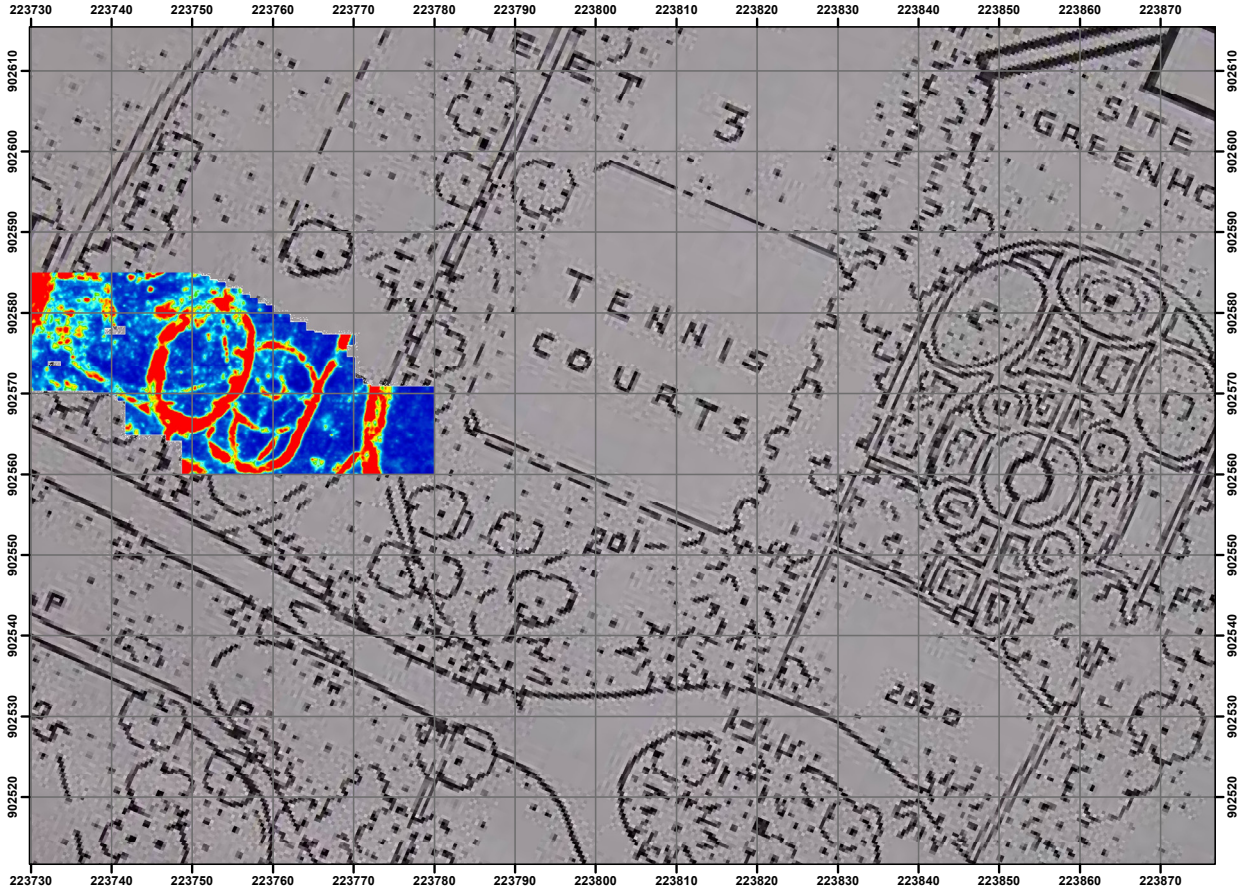

Figure 4.14. The GPR slice that shows the circular gravel path over a HABS map showing the garden built in 1835 by Robert Murray for Theodore Lyman Jr. The paths in the garden seem very similar in form to the circular gravel path at the greenhouse site, and the features may have been laid out at the same time. Grid in meters; north is to the top.

Greenhouse-Era

The Gores built the greenhouse in 1806, to replace an earlier structure which burned down in 1799 that was located elsewhere on the estate. This led to a transformation of the greenhouse site. The south yard wall, east cobble surface, stone drain, north yard pits, gravel pathways, and a fence line all appear to have been constructed during the lifespan of the greenhouse. The planting holes east of the greenhouse may indicate the location of an early outdoor garden.

The south yard wall connects to the greenhouse, near the southwest corner of the brick-floored extension and at the southeast corner of the main body of the building. It forms a semicircular yard to the south of the structure, setting the building off from the surrounding area. Since the southern face of the greenhouse was intended to let as much sunlight into the building as possible, the south yard wall was probably not very tall, so as not to shade the greenhouse too much. Just west of the building is a fence line, which forms a barrier between the greenhouse and a road that runs between it and the 1793 carriage house. The fence line and south yard wall both serve to separate the greenhouse from its surroundings, perhaps to distinguish the more utilitarian carriage house from its ornamental neighbor.

The fence line and south yard wall do not appear on maps of Gore Place, but the rectangular gravel path that encloses the greenhouse yard

does. The enclosure path was built sometime prior to 1834, and probably served a few purposes. First, it may simply have provided a convenient path to move around the greenhouse yard. It may also have helped further separate the greenhouse yard from the carriage house, entrance drive, and vegetable garden. The enclosure path was probably also used as a staging area for potted plants during the summer. The east cobble surface, located just east of the greenhouse, was probably also used for this purpose. Moving the potted plants from the greenhouse out onto the east cobble surface and enclosure path would have been done for both practical and aesthetic reasons. It was recommended to help with plant growth (Loudon 1824:173-174), but would also have transformed the greenhouse yard into a temporary garden, and given visitors entering the estate along the entrance drive a clear view of the plants being grown at Gore Place.

The construction date for the circular gravel path is unclear, but its location relative to the enclosure path strongly suggests the two features were contemporary. However, it does not appear on the 1834 map of Gore Place. This may have been an oversight, or might indicate the circular path had not yet been constructed. During Theodore Lyman Jr.'s tenure at Gore Place, he hired gardener Robert Murray to build a new garden north of the Federal-style mansion and east of the greenhouse. This garden, completed in 1835, favors circular, curvilinear designs and replaced an earlier rectilinear garden. The circular gravel path appears similar to the designs seen in the 1835 garden, and the feature may have been constructed to visually link the greenhouse yard with the new formal space to its east (Fig. 4.14). Overall, the yard south of the greenhouse appears to have been maintained as a pleasure ground during the building's lifespan.

To the north of the building, the greenhouse yard seems to have been a more utilitarian space. The 1834 map of the estate shows a rectangular structure along the enclosure path north of the greenhouse that may have been a hot bed. Hot beds were prepared soil beds that were covered with glass frames for starting outside plants early in the season or for protecting delicate plants. The location of the potential hot bed was under the tall hedge, and excavation units inside the hedge showed that its roots and other modern plantings had a significant effect on the area. Excavation inside the tall hedge turned up no evidence for such a structure, nor for any other feature. This may mean that the feature depicted on the 1834 map was very ephemeral to begin with, and/or that any subsurface remains were obliterated at some point after 1834.

The north yard did have two pit features: one located adjacent to the brick-floored extension, the other next to the main body of the greenhouse. Both cut through landscaping fill that was deposited during or soon after the construction of the greenhouse. These north yard pits may have been soil preparation beds, or been involved in the production of manure. Another possibility is that they were planting features. At the Vale, planting beds were found just north of the peach wall, despite their location leaving them in almost constant shade (Pinello 1999). The pits at the 1806 Gore Place greenhouse site could have been similarly shaded planting beds.

This part of the yard also appears to have been used to stockpile bone, shell, sand and compost for use in the preparation of manure. Planting pot fragments from the greenhouse seem to have been dumped in this area as well. Overall, it seems that the north yard was used as a storage or composting area, and may also have been home to hot beds and other planting features. Tucked away out of view from visitors to the greenhouse, this space was not maintained as part of the estate's pleasure grounds.

We still do not know very much about the water supply for the greenhouse. There was a well located to the northwest. The greenhouse plants would have needed to be watered daily, so there might have been a closer cistern or water tank fed by the well. Such engineering would not be out of place on the property, given Christopher Gore's close attention to water supply systems in his house. However, of the water management features at the greenhouse site found so far, only the stone drain seems to have been contemporary with the structure. That feature, located at the southwest corner of the brick-floored extension, demonstrates that efforts were made to encourage excess water

to flow away from the structure.

Post-Greenhouse

The greenhouse was deconstructed some time between 1841 and 1900, probably early in this period, with some of its architectural material repurposed for use in the creation of other features. The glass from the building was probably reclaimed and installed in the grapery greenhouses. Bricks and foundation stones were removed from the structure and used as fill in at least two of the three French drains found near the building. Old tools, planting pots, and other greenhouse related items were deposited in these drains. Unwanted architectural material was primarily dumped within the footprint of the greenhouse or just to the north of the structure. What limited parts of the greenhouse remain in situ appear to have been the lowermost sections of the building, those parts present below ground level at the time the structure was deconstructed. The main body of the greenhouse was demolished much more thoroughly than the extension, but strangely, a more dense and uniform layer of demolition debris (brick, plaster, and mortar) was left above the main body of the structure than above the extension.

The fence line just west of the greenhouse seems to have been removed at the same time as the building, but the demolition date for the south yard wall is unclear. However, it seems likely that the south yard wall was removed at the same time as the greenhouse and fence line. The fence and the south yard wall were closely connected in function, while the wall abutted the greenhouse itself. The wall also appears to have been deconstructed in the same way as the greenhouse, with only the above ground portions of the feature removed; its foundations remained in place.

The eastern French drain cuts through part of the enclosure path. Since the drain contains architectural material from the greenhouse, it is clear that the enclosure path, or at least part of it, ceased to be used at the same time the greenhouse was demolished. Had the path still been in use, it is unlikely that the eastern French drain would have cut through it. The circular path likely fell out of use at the same time as the enclosure path. The northern French drain may predate the destruction of the greenhouse. It contains discarded tools and planting pots, but it is unclear whether these materials were deposited when the greenhouse was destroyed, or during an earlier period when the building was being refurbished or cleaned. The southern French drain, however, appears to have been constructed after the greenhouse was demolished.

The French drains to present an interesting question: why did the site need three of them? The northern French drain may have been used to collect water runoff from the road east of the carriage house, but it is unclear why the other two drains were installed. The fact that there were so many water management features, all present in the western half of the greenhouse site and near the building's remains, suggest that drainage at the site was an issue. If the site was constantly inundated or muddy, this may have been a reason to demolish the greenhouse and relocate the horticultural activities at the estate to the fruit wall/grapery. Alternatively, the activities taking place at the site after the greenhouse was destroyed may have required a drier landscape, or perhaps changes elsewhere on the estate caused the site to become increasingly wet.

The east cobble surface and stone drain appear to have survived the destruction of the greenhouse largely intact. The east cobble surface might have continued to be used as a workspace following the removal of the greenhouse. It contains broken brick fragments among the cobbles, suggesting that material from the demolished building was incorporated into the surface. A second, smaller western cobble surface was installed north of the destroyed structure. Soil from the greenhouse site or elsewhere on the estate was eventually used to cover the structure's remains and landscape the site. The presence of mid-19th-century ceramics in the fill suggest that at least some of this landscaping happened after 1850.

The immediate result of the greenhouse's demolition was a general razing of the site. Most features associated with the building, such as the enclosure path, south yard wall, and fence line, were removed. The continued presence of the east cobble surface, the addition of the west cobble surface, and the installation of the French drains

south and west of the building, suggest that the site became more of a work area, possibly supporting activities at the 1793 carriage house or the vegetable garden to the north. The cobble surfaces and drains suggest that activities on the site may have been wet, or that they needed to manage run-off from the area. There do not appear to have been any new buildings constructed over or around the remains of the greenhouse, although a shed was built north of the structure prior to 1900. Aside from the French drains and cobble surfaces, the site appears to have been relatively empty during the time immediately following the greenhouse's destruction and few later period artifacts were deposited there.

The Greenhouse in Societal Context

Laborers at the Greehouse

One of the major interpretive questions of the Gore Place greenhouse is who oversaw and carried out the work there. The amount of daily labor and periodic specialized maintenance described in the greenhouse manuals and reflected in the receipts of the Cambridge Botanical Society greenhouse (MSPA Records) makes it clear that maintaining a greenhouse was a multi-person task involving both skilled oversight and continual manual labor. If the prescriptions set out in greenhouse manuals were followed, the labor involved in maintaining a greenhouse would have been constant and time consuming. It included daily and seasonally varied care of the plants themselves (watering, repotting, pruning, application of pesticide); careful regulation of the building's climate such as opening, closing, or covering windows and fueling furnaces (throughout the night when necessary); and regular repair and maintenance of the structure and equipment which ranged from sharpening tools to replacing panes of glass to pruning, cleaning and whitewashing the structure. Even if the cycle of tasks outlined in the greenhouse manuals represents an ideal rather than a reality, greenhouses were certainly costly, requiring money, labor and specialized knowledge to build and maintain.

Loudon is explicit that his manual gives a lady or gentleman the specialized knowledge so that they can dispense with a "regularly bred and skillful gardener," but the work will still require the "assistance of a footman or common labourer" (1824:5). The ladies and gentlemen to whom Loudon refers may have overseen the work, but probably did not carry much of it out. We know that the Gores did not choose to undertake this work without a gardener; at least two professional gardeners worked at Gore Place during the family's tenure, Robert Toohey and William Heathcot. The Gores would have had to employ specialists to construct the greenhouse, knowledgeable staff to tend the plants and the daily routines of heating, cooling, airing and covering the greenhouse, and possibly hire specialized workmen for repairs of the types mentioned above.

The people who worked in the greenhouse were just one part of a much larger system of domestic and agricultural labor that took place at the Gore estate. In addition to the gardeners, the Gores employed at least on farm manager (Jacob Farwell), if not several. Jacob Farwell's journal also refers to Isaac Farwell, who tended hotbeds for starting delicate crops like lettuce. The household staff were managed by butler Robert Roberts. Some of the full-time domestic and agricultural staff probably lived on the property, but others lived in Waltham and worked seasonally or as day-laborers. One of the hopes of the excavations at the greenhouse site was to find artifacts relating to the people who worked at Gore Place. Unfortunately, very little material was found that shed any light on the lives of the laborers at the greenhouse, suggesting that the greenhouse space was very specialized and was not also used as domestic or recreational space by workers.

Cultivating Gentlemen?

Tamara Plakins Thornton, a historian who studied the Massachusetts scientific agriculture movement, titled her book Cultivating Gentlemen. While it is clear that these male politicians and merchants were directly involved in horticultural activities, Rebecca Gore's involvement in the management of the greenhouse should also be considered. Mrs. Gore was one of only three women elected as honorary members of the Massachusetts Horticultural Society in 1830, one year after it was founded. At the time, women were not permitted

to be regular members of the society, but the three who were made honorary members were elected because of "their zeal in forwarding the objects of the society" (Wilder 1879:9), indicating that Rebecca was interested in horticulture and possibly one of the most influential women in the Boston area in the horticultural sphere.

Loudon, writing in England in 1824, stated that "a green-house is in a peculiar degree the care of the female part of a family" (1824:2), although his book is addressed to both men and women. Carmen Weber's (1996) research on 18th-century Maryland greenhouses argues that many of them were overseen by women. Christopher Gore's correspondence with Rufus King never mentions the greenhouse, although he does discuss his fruit trees, vegetables, grapes, and field crops regularly. This absence raises questions of his involvement, though does not demonstrate that Rebecca Gore was the primary person overseeing the greenhouse [There is only one known letter from Rebecca Gore]. Rebecca Gore does appear on lists of people who purchased plants from the Cambridge Botanical Garden. Either she or her tenants maintained the greenhouse after Christopher's death in 1827, because sales records at the time of her death in 1834 list oranges, variegated oranges, and lime trees (specifically identified as belonging to Mrs. Gore) and roses, geraniums, and other plants "in the vinery" (Brockway 2001:26, 28). In sum, Rebecca Gore appears to have been active and possibly influential in the Boston horticultural community. While we do not know that she supervised the greenhouse directly, her potential association with this aspect of scientific agriculture suggests the need to reexamine our preconceived notions about who was in control of these spaces.

The Greenhouse and Scientific Agriculture

Elite Massachusetts merchants and statesmen cultivated ornamental plants and fruit trees, scientifically or not, since the decade after the Revolution (Thornton 1989:147-148). Christopher Gore, however, was a founding member of the MSPA and a practitioner of what became known as scientific or experimental agriculture, so it makes sense to consider what aspects of that movement might also have found expression in the greenhouse. In some respects, the greenhouse is an ideal experimental laboratory because the climate could be controlled and the soil conditions in each individual pot carefully regulated. The evidence of the thumb pots, which allowed plants to be grown from seeds or clippings, points to a desire for full control over the growing process. Gore certainly used the carriage house to store and age compost (manure), and he or a later owner may have used the greenhouse area to further prepare soil or stock-pile bone and shell for processing. The lead tags from the building and scratched letters and numbers in recovered planting pots indicate that plants and other items in the building were labeled. The three different colors of window glass could also indicate an owner experimenting with materials in order to provide the best light for plants.

An Element of Display

Scholars have also argued that the control over nature showcased in a greenhouse was part of 18th- and early 19th-century elite self presentation (Leone 1984). As good manners demonstrated personal worth by exhibiting control over the body, cultivated exotic plants demonstrated control over nature. In Massachusetts in particular, country seats and agricultural experimentation became important for the political and mercantile elite because the virtuous, productive associations of agriculture and rural life offset some of the criticisms of commercial wealth, setting suggestions of self sufficiency and wholesome domestic production against imported luxury, wastefulness, and corruption (Thornton 1989:2-3).

Greenhouses were hybrid spaces, intended for both social and agricultural uses. They were expensive to build, and even more so to maintain. Unlike field crops, which provided food for the family and money through sale, a private greenhouse of this size would probably not provide a significant amount of food or produce for the market. They could produce some citrus or other tropical fruits, but not dietary staples.

Besides growing food or exotic plants, greenhouses functioned as elements of display. The white marble flooring, extensive display of expensive pane glass, and prominent location on the entrance drive at Gore Place suggest that there

were aspects of the greenhouse intended for public view. The fence and south yard wall which set the greenhouse apart from the rest of the estate also reinforce its privileged place at Gore Place.

In fact, contemporary accounts suggest that greenhouses and orchards of exotic fruit trees played an important role in the social round of the period. Visitors to the homes of Essex County merchants wrote of being shown gardens and fruit trees, sometimes by the gardener himself (see descriptions in Moore 1988). They marveled at the quality, size, and variety of fruits and at exotic plants. Well-stocked greenhouses and orchards were destinations in themselves, for both male and female visitors. A young woman from New York, for example, wrote this description in 1802:

> In the afternoon rode out to Hasket Derby's farm, about 3 miles from Salem, a most delightful place,--the gardens superior to any I have ever seen of the kind; cherries in perfection! We really feasted!... We visited the greenhouse, where we saw oranges and lemons in perfection; in one orange tree there were green ones, ripe ones, and blossoms; every plant and shrub which was beautiful and rare was collected here.
>
> Quoted in Moore 1988:136.

Gardens and greenhouses provided important spaces for socializing: to walk, to admire the view of a well laid-out estate, and to see (and sometimes taste) exotic and unusual plants. The views from someone's gardens, the abundance of their fruit trees, and the taste skills of their gardener were measures on which people were compared among the social elite. Possessing these things allowed the Gores to offer a particular kind of hospitality.

Archaeological Sensitivity

Excavations at the site of the second Gore Place greenhouse uncovered a wealth of features dating to the Gore family occupation of the property and later. Many of these features appear to have been undisturbed since the mid 19th century, and they paint a picture of a heavily modified and often used landscape. The Gore, Lyman and Greene families would all have visited the 1806 greenhouse, and the estate's gardeners and farm laborers would have worked in and around the building. Almost all of the features discovered at the site are located between the tall hedge, entrance drive, and parking lot, and as such this area is one of high archaeological sensitivity. As a result, preservation of these features in place is recommended.

Testing within the tall hedge revealed what may be planting features, but their time period is unknown. No other features were discovered in this area, and it seems to be an area of low archaeological sensitivity. However, many of the features identified during this project were visible in the GPR results, although some, like the eastern French drain, were only discovered through excavation. Thus, there remains the potential for more features to be discovered both within and south of the hedge. Therefore, it is recommended that any construction or demolition within the hedge that will disturb the soil be accompanied by archaeological monitoring.

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Appendix A: Aritfact Catalog