GREENE FARM ARCHAEOLOGY PROJECT
Warwick, Rhode Island

FIELD REPORT – 2006-07

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INTRODUCTION
GREENE FARM ARCHAEOLOGY PROJECT – 2006

Krysta Ryzewski

The 2006 Greene Farm field season involved six weeks of extensive archaeology and produced a remarkable collection of material and data, which kept the project archaeologists busy in the labs during the 2006-07 academic year. The focuses of the 2006 season were more concentrated than the previous two seasons, with excavations occurring only in the Bog Garden and Old House areas. With a field crew ranging in size from 12-15 participants, the excavation goals were successfully completed.

Bog Garden / Ironworking Area

In 2005 excavations in the Bog Garden confirmed the existence of an ironworking feature, interpreted at the time as an iron bloomery dating to the colonial period. The goals of the 2006 survey and excavations in this area were to establish the spatial extent of the ironworking feature and uncover any additional features associated with the features located in 2005 (e.g. the tuyeres, slag dump, or architectural material). In contrast to the dense Old House artifactual deposits, the ironworking area in the Bog Garden yielded a significantly lower quantity of material. Though not a considerable material deposit, the reasonable quantity of industrial and household artifacts found in the Bog Garden constitutes an important record of early industrial activity in colonial Rhode Island. The most convincing evidence of ironworking in the Bog Garden was found in the feature's stratigraphy, which clearly displays the process of working with natural resources (bog ore, charcoal, etc.), the importance of landscape and environment to industrial activity, and the layout of the industrial operations. A rigorous sampling strategy produced a thorough understanding of the ironworking area's stratigraphy both internally and externally, in relation to that of the surrounding West Yard. This understanding allowed archaeologists to determine the spatial extent of the ironworking operation; the extant ironworking area's stratigraphy covers an area of at least 140m². The size of the area indicates that the ironworking activities in the area were broader in scale than initially anticipated, and also indicates that the nature of ironworking occurring during the colonial period at Greene Farm was not just a one-time experimental operation. The absence of standing structures or large, intact features around the

ironworking area is due to centuries of disturbance, landscaping, and filling in the immediate areas.

The goals of the 2006 Bog Garden excavations were met and there will be no further excavations in the area. Instead, the focuses of the Bog Garden analyses have shifted to landscape, materials, and artifact analyses. Current and future efforts to understand the type and processes of ironworking in this area involve detailed stratigraphic analyses, geophysical testing, landscape modeling, and metallurgical analyses, in addition to traditional artifact, historical, and archival research. Through this comprehensive range of transdisciplinary approaches, we aim to produce a highly detailed account of the Greene Farm colonial ironworking operations.

Old House

In the Old House area the primary objectives were to determine the extent of the 17th century midden and to locate and confirm the existence of a substantial 17th century structure - the "Old House" - adjacent to the midden deposit. The first objective was accomplished with an intensive surveying strategy and wider excavation units designed to sample the midden material. The second objective was met, but to a degree that far exceeded our original estimations. A combined series of shovel test surveys and large excavation units not only confirmed the existence of at least one 17th century domestic structure, but also located additional architectural features (possible outbuildings, additions, a stone end and/or chimney) that extend over an area at least 60m². While the archaeology yielded much valuable data, the Old House area can now be recognized as occupying a much more significant spatial area than previously thought. The area's value as a relatively undisturbed 17th century deposit is outstanding, and several seasons of future excavations will be necessary to understand the full extent and composition of the Old Hosue. Ultimately, the quality of the Old House data and materials will undoubtedly spur many studies and nuanced insights into life in colonial Rhode Island.

Lab Analyses

Throughout the academic year all artifacts were cataloged and researched in the Brown laboratory, with Kaitlin Deslatte processing the majority of the Old House

material, Krysta Ryzewski researching the Bog Garden data, and Ninian Stein dedicating her efforts to managing the artifact database, which is nearly complete with over 10,000 entries. These database entries record all of the artifacts excavated during the 2004-06 field seasons. The current number of artifacts collected to date totals approximately 80,000. The artifacts remain for study and storage in the Brown University archaeology laboratories, where any interested scholars are welcome to learn from or work with them.

Collaborations

With a confident grasp on the identity and extent of the Bog Garden and Old House areas, we have involved GFAP with complementary and experimental modes of research from within and outside of our discipline. Ninian Stein successfully integrated GFAP into her Environmental Studies course at Brown, and we continue to collaborate with geophysicists from Brown University's Environmental Geophysics Group, metallurgists from Yale University's Department of Geology, and filmmaker Lee Fearnside in the recording of her creative documentary "Telling Stories".

Dissemination

Wiki / Website

The most exciting addition to the Greene Farm Archaeology Project this past year was the creation of a wiki via Brown's Joukowsky Institute of Archaeology and the Ancient World (see: http://proteus.brown.edu/greenefarm/Home). The wiki is identical to a website, but allows the added option for multiple editors to participate in editing content and posting comments on the page(s). GFAP is the first archaeology project to use a wiki throughout the course of excavations and analyses. The wiki is designed and maintained by Krysta Ryzewski, and contains detailed information about all aspects of GFAP. Information about many of the features and finds not discussed in detail within this report appears in various formats on the wiki (including the artifact database to date). The increased visibility of Greene Farm on the internet has been instrumental in gaining support from our colleagues in and outside of our immediate discipline(s).

Publications and Presentations

As a result of the many collaborations, independent research, and new online publishing options, several members and collaborators of GFAP have presented several papers and talks this year. Though many publications are forthcoming from the field reports, conference papers, and research projects, a few were completed over the past year. Below is a list of publications and presentations related to GFAP that were completed in 2006-07.

- Creative Documentation and Archaeological Practice: Surveying Archaeologists on Film, Krysta Ryzewski, *Archaeolog,* April 22, 2007.

- '"Telling Stories": When Archaeology meets Art'. Lee Fearnside and Krysta Ryzewski, CHAT – Contemporary Historical Archaeology Theory Conference, Bristol, UK, November 2006.

- "Dodging the Wrecking Ball: Combining Archaeology and Environmental History to Preserve a Factory, Forest and Farm in Southern New England." by Ninian Stein, American Anthropology Association, San Jose, CA, November 2006.

- An Introduction to Faunal Analysis: The Greene Farm Site, Stephanie Minor, May 2006. Independent Study Research Paper, Brown University, Department of Anthropology.

- "Factory, Forest and Farm: Combining Land Use History and Archaeology in New England." by Ninian Stein, American Society for Environmental History, Minneapolis, MN, March 2006.

- "Rebels with a Cause: The Greenes in 17th century Rhode Island." Poster by Kaitlin Deslatte, Krysta Ryzewski, and Randi Scott, Society for American Archaeology (SAA), Annual Meeting in San Juan, Puerto Rico. April 27, 2006.

All of these references are posted on the GFAP website, and we expect many additions in the near future.

GFAP 2006 Old House Report

Kaitlin Deslatte

Introduction

The 2006 field season in the Old House area was very productive. We discovered many features and collected large quantities of material. The most rewarding accomplishment was the successful location of a 17th-century wall, which is likely from the "Old House" or another associated outbuilding. Also, several dozen intriguing 17th-century artifacts were excavated from the various features of the Old House. This report discusses the preliminary interpretation of the Old House features.

Methodology and Findings

From our discovery of the architectural and midden features during the 2005 field season, we were able to devise a systematic plan to locate and collect additional information about the Old House area. The survey plan followed four grid lines along which 50x50cm STPs were excavated at 4m intervals. The design of this survey plan allowed for the successful determination of the extents of the midden and architectural features. Two of the survey lines ran East to West on the South 68 axis and South 76 axis, while the other two lines ran North to South on the East 80 axis and East 90 axis, together creating a "tic-tac-toe" shaped survey grid (Figure 1). Unfortunately, we were not able to align our 2006 survey grid on the same due North directional grid system as assigned in the past field seasons. Due to the poor conditions of the open 2005 units, we could only establish a survey grid that was off 10 degrees North by West. These new directions North at 350, East at 80, South at 170 and West at 260 were implemented as the standard grid system for the Old House area.

Once the features were identified from the excavated STPs, thirteen larger test units were positioned within the area to explore our findings in greater detail. The thirteen units varied in size from 2x2m, 1x2m, and 1x1m excavation units. All soil was screened through 1/4" mesh until features were identified and then the feature soil was screened in 1/8" mesh. From the fifty STPs along the survey grids, we recorded eleven archaeological features. These features are labeled by a double letter alphabetical

designation (ex. Feature AA). Five of these features were considered to be especially significant, and larger excavation units were placed on these features. The majority of these features were architectural in nature with the exception of the midden. These features were comprised mostly of stone, brick, and mortar, though they also included typical artifacts such as ceramics, pipes, glass, nails, bones, and shells. The four architectural features were the "brick pile", "chinking stone area", the "cellar", and the "wall" (Figure 2).

Figure 1: Old House 2006 Survey Grid Lines: S68 in **Red**; S76 in **Blue**; E80 in **Yellow**; E92 in **Green.**

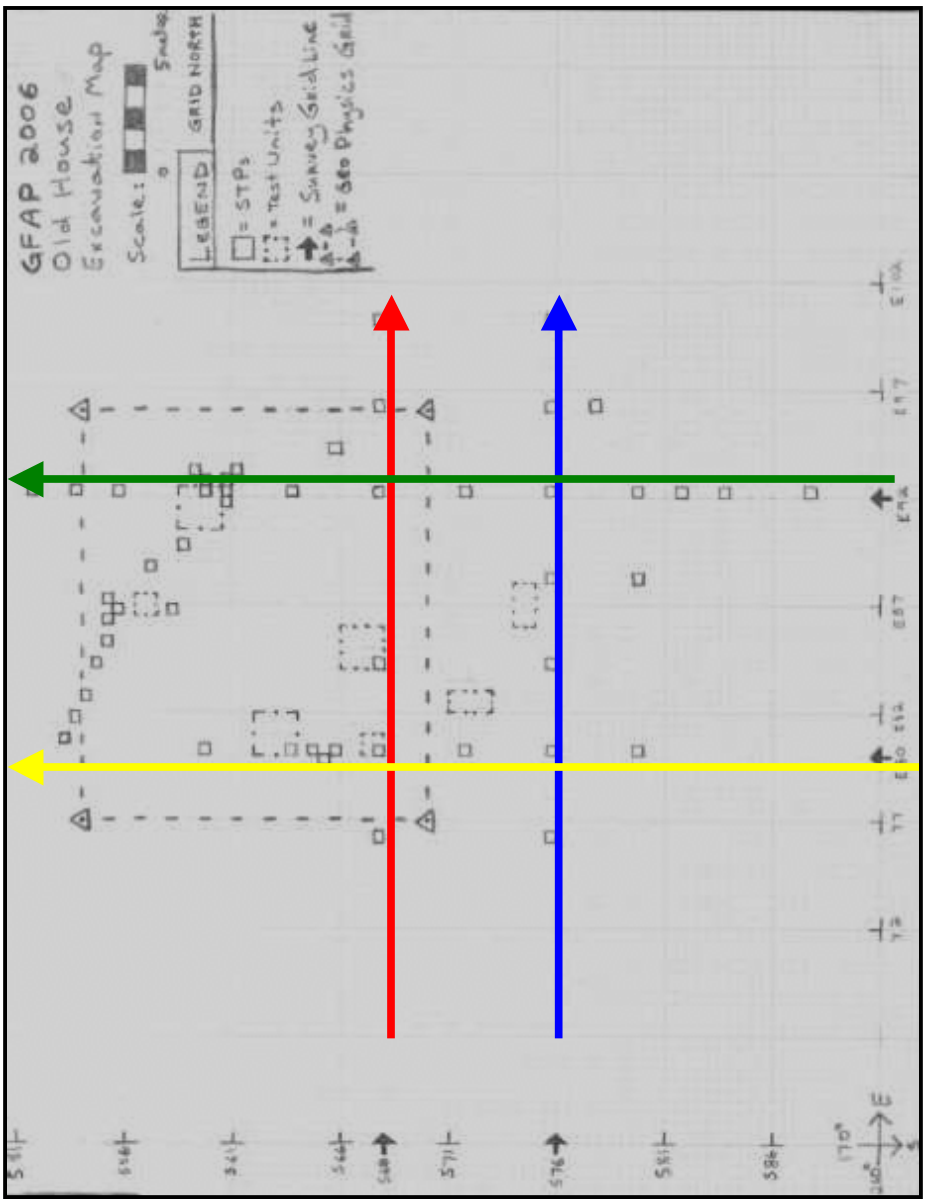
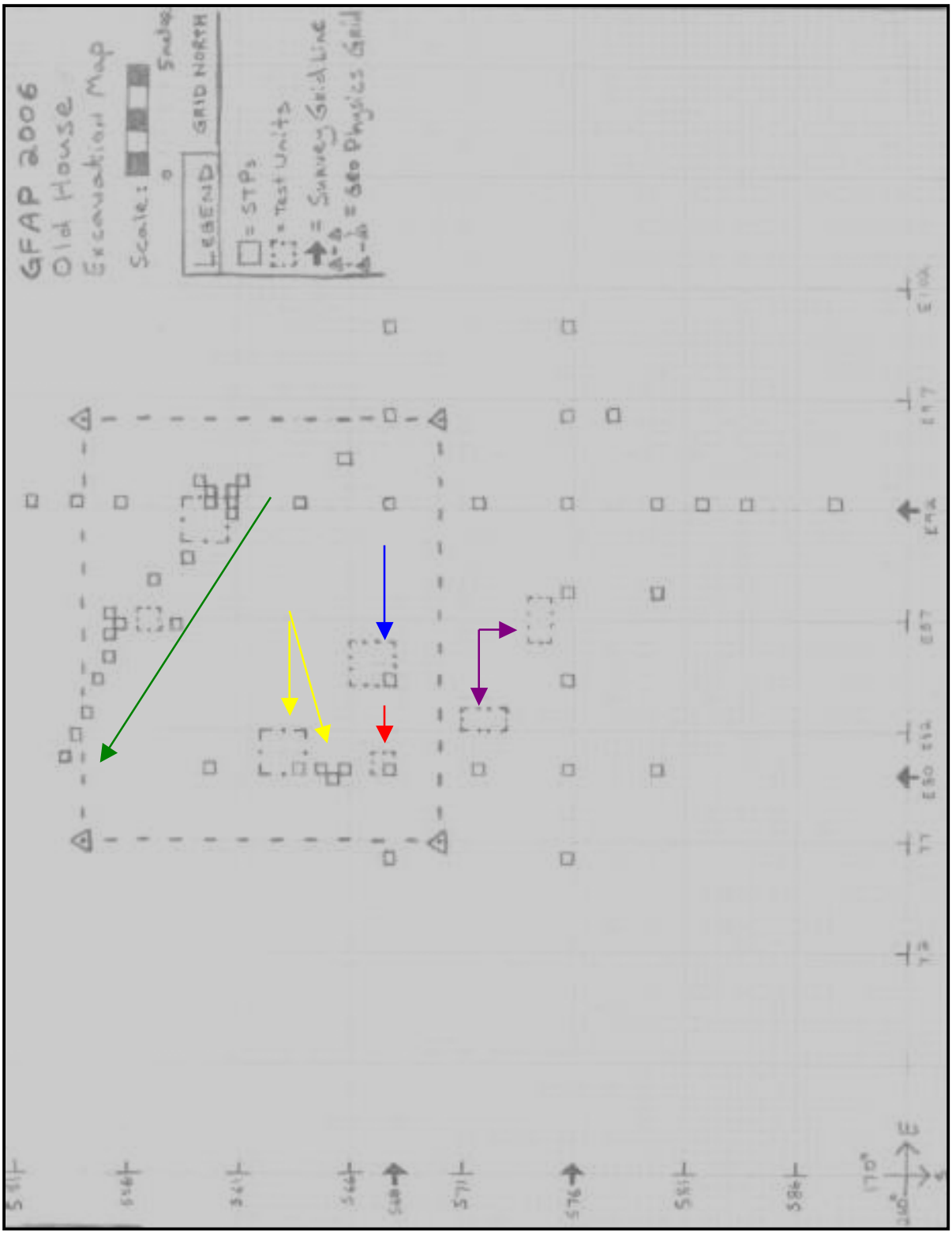


Figure 2: Old House 2006 excavation feature areas: **Green** = Wall Area; **Blue** = Cellar Area; **Yellow** = Chinking Stone Area; **Red** = Brick Pile Area; **Purple** = Midden Area.



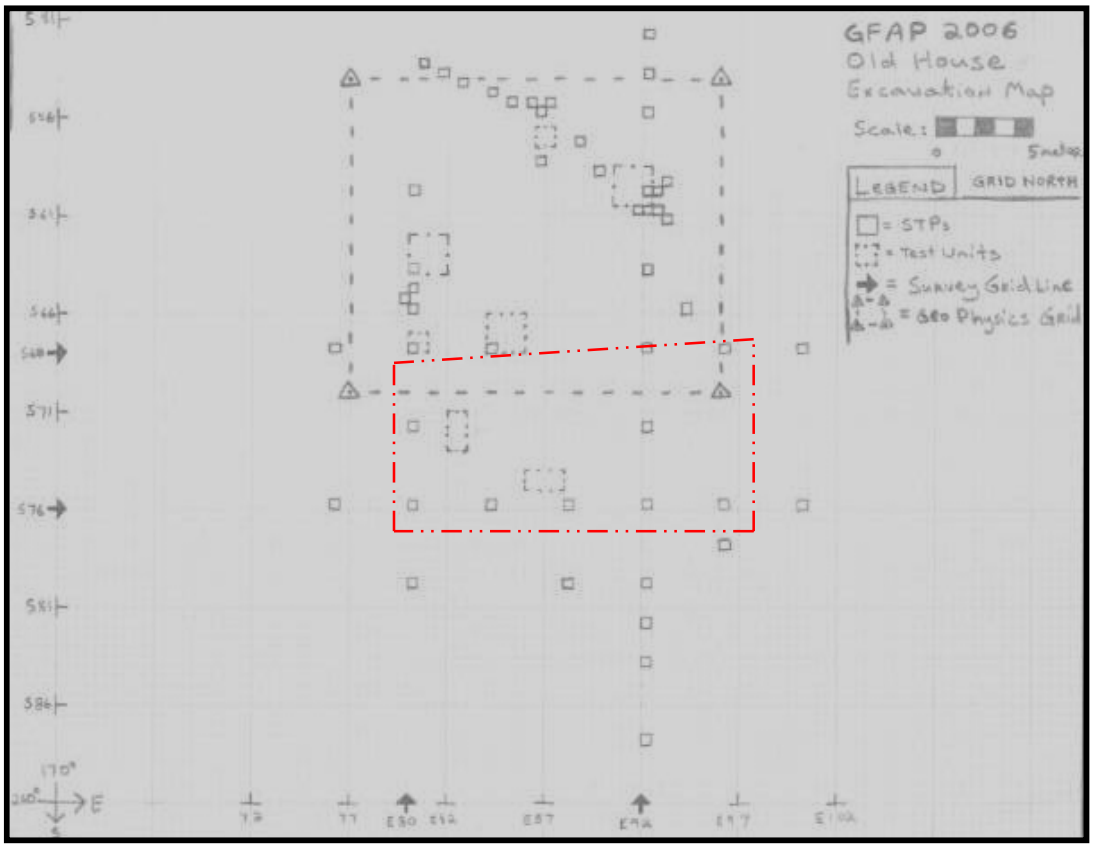
Below lists a brief description and interpretation of the four excavated features:

- The "brick pile" or Feature CC was excavated as a single 1x1m unit. It was a shallow 35cm subsurface feature which had brick and stone rubble spread across the entire unit. An iron key was recovered from this unit and was labeled as a special find. The large quantity of brick could suggest a possible hearth area. The rubble was left *in situ* for further investigation in 2007.
- The "chinking stone area" or Feature DD was excavated in four conjoined 1x1m units. They reached an approximate depth of 40cm and yielded several interesting artifacts such as a copper button, hand forged wrought nail, small quartz projectile point, copper thimble, and a pipe bowl fragment with a daisy motif. The uncovered chinking stones were mortared together forming a possible wall. This feature spreads southward in the direction to the "brick pile" as investigated by three STPs positioned between those featured 1x1m units.
- The "cellar" or Feature II was excavated in a single 2x2m unit. There was a lot of architectural debris consisting of stones, mortar, and brick scattered throughout the entire unit, but this feature was concentrated exclusively in the northern half of the unit. The cellar pit was obvious in the north wall profile as it was heavily filled in with architectural debris. It appeared that this feature continued in a northwesterly direction and portions in the northwestern corner were left *in situ* for exploration in 2007. Some of the special finds that were excavated from this unit include a polished ivory tusk fragment and copper thimble.
- The "wall" or Feature BB was excavated in a series of 1x1m units and STPs. There was a group of four conjoined 1x1m units that created the initial center of exploration for the stone wall. This building foundation feature appeared at a depth of approximately 35cm. From that 2x2m area, seventeen STPs were positioned in a northwesterly direction to trace out the wall's path. These STPs were excavated as quadrants of 1x1m units along the established Old House grid. From this investigation we were able to determine the width and length of the wall, but unfortunately we were unable to define corners. It appears that the stone wall is 60cm wide and runs approximately at 310 degrees for 11m. The

excavations here also yielded a few special finds: iron scissors, English gun flint, pipe bowl with initials "RT", and iron ox shoe.

The fifth feature that was excavated during this field season was the 17th-century midden. From surveying the fifty STPs, we were able to delineate this feature's boundaries. The midden is located to the south and down slope from the other identified architectural features of the Old House. Our calculations from artifact and stratigraphic analysis approximate the midden to be 20m running east/west by 12m running north/south, totaling approximately 240m² (Figure 3).

Figure 3: Old House Midden Approximate Boundaries – marked in red.



Once the boundaries were established, larger test units measuring of 1x2m were positioned within the midden to sample its material. The excavations from the ten STPs within midden deposit and the two 1x2m units collected an impressive array of artifacts. This sample collection along with previous excavation samples within the midden

boundaries is the current research focus of a master's thesis. Though this research is not yet complete, most of the analysis is finished and a short discussion of those results will follow below.

Midden

The stratigraphy of the midden consisted of 3 strata. The first two layers (Strata 1 and 2) contained the midden deposit, while the third layer was sterile soil. The depth of the first stratum was approximately 20cm and the second stratum measured about 25cm. Through ceramic analysis, it was determined that the upper layer of midden was a disturbed context of mixed 17th-century and 19th-century materials as the lower layer was a sealed stratum of only 17th-century artifacts.

The practice of spreading trash in a wide scatter (or sheet midden) was a typical practice in the 17th-century. This concept and process coincided with our midden findings. The mixing of material in the upper layer can be explained through the archaeological record as well as by family oral history. The law of superposition designates that whichever stratum is lower was placed there first and therefore is older. With this in mind, the original sheet midden context would have been approximately 50cm in depth, until an episode in the late 19th-century mixed parts of that period's material within the 17th-century midden feature. The current landowner recalled how her grandmother, who was born in 1869, played in the ruins of the old house until the age of seven when the family decided to fill in the area for concerns of the children's safety. This information explained why a small amount of creamware and pearlware sherds were found along side North Devon ware and tin-glaze earthenware fragments in that upper layer. The Brown family covered up any remaining ruins of the Greene family's original homestead on Occuppesuatuxet Cove in 1876 or 1877.

Midden Material

Even though the upper midden stratum was a mixed deposit, the artifacts from it were temporally distinct and therefore allowed detailed research of the 17th-century Greene occupation in that stratum as well as in the lower undisturbed layer of 17th-century material. The Greene family-related artifacts are especially interesting. The

artifact assemblage is rich in ceramics, pipes, and special finds. These recovered artifacts represent only a minimal sample from the Greene's midden, but still speak enormously about the early colonial life of Rhode Island.

~Ceramics~

There were only five types of ceramics recovered from the undisturbed Greene family occupation strata: Redware (399), Stoneware (3), North Devon ware (46), Tin-glazed ware (48) and Unidentified (28). From the four identifiable ceramic types, a minimum of 32 vessels were positively recognized out of the total 496 sherds (Figures 4 & 5, Appendix A).

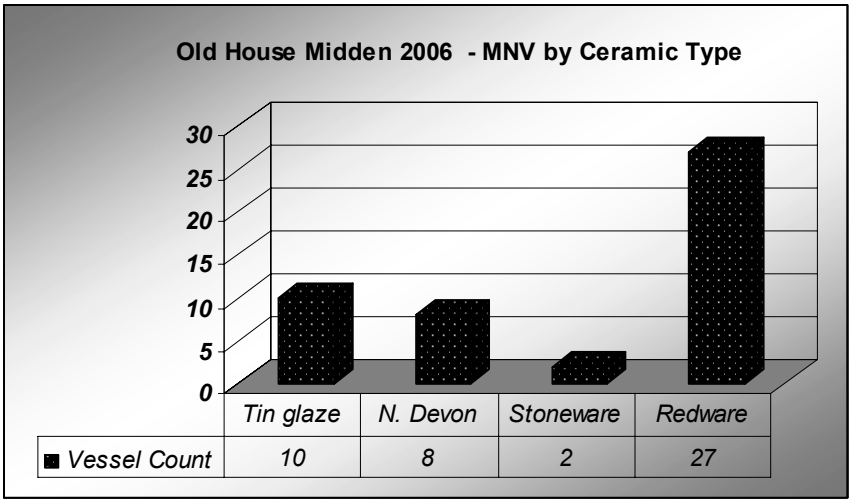


Figure 4.

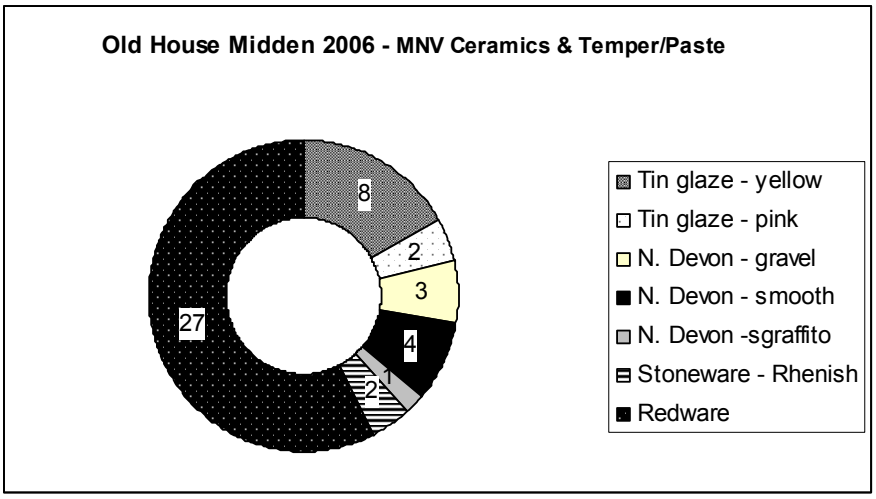


Figure 5.

The majority of vessel types were in the form of hollowares with exception of the tin-glazed sherds that were mostly identified as flatware. Some of these vessel forms include: Redware pipkin, bowls, and pans; North Devon pan and sgraffito jug (Figure 6); Stoneware bottle and jug (Figure 7); Tin-glazed ointment jar and soup plates (Figures 8 & 9).

Figure 6. North Devon sgrafitto jug.

Figure 7. Rhenish stoneware mug.

Figure 8. Tin glazed ointment jar.

Figure 9. Tin glazed soup plate sherds.

Redwares were utilitarian in nature and were used everyday, so it was logical that this type dominated the ceramic assemblage. Tin-glazed wares, on the other hand, were not just utilitarian, but were genteel. Here notions of the Greene's prominence and status during the early colonial period can be seen. Another interesting ceramic type was the North Devon sherds. This pottery was manufactured in the southwest area of England; a place that was also the origin of the Greene family and would have created a sentimental value for these vessels. Considering that that both the tin-glaze and North Devon sherd count totals were about the same, these two types of wares could have shared a similar importance value to the family.

~Pipes~

Next to ceramics, white clay pipe fragments were the other large quantity artifacts collected from the midden. The total number of pipe fragments were 52; where 14 of them were bowls and 38 were stem pieces. From these 52 fragments, only 12 were decorated and of these 12, only 8 stems had diagnostic decorations. Some of these include: stamped initials, molded motifs, and roulette patterns (Figures 10 &11).

Figure 10. Pipe Stem with molded motif.

Figure 11. Pipe foot with EB stamped initals.

There were 4 different size bore holes among the pipe fragments: 5/64", 6/64", 7/64", and 8/64". The size 7 bore had the largest amount of fragments with 20, while size 8 was second with 9 fragments, then size 6 with 4 fragments and size 5 with 2 fragments. More analysis is needed in order to extract any other information on these pipes (Figures 12).

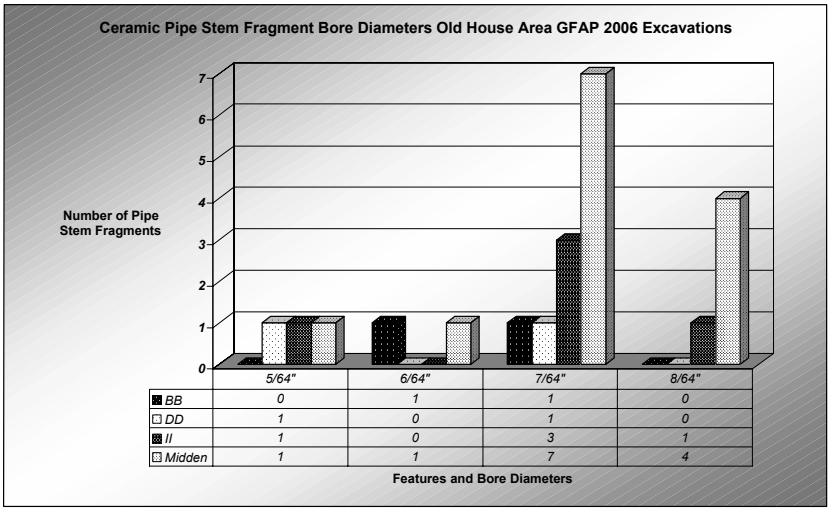


Figure 12.

~Special Finds~

These artifacts were considered special finds because they have qualities and characteristics that can further enhance our interpretations of Greene Farm. They provide supplementary information that could not be attained by the standard and popular ceramic or pipe analysis. This other data set consists of metals, lithics, and beads. The midden produced a few different types of metal items such as iron, lead, and copper. Iron objects were the most plentiful of the metal artifacts. In this midden assemblage, there are buckles, a fish hook, clothes latches, and a black glass button with iron back attachment (Figures 13 & 14). Archaeologists also recovered 2 fragments of lead window caming (Figure 15). The caming requires more analysis in that when the fragments are carefully opened, some may have the manufacturing date stamped inside and this could provide for an exact date of the construction for the original house. Archaeologists also collected 2 lead shot balls; one that is 8mm and another that is 5mm. Associated to the lead shots is a European gun flint that was also found in the midden (Figure 16). Some lithic debitage was collected and was composed of both Native American and European flint. Other Native American related items discovered in the 17th century midden were 5 tiny beads (Figure 17). Two were shell wampum beads; one is white and the other is purple. The other 3 beads are made of glass. Two are compound, tubular with unfinished ends that have been identified through the Kidd and Kidd typology as IIIa2 and Ib7. The third is an opaque black, round bead typed as IIa6. These beads are evidence of the trade between the Greenes and Native American groups both locally and across the Northeast. The final special find that was recovered from the midden was a carved bone handle and it is interpreted as use for a large utensil, most likely a knife (Figure 18).

Figure 13. Fish hook and lead shot

Figure 14. Clothes latch and button

Figure 15. Window caming

Figure 16. Gunflint

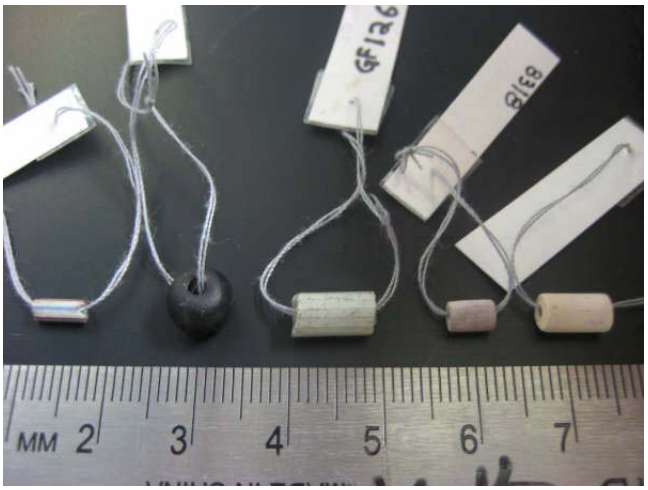


Figure 17. 17th century glass beads, white and purple wampum

Figure 18. Carved bone knife handle

Midden Conclusion

The artifacts recovered from the midden feature represent only a small percentage of what actually exists in this deposit's archaeological record. Yet, the midden has already provided our research with numerous data sets to analyze and many avenues for interpretations. The midden findings from the 2006 field season are only one aspect of the archaeology from the Old House area, but are unique because this sealed context contains the cultural remnants to some of the first Rhode Island colonists and offers new information on the colony's history during 17th-century.

Old House Area 2006 - Conclusions

The data and discussions presented in this report are merely preliminary. Though we had a successful field season, a full scale analysis and resulting interpretations of every unit and feature are still in the working stages. With such a small staff as ours at Greene Farm, we have still managed to complete the processing of the archaeological material of the Old House excavations. All of the Old House material has been cataloged, data based, bagged, and stored in our lab facility at Brown University.

The 2006 Old House area excavations were very productive, but as we answered some research questions, more seemed to arise. We discovered a 17th-century stone wall to a Greene family structure, but are unsure which direction the rest of the building is headed. We also uncovered several other architectural features that are structural in nature, but their function remains unclear. From this field season, the only components that our research can decisively conclude are the midden boundaries, its date, and its content. Additional research on all levels is necessary to our investigations at Greene Farm. With more research in the future, we will gather a better understanding of Rhode Island's colonial past.

GFAP 2006 -OLD HOUSE APPENDICES A-C.

APPENDIX A.

Table 1. Old House Midden Vessels (basic)

GFAP 2006 Old House Midden Vessels

Artifact ID	GF #	Type	Variety	Frag	Deco	Diag	N
318	286	tin glaze	Yellow	body	white	17thC	3
4869	268.03	tin glaze	Yellow	Rim	blue	17thC	1
5700	1501	tin glaze	Yellow	Base	n/a	17thC	1
5757	269.03	tin glaze	Yellow	Rim	white	17thC	1
6278	1525	tin glaze	Pink	Rim	blue	17thC	1
7073	1260	tin glaze	Yellow	Rim	n/a	17thC	1
8312	1484	tin glaze	Yellow	Rim	white	17thC	1
9277	1574	tin glaze	Pink	Rim	white	17thC	1
4799	268.07	N. Devon	Gravel	base/body	yellow	1675-1725	1
5803	271	N. Devon	Gravel	Rim	yellow	1675-1725	1
7037	1257	N. Devon	smooth	body	yellow	17thC	2
7067	1260	N. Devon	smooth	Base	yellow	17thC	2
7101	1262	N. Devon	Gravel	handle/body	yellow	1675-1725	1
9279	1574	N. Devon	sgraffito	body	yellow	1650-1700	1
9365	1602	N. Devon	Gravel	Base	yellow	1675-1725	1
8332	1484	stoneware	Rhenish	body	brown	1500-1700	1
4695	266.04	stoneware	Rhenish	Base	blue & purple	1650-1775	1
5785	270	redware		body	brown		1
7089	1263	redware		rim/body	clear		4
7105	1262	redware		rim/body	clear		6
7110	1264	redware		body	brown		1
7110	1264	redware		body	brown		1
8315	1484	redware		Rim	clear		1
8315	1484	redware		Rim	clear		1
9125	1553	redware		Rim	clear		1
9148	1556	redware		body	clear		2
9182	1565	redware		Rim	brown		2
9199	1571	redware		Base	n/a		1
9267	1574	redware		Rim	clear		2

9268	1574	redware	Rim	clear	2
9271	1574	redware	body	black	1
9351	1601	redware	rim	clear	1

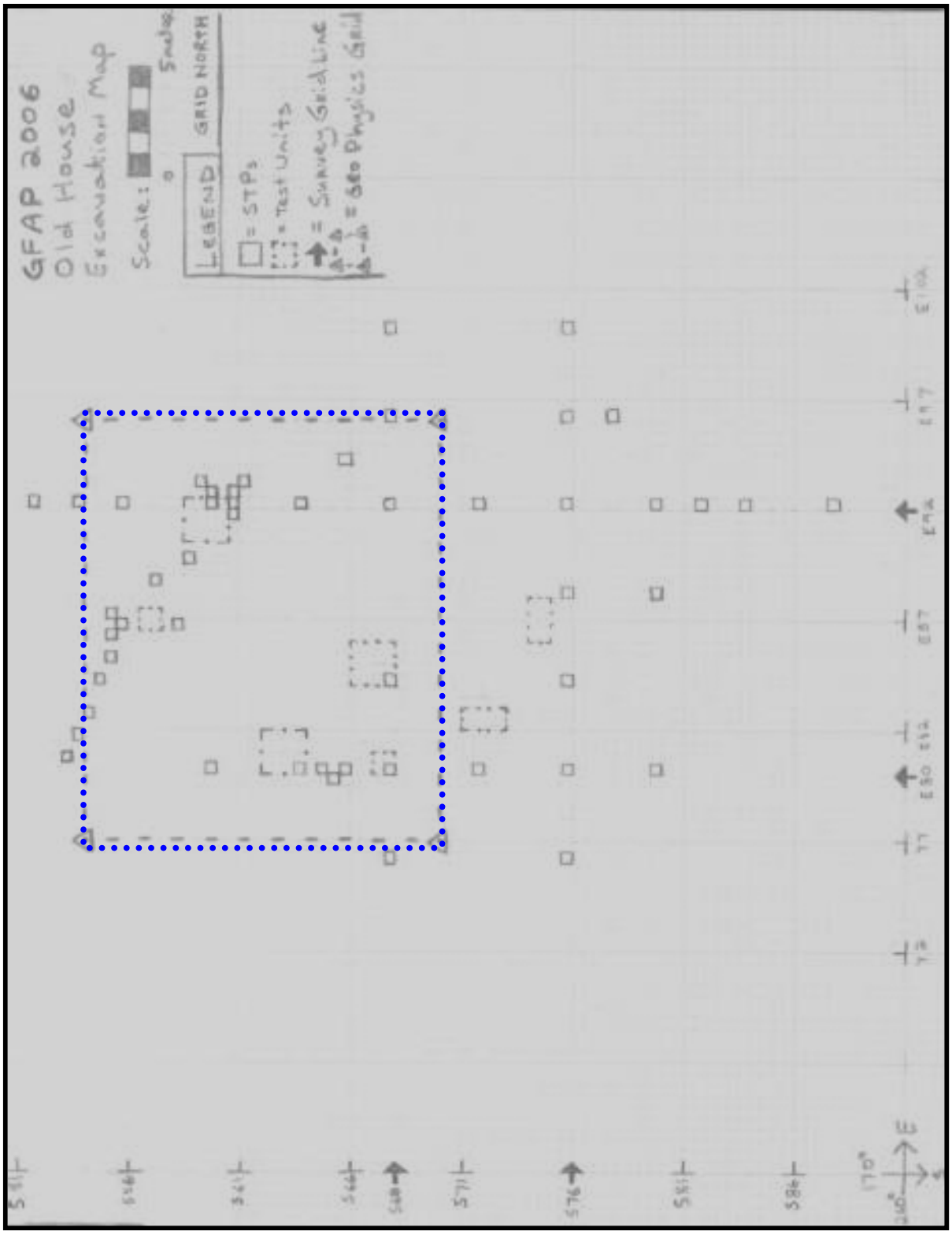
Table 2. Old House Midden 2006 (description information for same material as Table 1)

Remarks	Notes	Artifact ID
pierced porringer/colinder	halloware, UID	318
octagonal edges, scallop ridges	flatware, soup plate	4869
	halloware, ointment container/egg cup; diam: 4cm/1.574" @ 100%	5700
variation paste	flatware, plate/twiffler; diam 21cm/8.267" @ 5%	5757
poss French	flatware, saucer; diam 13cm/5.118" @ 5%	6278
	flatware, soup plate; diam: 22cm/8.661" @ 4%	7073
	flatware, plate-muffin; diam: 19cm/7480" @ 4%	8312
poss French, glz darker white	flatware, soup plate; diam: 19cm/7.480" @ 4%	9277
coarse int,unglazed ext,bod bellys out	halloware, pan; base diam17cm/6.692" @ 15%	4799
poss shoulder, large vessel	halloware, bowl (pan)/jar/; diam 21cm/8.267 @ 9%	5803
ribbed, upper portion of jug/pitcher	halloware, UID jug/pitcher; rib body diam 6cm/2.362" @ 20%	7037
	halloware, UID cup/small jug; base diam 10cm/3.937" @ 18%	7067
smooth int, brn slip on handle, burnish	halloware: porringer/handled pan; body diam: 17cm/6.692" @ 16%	7101
shoulder frag, incised lines	halloware, jug; diam 10cm/4" @ 14%	9279
coarse int, missing ext	halloware, IND	9365
brown ext, clear int, german jug	halloware, Bartman bottle (brown-frechen)	8332
mended 6272/6148, westerwald	halloware, jug/mug; diam: 9cm/3.543" @ 46%	4695
coarse glaze, brn int & ext, util food storage	halloware, jar; body diam 15cm/6" @ 20%	5785
appr orange, 1rim mend, 1 body line	halloware, tankard; diam: 7cm/2.755" @ 10%	7089
1rim ridge lip int/ext glazed, burnish brn ext	halloware, pan; diam 15cm/6" @ 8%	7105
coarse glaze, brn int, brn ext, util	halloware, Indeterminate; body diam: 21cm/8.267" @ 9%	7110
coarse glaze, brn int & ext, util	halloware, IND; body diam 21cm/8.267" @ 9%	7110
red slip, clear glaze	halloware, Indeterminate	8315
red slip, clear glaze	halloware, IND; too small diam	8315
appr brn int, burnish red ext	halloware, bowl; diam: 19cm/7.480" @ 12%	9125
mend, appr brn, burnished red est, util	halloware, milk pan; diam: 25cm/9.84" (at least) @ 12%	9148

int/ext glaze, burnished brn ext, lid edge	hware, pot (chamber/jar); diam 19cm/7.480" @ 10% mend9127	9182
burnished red ext	halloware, bowl/jar; diam 15cm/6" @ 18%	9199
mend, appr brn	halloware, IND - bowl; body diam: 6" @ 9%	9267
mend, app rbrn, white slip	halloware, bowl; diam: 14cm/5.511" @ 20%	9268
blk glazed int, no glaze ext, util	halloware, Indeterminate	9271
clear int, burnished red ext	halloware, pipkin (small cooking pot) diam: 9cm/3.543" @ 6%	9351

APPENDIX B.

Old House 2006 Geophysical Survey Grid 1 (in blue).


GFAP 2006
Old House
Excavation Map
Scale:
5 meters
0
LEGEND
GRID NORTH
= STPs
= Test Units
= Survey Grid Line
= 560 Physics Grid

APPENDIX C.

Table 3. Old House 2006 Excavation Unit List

Coordinates	*Unit/STP*	*Size*	*Association*	*Notes*
S52E92	stp	50x50cm	Negative Ft BB	SW quad
S53.5E80.5	stp	50x50cm	Feat BB	NE quad
S53.5E81.5	stp	50x50cm	Negative Ft BB	SW quad
S54.5E82.5	stp	50x50cm	Feat BB	SW quad
S54E92	stp	50x50cm	Negative Ft BB	SW quad
S55.5E83.5	stp	50x50cm	Feat BB	NE quad
S55.5E84.5	stp	50x50cm	Feat BB	SE quad
S55.5E85.5	stp	50x50cm	Feat BB	SE quad
S55.5E86.5	stp	50x50cm	Feat BB	SE quad
S56.5E86.5	stp	50x50cm	Negative Ft BB	NW quad
S56E92	stp	50x50cm	Negative Ft BB	SW quad
S57.5E86.5	unit	1x1m	Feat BB	
S57.5E88.5	stp	50x50cm	Feat BB	SW quad
S58.5E86.5	stp	50x50cm	Feat BB	SW quad
S59.5E89.5	stp	50x50cm	Feat BB	NW quad
S59.5E90.5	unit	1x1m	Feat BB	
S59.5E91.5	unit	1x1m	Feat BB	
S59.5E92.5	stp	50x50cm	Negative Ft BB	SE quad
S60.5E90.5	unit	1x1m	Feat BB	
S60.5E91.5	unit	1x1m	Feat BB	started as STP
S60.5E92.5	stp	50x50cm	Negative Ft BB	NW quad
S60E80	stp	50x50cm	Negative Feats	SW quad
S60E92	stp	50x50cm	Feat BB	NE quad of unit
S61.5E91.5	stp	50x50cm	Negative Ft BB	NW quad
S61.5E91.5	stp	50x50cm	Negative Ft BB	NE quad
S61.5E92.5	stp	50x50cm	Negative Ft BB	NW quad
S61.5E92.5	stp	50x50cm	Negative Ft BB	SE quad
S63E80	unit	1x1m	Feat DD	
S63E81	unit	1x1m	Feat DD	
S64E80	unit	1x1m	Feat DD	started as STP
S64E80	stp	50x50cm	Feat DD	SW quad of unit
S64E81	unit	1x1m	Feat DD	
S64E92	stp	50x50cm	Negative Feats	SW quad
S65E80	stp	50x50cm	Feat DD	SW quad of unit
S66E79	stp	50x50cm	Feat DD	NE quad of unit
S66E80	stp	50x50cm	Feat DD	SW quad of unit
S66E94	stp	50x50cm	Midden	SW quad
S68E100	stp	50x50cm	Negative Midden	SW quad

S68E76	stp	50x50cm	Negative Midden	SW quad
S68E80	unit	1x1m	Feat CC	started as STP
S68E80	stp	50x50cm	Feat CC	SW quad of unit
S68E84	unit	2x2m	Feat II	started as STP
S68E84	stp	50x50cm	Feat II	SW quad of unit
S68E92	stp	50x50cm	Midden	SW quad
S68E96	stp	50x50cm	Midden	SW quad
S72E80	stp	50x50cm	Midden	SW quad
S72E92	stp	50x50cm	Midden	SW quad
S73E82	unit	1x2m	Midden	
S75E86	unit	1x2m	Midden	
S76E100	stp	50x50cm	Negative Midden	SW quad
S76E76	stp	50x50cm	Negative Midden	SW quad
S76E80	stp	50x50cm	Midden	SW quad
S76E84	stp	50x50cm	Midden	SW quad
S76E88	stp	50x50cm	Midden	SW quad
S76E92	stp	50x50cm	Midden	SW quad
S76E96	stp	50x50cm	Midden	SW quad
S78E96	stp	50x50cm	Negative Midden	SW quad
S80E80	stp	50x50cm	Negative Midden	SW quad
S80E88	stp	50x50cm	Negative Midden	SW quad
S80E92	stp	50x50cm	Negative Midden	SW quad
S82E92	stp	50x50cm	Negative Midden	SW quad
S84E92	stp	50x50cm	Negative Midden	SW quad
S88E92	stp	50x50cm	Sterile	SW quad

Note: only units marked sterile were void of artifacts; while units marked negative had artifacts, but they were not associated to adjacent feature.

Sewing Utensils: Thimbles

Figure 1.

Two copper thimbles were found in Feature II (S68/E84) and in the second strata of Feature DD (S63/E81)**.** The thimbles are identical, measuring ½-inch diameter at the mouth. The first is badly cracked in two places, damage that may have happened after the thimble was deposited or before, being therefore the reason for its being thrown away. The other thimble has only a hairline crack and is in almost perfect condition. This thimble may give us insight into the deposition episode. As it is unlikely its owner would have thrown away a perfectly usable tool, we are able to propose that the site may have been abandoned quickly. The thimbles are typical of copper thimbles in use in the seventeenth and eighteenth centuries across the Anglo-Atlantic. Archaeologists in Maryland found an identical complete copper thimble from the servants' quarters of a seventeenth-century tobacco plantation at Compton in Calvert County.[1]

[1] Maryland Archaeological Conservation Laboratory "A Comparative Archaeological Study of Colonial Chesapeake Culture," http://www.chesapeakearchaeology.org/SiteSummaries/ComptonSummary.htm; King, Julia and James G. Gibb, "Gender, Activity Areas and Homelots in the 17th-Century Chesapeake Region," *Historical Archaeology* 25, no. 4: 109-31.

Sewing: Pin

Figure 2. Artifact #9547

In the same area and strata as the less-damaged thimble (DD: S64/E81), we found a brass straight pin with a round head. Pins, made of brass or iron, are often found at colonial sites. They were not only used in sewing, but also as accessories attaching collars and cuffs to clothing. Each pin was made by hand from drawn wire. Researchers at Plimouth Plantation speculate that pins found there were possibly made nearby in Massachusetts Bay Colony at Jencks blacksmith shop of the Saugus Ironworks, where evidence of wire drawing survives from circa 1647.[2]

Sewing: Scissors

[2] Goldstein, Kate, "Stitches in Time: Sewing in Plymouth Colony," http://www.plimoth.org/discover/colonial-life/sewing.php.

Figure 3. Artifact #9769

We also found other sewing utensils scattered about the site. In the second strata of Feature BB (S59.5/E90.5), along one wall of the Old House structure, we found the handle to a small pair of iron scissors (the circular end of the scissors measures 1-inch in diameter). If this wall turns out to be the northeastern wall of the structure, as we suspect, then the scissors are situated across the room or in another room of the structure than the other sewing utensils (pin and thimbles).

Clothing: Button

Figure 4. Artifact #9545

This button, found with most of the sewing items (DD: S64/E81, strata 2), is probably brass and is about ¾-inch diameter. Although small, it is very solid and in good state of preservation. It has a soldered loop on the back for attachment to clothing and it front surface curves inward with a slightly flanged edge. There is no decorative work at all on the button, which might be read as consistent with the plain clothing prescribed by strict Reform Protestant sects. The brass when polished and shiny, however, would have signified a wealthier or gentry status. Moreover, the buttons may have had decorative work on their surface at one point, which has been rubbed off over the years underground.

Clothing or Tackle: Buckle Tongue

Figure 5. Artifact #9941

This small (1.5 inches) buckle tongue is iron and was found in Feature II (S68/E84). Sometimes brass buckles used iron tongues. Fine clothing would not have had any iron buckle parts, but lower-class boots or belts may have. Harness tackle for horses, mules, or oxen also used iron buckles.

Accessories: Polished Ivory Tooth

Figure 6. Artifact # 10017

Also found in Feature II (S68/E84) was what appears to be a piece of bone with a polished and flaking white tip. The softly pointed ivory or enameled tip measures a little

more than an inch long and the brown "root" about 1.5 inches. As elk are the only animals in North America with ivory teeth, and their teeth are much smaller and not as elongated, this tooth does not come from a local land animal. It most closely resembles the teeth of a small whale (see Fig 7). Sperm whales have 20-26 pairs of cone-shaped teeth in their lower jaw. These were valued by Anglo-American sailors and Native Americans alike, who often carved "scrimshaw" designs on them or wore them strung on a necklace. In the winter, sperm whales concentrate off the coast of Cape Hatteras, but in spring the sperm whale population shifts north and is widespread throughout the central portion of the mid-Atlantic bight and the southern portion of Georges Bank. In summer, the distribution is similar but also includes the areas around the continental shelf south of New England. Sperm whale occurrence off New England is at its highest levels in the fall.[3] As traders and fishermen from New England spread over all these locations, fishing on the Banks and conducting business all along the eastern seaboard, including Nantucket, known for its access to whales from pre-contact periods, it is difficult to conjecture where the tooth originated.

Figure 7: An ancient fossilized sperm whale tooth from Chile, measuring 3.6 inches long. The teeth of today's sperm whale are the same, only lighter in color.

[3] NOAA, Office of Protected Resources, http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.htm; and Perrin, WF, Wursig, B, Thewissen JGM, eds. 2002. *Encyclopedia of Marine Mammals*, Academic Press.

An alternative explanation attributes the ivory tooth to an animal from Africa or Asia. While serving as lieutenant governor, Major John Greene issued privateering licenses to a number of Newport mariners who sailed to the coast of Africa and the Indian Ocean in the 1690s. Typically such seafarers brought home exotic gifts from distant lands, including ivory, to honor their patrons, and it is totally plausible that Greene received such exotica as ivory teeth from the local mariners he supported. In addition, the slave and ivory trades went hand-in-hand in Africa, and slaves in America are known to have worn ivory. If we determine that African slaves were present at Greene Farm in the 17th or early 18th century, it is plausible that ivory from Africa would have arrived either among the few personal adornments of enslaved Africans or acquired as part of this trade, and again, offered to Greene as a gift. Arguing against these explanations, however, is the small size of the tooth, which is much more consistent with the local sperm whale population and not African warthogs, elephants, or rhinoceros. It still may have been possible that an African or Native American, with a tradition of wearing ivory jewelry, was responsible for the tooth, as such adornments were uncommon among the English.

Recreation: Mouth Harp

Figure 8. Artifact #9679

We found the ring end of what is probably a copper mouth harp along the wall, of the structure (BB: S59.5/E91.5, strata 1). It measures about 1 inch across and is identical to a "mouth harp" found in a pre-1696 context in excavations at the Colony of Avalon, a 17th-century European settlement in coastal Newfoundland, Canada. Avalon was settled by the English from 1621 to 1696, and by the French from 1696 for the remainder of the colonial period. Also called a "Jew's harp" or a "jaw harp," this sort of portable musical instrument had been popular in Europe since the Middle Ages. But such a harp can be identified in Chinese art from over two millennia ago and is considered one of the oldest musical instruments known. The harp can produce only one note, but players can vary its tonal range by changing the shape of their mouth. As many reformed Protestant sects forbade making music or owning musical instruments, the appearance of this harp on the site of the Greene family, originally Gortonists, is of interest.[4] If the Gortonists shared

[4] Thomas Clarkson, 1806, A Portraiture of Quakerism**,** Taken from a View of the Education and Discipline, Social Manners, Civil and Political Economy, Religious Principles and Character, of the Society of Friends; Richard L. Greaves "Music at Puritan Oxford: A Footnote to Percy Scholes," The Musical Times, Vol. 110, No. 1511 (Jan. 1969), p. 26; Eggleston, Edward, "Scruples about psalm singing," in The Transit of Civilization from England to America in the Seventeenth Century, New York, D. Appleton & Co., 1901.

the Puritan and Quaker prohibition on musical instruments, then this harp probably belonged to a resident outsider or traveling visitor.

Trade: Wampum

Figure 9. Artifact #9543

A tiny purple wampum bead, called *wampumpeag* by northeastern Native Americans, appeared in the same area as the thimble and pin (DD: S64/E81, strata 2). It represents ordinary Native American currency made from quahog shells. Wampum was also owned and used by European settlers throughout the colonial period, but especially in the 17th century. This bead is another addition to Greene Farm's growing bead collection, which includes European glass beads as well as a white wampum bead. The purple beads were of greater value than the white beads.[5] While the coastal Narragansett Indians controlled wampum production in the area, we have yet to find any "wampum blanks" indicative of contemporary production at Greene Farm. Wampum was generally strung along hemp fibers or sinews of animal tendon.

Architectural Material: Padlocks

[5] Hammell, George R. "The Iroquois and the World's Rim: Speculations in Color, Culture, and Contact" *American Indian Quarterly* Fall (1992): 463; Scozzari, Lois, "The Significance of Wampum to Seventeenth-Century Indians in New England," *Connecticut Review*, reproduced on "World History Archives," http://www.hartford-hwp.com/archives/41/037.html#N11.

Figure 10. Artifact #10170

The first of two iron, heart-shaped padlock backs is 2.25 inches long x 1.75 inches wide (found in II: S68/E84); the second is 3.5 inches long x 2.5 inches wide. The second (found outside the features in S66/E94) has three prongs protruding from the back where the hasp and mechanism (now missing) attached. According to Noël Hume the heart-shaped padlock was showing up in America by the late 17th century.[6]

Skeleton Key

Figure 11. Artifact #9412

[6] *A Guide to Artifacts of Colonial America*, 1969, p. 250-51.

The iron key is complete, with head, shank, and blade being intact. It was found a few feet from the locks in the first strata of Feature CC (S68/ E84). The head is 1 ¾-inchs wide x ½-inch wide; it is a decorative heart-shape made of three loops. The shank is 2 inches long and balustered below the head. The blade is small (3/8 inch x ¼ inch). This artifact and the lock parts will be conserved, but since the fronts of the padlocks are missing, it will be difficult to determine if the key was associated with them.

Wrought Nail

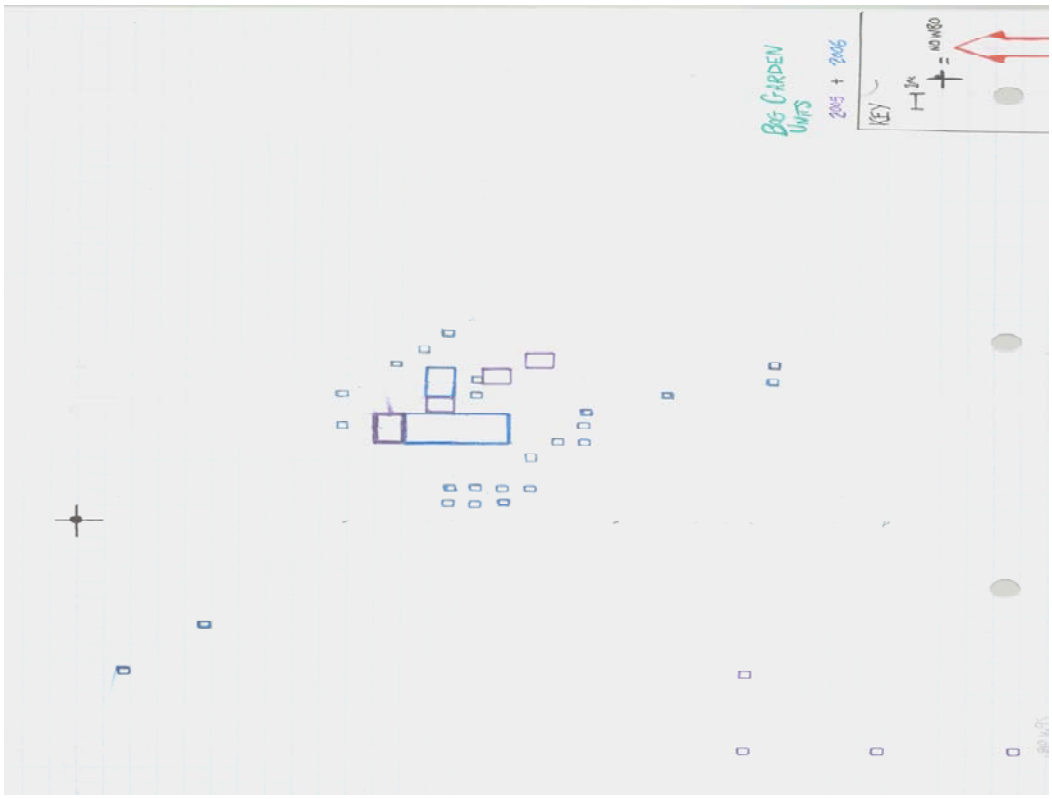
Figure 12. Artifact # 9548

In the second strata of the unit with the sewing materials and window lead was a perfectly conserved wrought iron nail (DD: S64/E81). It is 2 5/8 inches long, with a rose head and a spatula tip. It is perfectly black tinged with bright red, indicative of intense burning.

For more images and interpretations of Old House special finds, see the Material Culture link on the GFAP website: http://proteus.brown.edu/greenefarm/1713

Excavations during the 2006 field season uncovered an area equivalent to 17m² in the Bog Garden. The aim of the 2006 excavations was to document the extent of the ironworking features that were exposed during the 2004 and 2005 seasons. The 2005 excavations exposed a complex stratigraphy indicating that the area of the ironworking operation was much larger than expected.

Two methodologies were employed; large excavation units were opened adjacent to the possible tuyere features uncovered in 2005, and an intensive shovel testing survey aimed to delineate the extent of the remains of the ironworking area. Both approaches provided sufficient information that will allow for an accurate reconstruction of the ironworking feature(s).



Map 1. Bog Garden Excavation areas 2005 (purple) & 2006 (blue).

Excavation Units

Four excavation units were designed to focus on the central area of the ironworking feature. Two 2x2m units beginning along the southern walls of the 2005 units S12 W74 and S12 W75. The 2x2m units were designated according to the point of their southwest corners (S14 W75 and S16 W75). Each 2x2 was excavated separately, but when combined with the 2005 units, these units encompass a contiguous excavation area measuring 5x2m. The unit immediately south of the 2005 units, S14 W75, revealed the same complex stratigraphy as 2005 units S12 W75 and S12 W74, with the clay Strata 3a adjacent to the sandier Strata 3b, separated at the upper levels by an intrusive shallow feature, probably the remains of a 19th-20th century pipe trench (Figure 1).

Fig. 1 Facing south, units S12 W74, S12 W75 (foreground), S14 W75, and S16 W75. Unit S14 W75 contains clay Strata 3a on left, 3b in center, and 3c / Feature BB hard pan iron on right and extending across S16 W75. A tuyere remains within wall collapse and in clay Strata 3a, located in north wall of S14 W75.

Beginning at level 5, Strata 3b and a rust-colored Strata 3c disappeared and Feature BB began. Feature BB is a hardpan iron layer, above Feature CC, a gray ash layer, which sat above Feature EE, an even harder iron layer (Figure 2).

Fig. 2 West and south wall of S14 W75 showing Feature BB, hardpan rust colored iron layer above Feature CC, ash, above Feature EE, an impenetrable hardpan iron layer.

All of these features were virtually sterile, but it is important to note that the sequence of iron / ash / iron layers does not extend far westward or eastward from these units. Instead, to the west a hardpan iron level (equivalent to Feature BB) extends for an additional 4-5 meters, and eastward for about 10 meters. Thus, a hardpan and watertight iron surface encompasses an area of approximately 15m² within the immediate excavation unit area. Shovel testing results expand this area in size nearly tenfold. Also crucial to note is that Strata 3a, the clay level with embedded tuyere pipes, is adjacent to the hardpan iron and ash sequences, but does not at all contain any of these stratigraphic elements. Strata 3a also contained artifacts, but only the end of one additional tuyere. Strata 3a does continue slightly into the 2x2m unit S16 W75, in its northeast quadrant, but heads diagonally into the 2005 1x1m unit S14 W73 and towards the bottom of the Bog Garden and slag dump remnants. Strata 3a does not extend into the 1x2m unit S14 W72 immediately east of S14 W73. The 2x2m unit S16 W75 was not excavated beyond the exposure of Feature BB. The profile of unit S14 W75's southern wall exposed a homogeneous distribution of Feature BB, CC, and EE layers as well. An STP placed at the southern wall of S16 W75 confirmed the extent and depth of Feature CC, although the hardpan iron surface continued.

This 1x2m unit S14 W72 documented residual evidence of an architectural feature. A few pieces of wood planking were recovered, as was a similarly aligned row of bricks. These features were similar in nature to the material recovered from the 2005 1x1m unit S16 W71. Material analyses of the bricks from S16 W71 determined that they were exposed to high temperatures, probably repeatedly, as indicated by the glassy and slag-like exterior and melted interior. It is possible that the 2005 unit S16 W71 combined with the 2006 1x2m S14 W72 contain evidence of a support structure and/or bricks from a hearth or firing area. This is additionally supported by evidence of a charcoal/coal pile 1-2 meters north of the unit, as exposed in Feature CC in the northeast corner of S12 W74 and the south wall of STP S10 W72. A hardpan iron surface, Feature BB also exists at the lowest level of S14 W72 and S16 W71.

Shovel Testing Survey

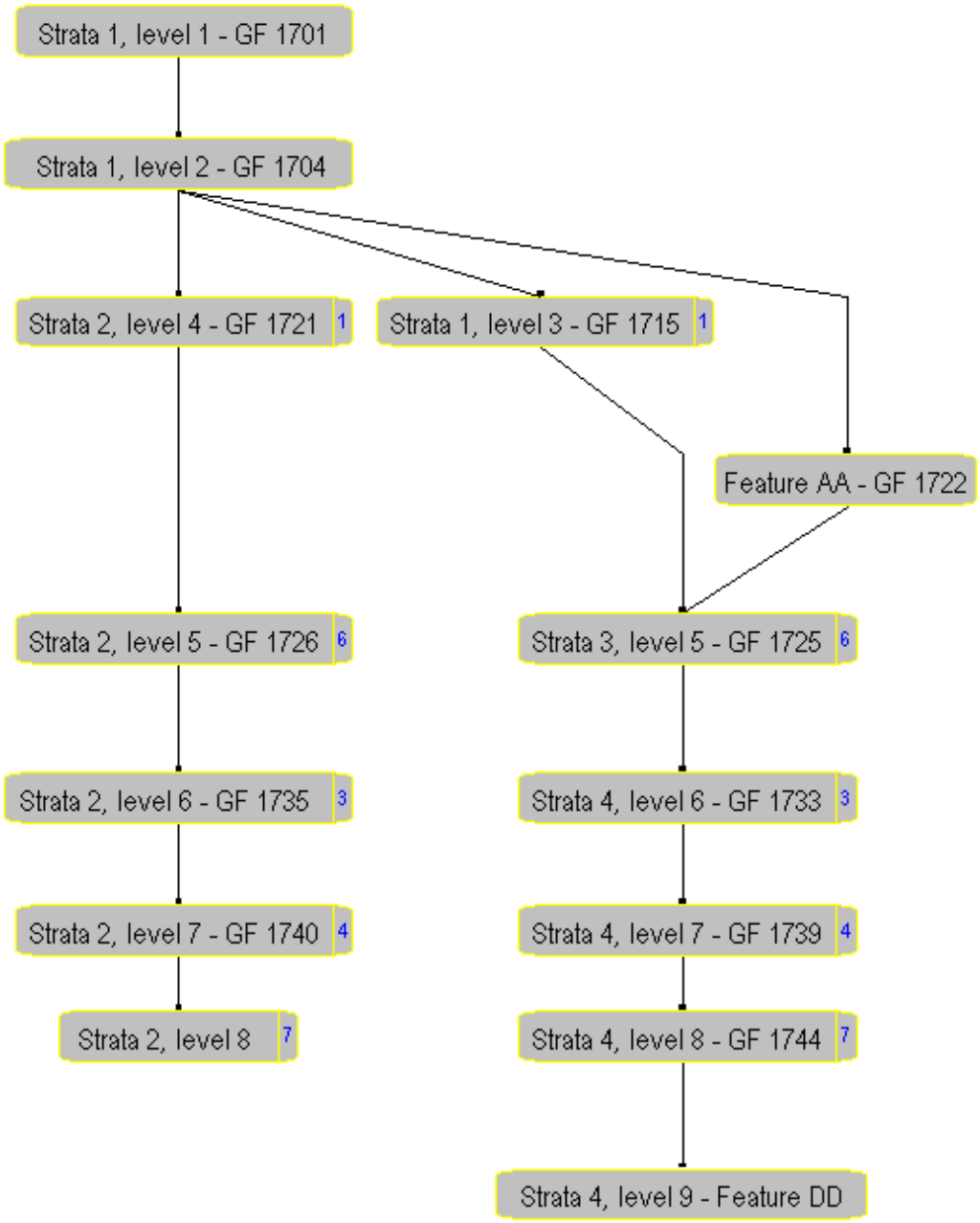
Twenty-seven shovel test pits were completed. The STPs began along the southern and western walls of the 2x2m units S14 W75 and S16 W75 and continued until the hardpan iron surface disappeared stratigraphically. This strategy effectively determined that the Feature BB hardpan iron surface extended at least 5 meters from the southern wall of S16 W75 and 5 meters from the west wall of S16 W75. If the hardpan iron surface is evidence of a water tight work surface, as has been interpreted to date, then this likely indicates the extent of the remaining work surface. Combined with evidence from the 2004 and 2005 excavations, it is also possible to estimate that the hardpan iron feature continues 10 meters easterly from the southwest corner of S16 W75, and 2 meters north of the southwest corner of S12 W74. The remaining hardpan iron feature BB therefore covers a known area of at least 10x14m or 140m².

Two shovel test pits were placed along the ridge adjacent to the re-routed stream and terraced edge of the West Yard in an attempt to locate any indication that waterpower was used to fuel the ironworking operation. These shovel test pits were not especially productive, as they were ridden with tree roots. Unfortunately, it will not be possible to further investigate this area archaeologically because of the heavy tree cover there.

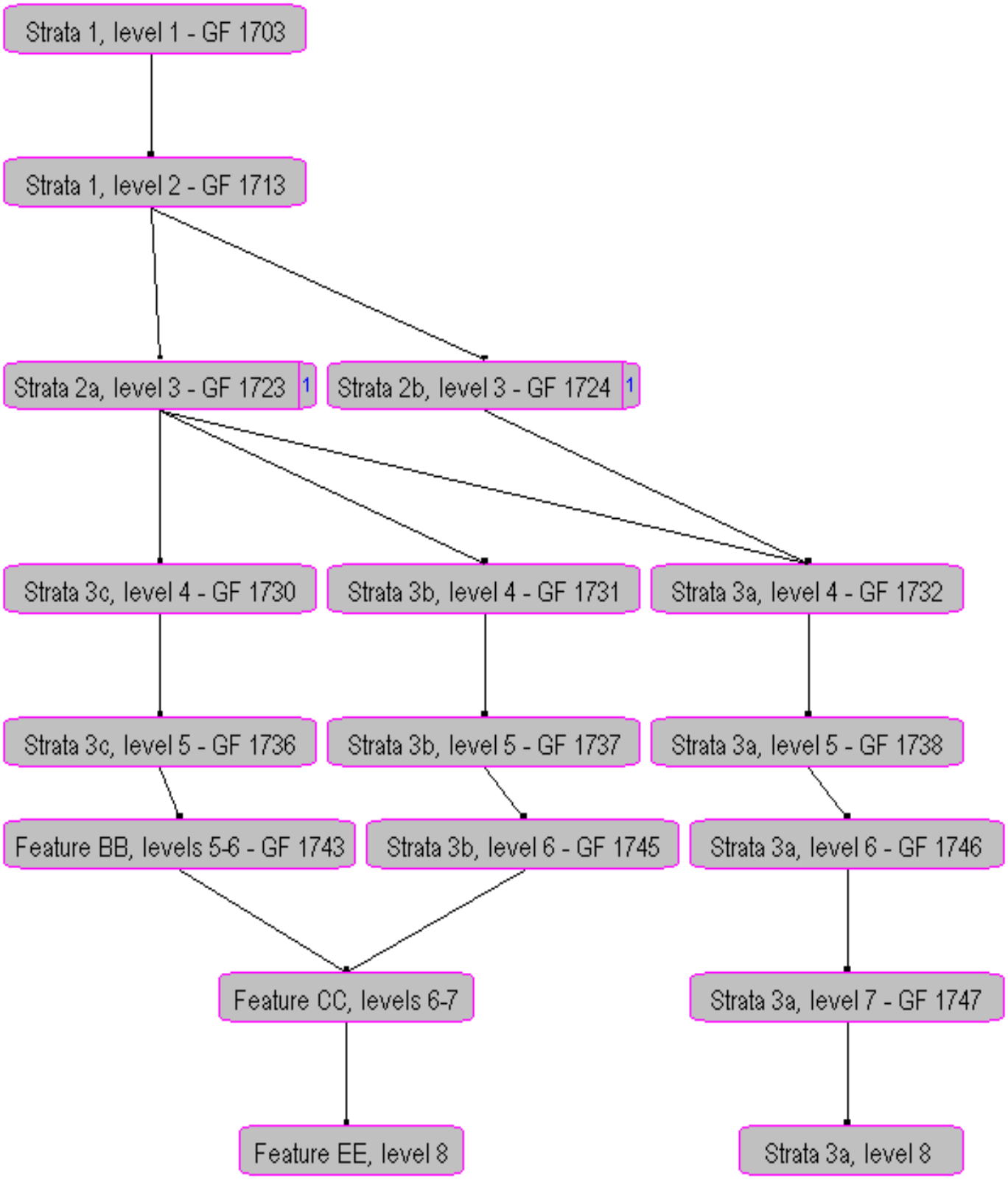
APPENDIX D. BOG GARDEN HARRIS MATRICES
From 2005 and 2006 Excavations

Krysta Ryzewski

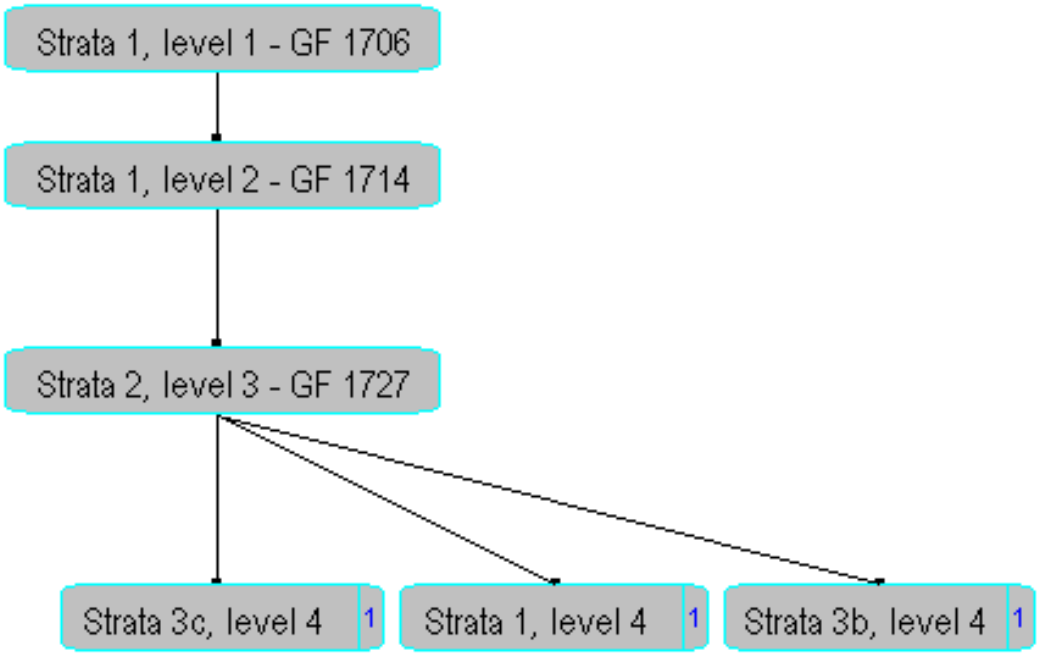
S14 W72 (2x1m) - 2006



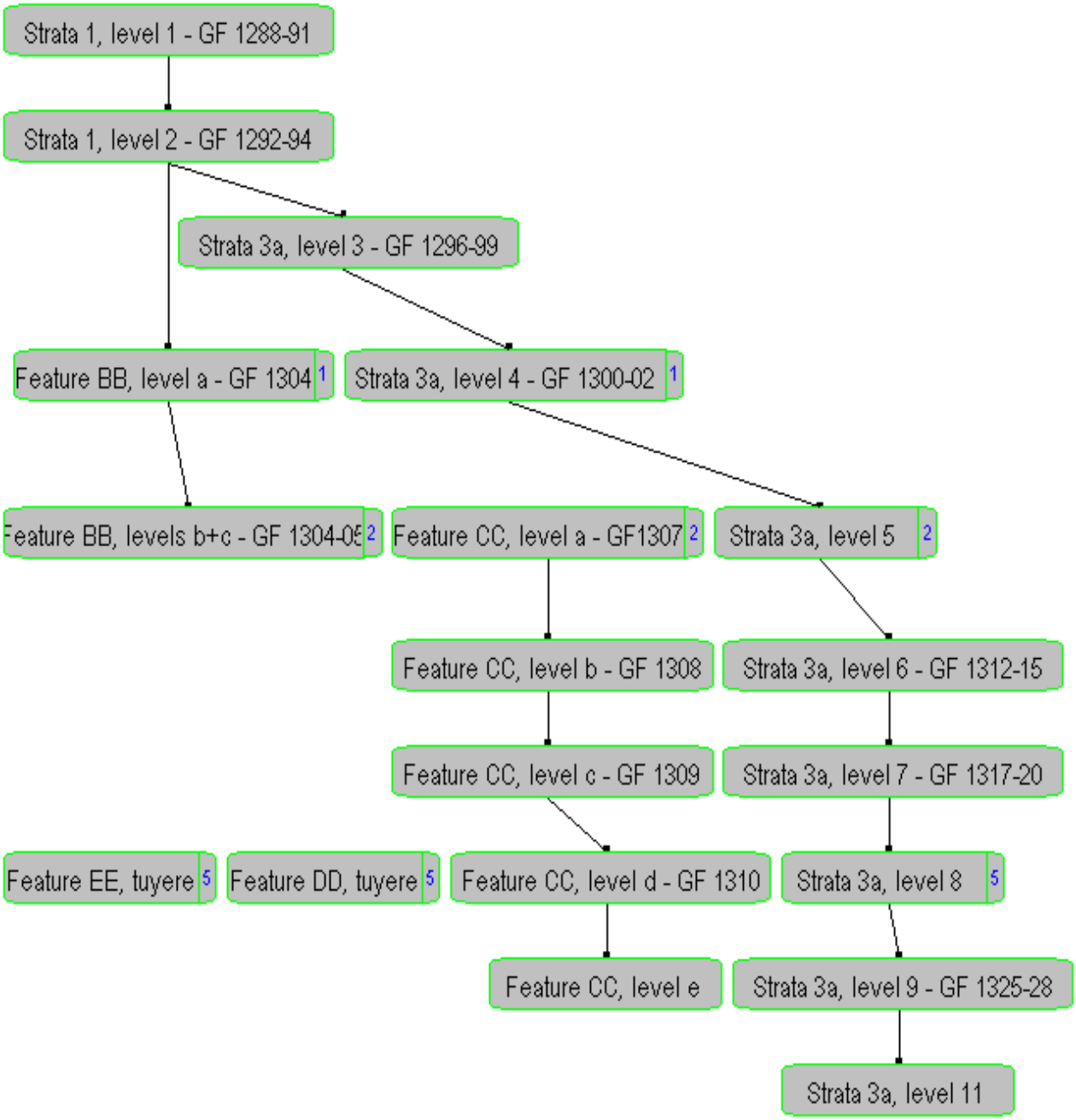
S14 W75 (2x2m) - 2006



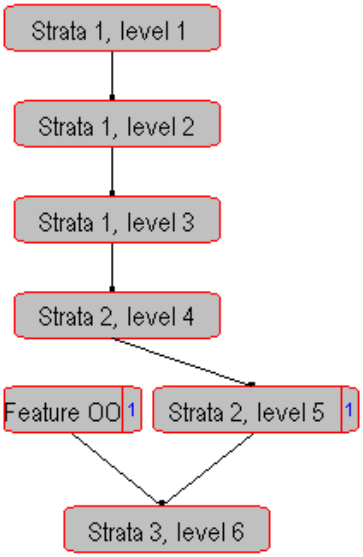
S16 W75 (2x2m) - 2006



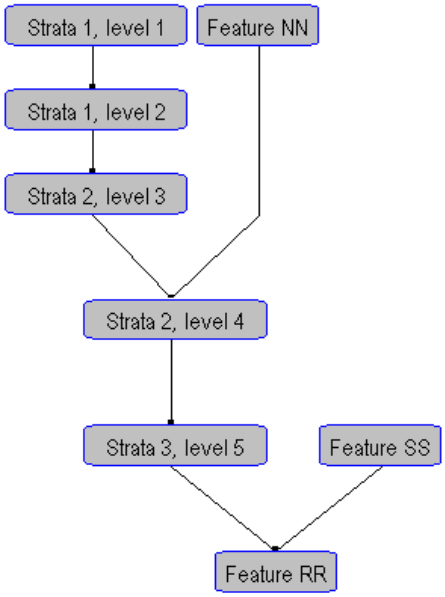
S12 W74 (1x1m) - 2005



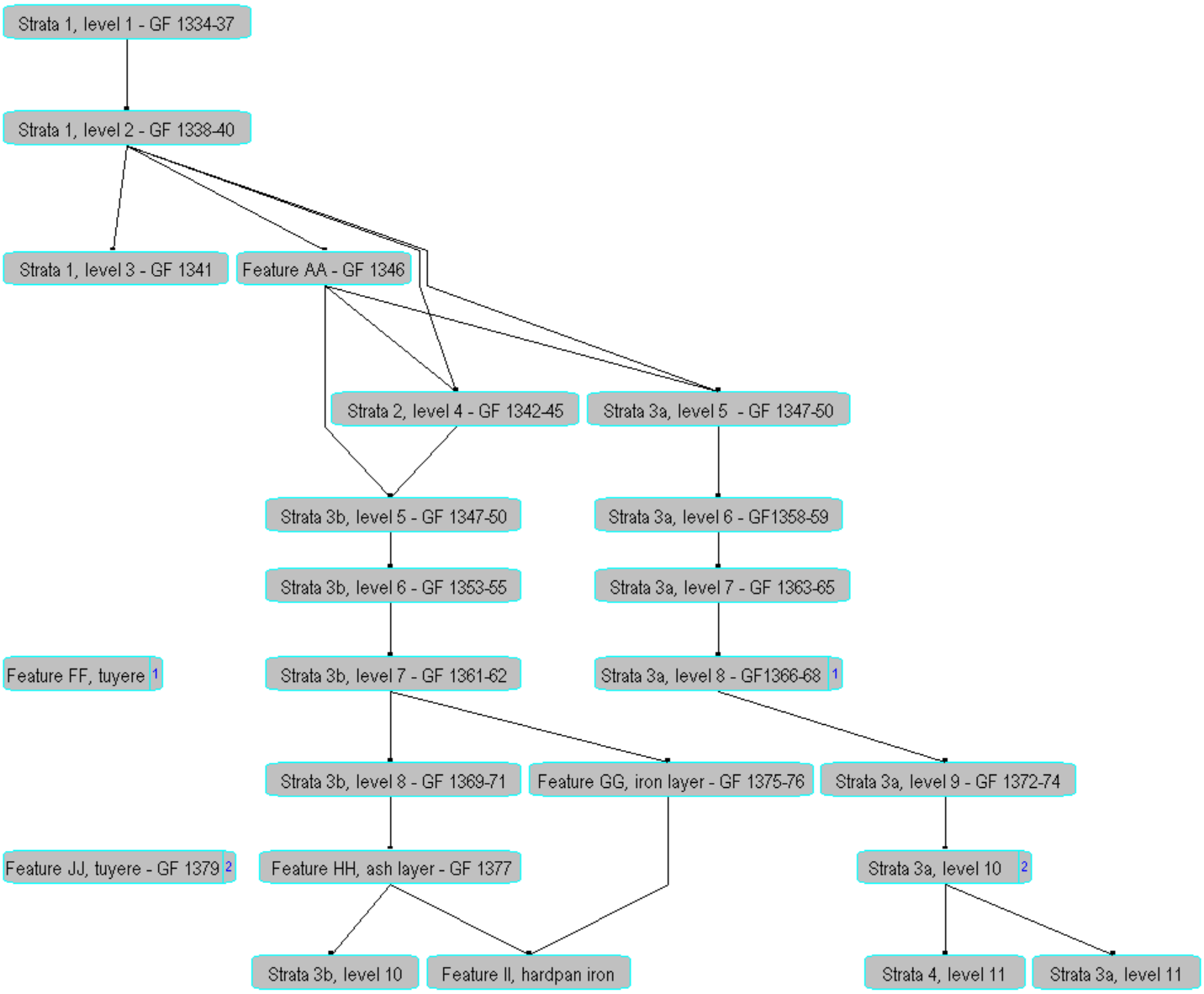
S16 W70 (1x1m) – 2005



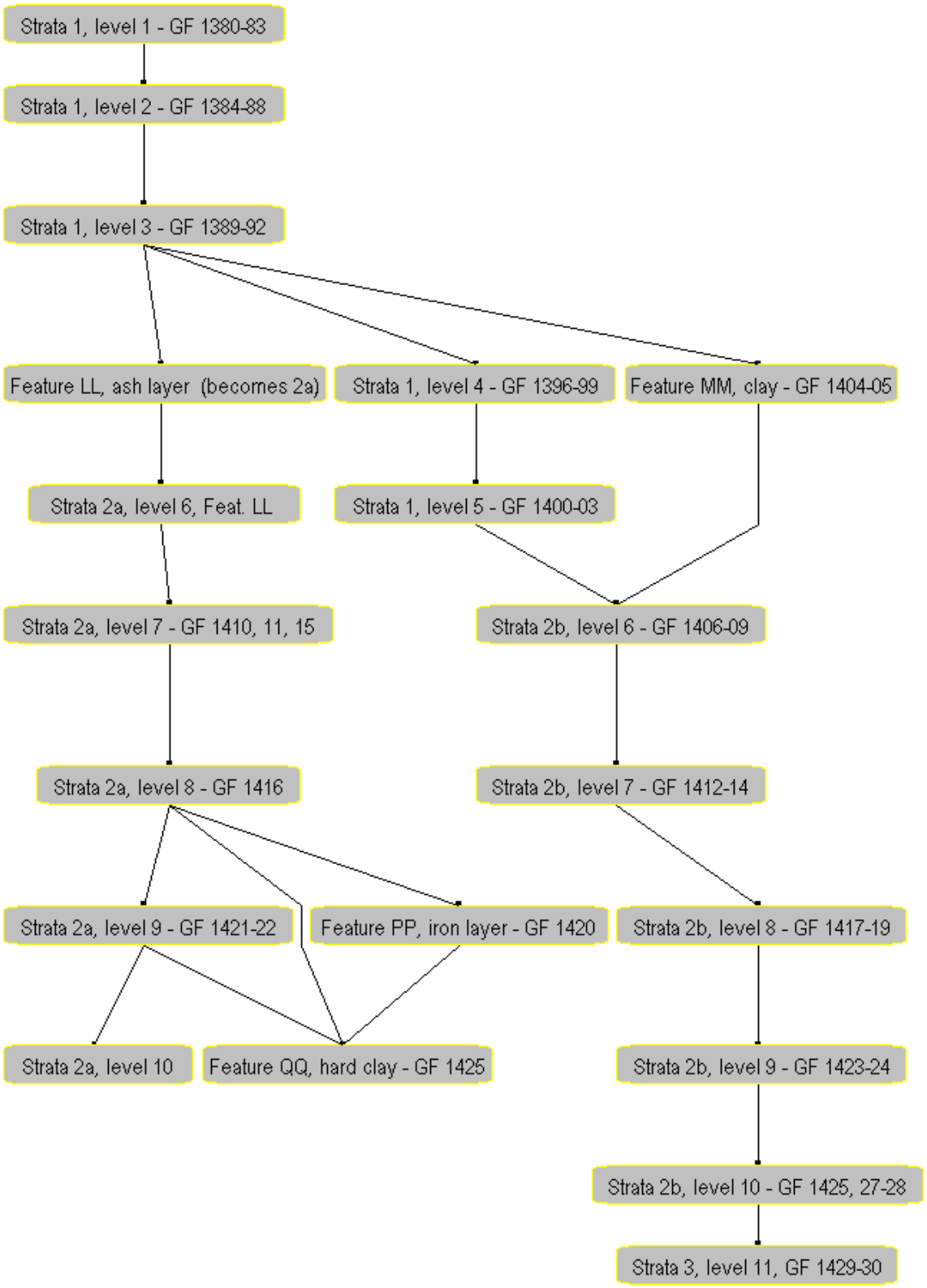
S17.75 W69 (1x1m) - 2005



S12 W75 (1x1m) - 2005



S14 W73 (1x1m) - 2005



Archaeometallurgical Analyses – Preliminary Results

Krysta Ryzewski

In November 2006, Krysta Ryzewski began conducting ongoing archaeometallurgical analyses of the metals from the Greene Farm Bog Garden and Old House area under the supervision of Prof. Robert Gordon at Yale University.

Krysta selected over thirty samples for detailed analyses. The majority of nails were collected from the ironworking feature in the Bog Garden, the blacksmith feature from the Woodhouse (2004), and the architectural features of the Old House. Four metal tools from the Bog Garden, and one ox shoe from the Old House were also analyzed. Also, several slag samples were examined from the Bog Garden slag dump. The aim of the analyses were to determine whether the iron was made from bog ore, which could imply local production, to assess the quality of the iron, to examine the techniques of manufacture, and to infer the type of ironworking operation(s) occurring at Greene Farm.

The preliminary results are briefly summarized here, though more detailed analyses will appear as part of Krysta's dissertation research, and will be posted online at the Greene Farm wiki http://proteus.brown.edu/greenefarm/Home.

Old House Metals

The sampled nails from the Old House are all wrought nails manufactured by hand. When examined in transverse cross-section microscopically these nails exhibited an extremely high phosphorous content, which indicates that these nails were made from low quality bog ore. The nails contain a high slag content and show clear evidence of hammering during a non-molten state (Figure 1).

Figure 1. Specimen KR-20 - Old House hand wrought nail with high phosphorous content (hill and valley texture) indicating that the nail was produced from bog ore in an iron bloomery (no magification).

This is a clear indication that the Old House nails were made in an iron bloomery. No nails of these types were recovered from the Bog Garden area, which suggests a later colonial date for the ironworking operation in the Bog Garden, one post 1690 but pre-1782.

Bog Garden Metals

The sampled nails and tools from the Bog Garden reveal very interesting features and raise several questions that remain under investigation. The nails from this area include a few hand wrought specimens, with variable phosphorous content, but largely consist of nails cut and headed in two steps. This method of manufacture precedes the type of cut nails created in one-step nail machines of the 19th century. The grain structures of the nails suggest that several of the nails were headed at a relatively cooler temperature, suggesting that they were headed by hand with the use of a supporting die and significant applied pressure.

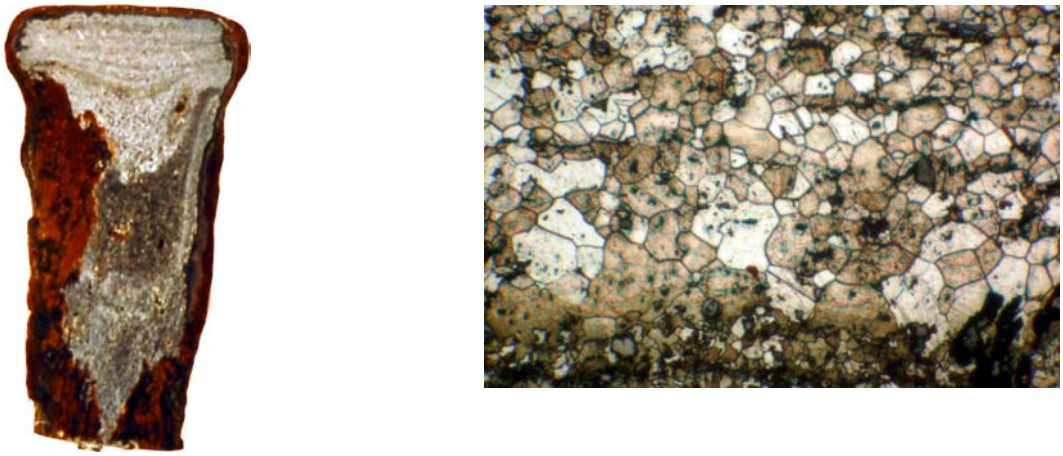


Figure 2. Specimen KR-18 – Cut nail from Bog Garden, (no magnification – left) and on right, head of nail showing variable ferrite grain size, deformed grains, dark slag veins, and phosphorous content (note hill and valley texture) (mag. = 210x). This type of nail was made of an intermediate technology between hand wrought and one-step machine made, but still may have been made from low-medium quality bog ore and was worked or hammered in a non-molten state, similar to the state of bloomery-produced iron materials.

This manufacturing step does not necessarily indicate that the nails were made with a substantial machine, but as demonstrated by Robert Gordon, they could have been produced by a relatively small, homemade operation. It remains unclear whether or not these nails were being manufactured in the ironworking operation of the Bog Garden, though the phosphorous and slag levels in some of these specimens indicate that bog ore and bloomery iron could have been used in their manufacture. Likewise, the tools examined document evidence of bloomery manufacture, especially in the existence on Neumann bonds extending across grains. These bonds indicate that cold rehammering occurred after the equipment was shaped while in a non-molten state.

Initially the slag analyses were unsuccessful, but this was soon discovered to be a consequence of the fact that we were actually looking at brick rather than slag. Bloomery slag is often found in archaeological contexts in heavy brick-like blocks, as it would have collected at the hearth or furnace bottom during the ironworking operation. As mentioned earlier, the bricks from the Bog Garden units were exposed to constant high temperatures and consequently appeared both internally and externally to be slag-like, in color and texture. The absence of microscopic ferrite grain structures concluded that these samples were not slag, but may instead have been hearth bricks. This was a positive indication that a fire feature existed in the area, but could not provide information about the nature of ironworking in the area. Unfortunately the slag that remained at Greene Farm

represents the small fraction that was not removed during later landscaping episodes in and around the Bog Garden and West Yard. The slag that does remain and was collected for analyses is smaller and significantly more fragmented than is typically found in bloomery and larger ironworking operations. This small concentration has not, however, been interpreted as the complete quantity of slag that once existed in association with the ironworking feature. In fact, of the small fragments, some slag pieces were magnetic. These were selected for analyses. Ultimately a sample of slag did show evidence characteristic of bloomery smelting, including ferrite grains and glassy elements visible at high magnification. This is encouraging evidence for the confirmation of historical ironworking in the Bog Garden area.

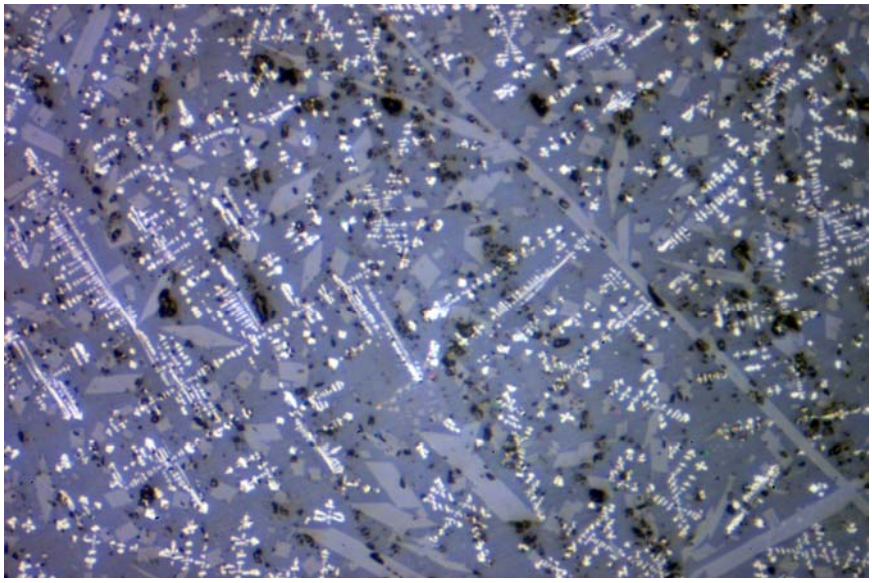


Figure 3. Specimen KR-31 - magnetic slag. The white lines and scratches are ferrous grain inclusions leftover from the bloomery process of extracting ore from a non-molten bloom (mag. 418x)

Finally, the possible tuyere was examined in an attempt to confirm its identity as a tuyere that would have supplied air and regulated the temperature of an ironworking operation. The tuyere pipe was cut in half with a diamond saw (Figure 4).

Figure 4. Tuyere cross section after cutting. Red arrow points to "bottom", or portion that rested downwards. The interior of the bottom area had a residue buildup from use.

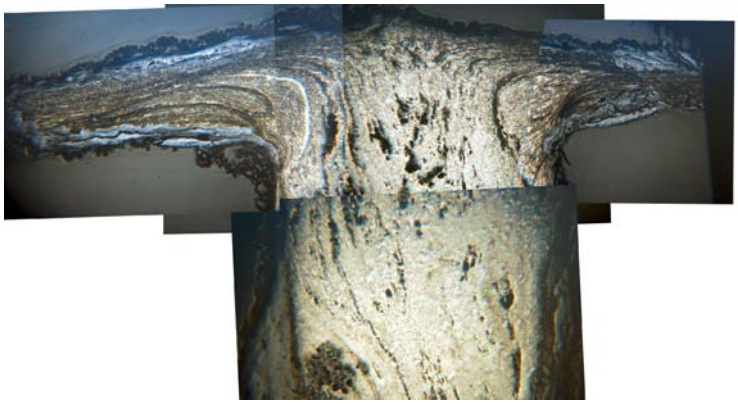
The cross section revealed that the pipe was not constructed of metal or ceramic, as is typical for tuyeres. Instead it appears to be constructed of a dense sandy conglomerate, resembling more of a crude concrete material. Some interpreted this evidence as proof that the possible tuyere was merely a pipe. Given the strong evidence from the surrounding clay stratigraphy and contextual association of the potential tuyeres with the other ironworking features, the tuyere theory was not readily dismissed. The possible tuyere, constructed of a sandy conglomerate, which would not be structurally stable or effective as a pipe transporting water. Further examination of the tuyere interior revealed a concentration of magnetic ferrite and magnetite micro-particles concentrated on one longitudinal section of the interior hole. This suggested that the particles collected on the downside of the interior, or a section that rested downwards on a surface for an extended period of time. It is important to note that the interior of the tuyere when excavated was packed with clay and soil. After careful cleaning, this distinct residue was

apparent along the longitudinal base. The presence of magnetic ferrite and magnetite from the longitudinal base sample are encouraging for two reasons. First, the tuyere was packed in clay, and would not have otherwise been exposed to these particles unless used in a firing process that would have emitted them. Second, magnetite is a characteristic element found in black sand, which was regularly used in bloomery operations. Though undoubtedly low quality hardware, it can be said with confidence that these tuyeres were used in the ironworking operation. The low quality of the material may have ensured a short life-span. It is also possible that the end of the tuyere that entered the fire would have had a detachable ceramic tip that would have adequately handled the heat and pressure. Examples of low quality conglomerate and ceramic tuyeres exist in prehistoric European contexts (personal communication Kevin P. Smith). Also, it makes logical sense that the Greenes would have constructed the tuyeres out of whatever material was available, especially in the absence of iron and ceramic manufacture.

Woodhouse Metals

Of the several hundred nails collected from the Woodhouse blacksmith feature, there are a great variety of types ranging from hand wrought, poor quality nails to machine-made 20th century examples. This is likely a result of architectural alterations in the Woodhouse area over the past century mixing with earlier deposits, such as a blacksmith feature that may be associated with the ironworking operation in the Bog Garden.

Figure 5. Specimen KR-1 - Interior of a machine-headed nail from Woodhouse, 19th century (no magnification). The impact of the powerful mechanized heading process caused the regular and fairly even horizontal grain direction in the nail head.



Figures 6 & 7. Specimen KR-10A – hand wrought nail from the Woodhouse, 17th century. Fig. 6 (left) – no magnification, Fig. 7 (right)- 4x magnification photomosaic. Evidence of repeated impacts from and shaping by a blacksmith's hammering is clearly visible in the head, where the ferrite grains are tightly compressed at the tips of the head. The black lines and concentrations are dense slag deposits, indicating the impure and low quality of this nail, likely made in a bloomery from bog ore.

The results of these archaeometallurgical investigations have raised new questions about the methods of iron manufacture in the centuries pre-dating one-step machine made nails. We are broadening the analyses to incorporate a more regional scale by sampling nails from Potowomut, and sites with known affiliations to early nail making, such as Strawbery Banke, Amesbury, and Spencer-Peirce-Little.

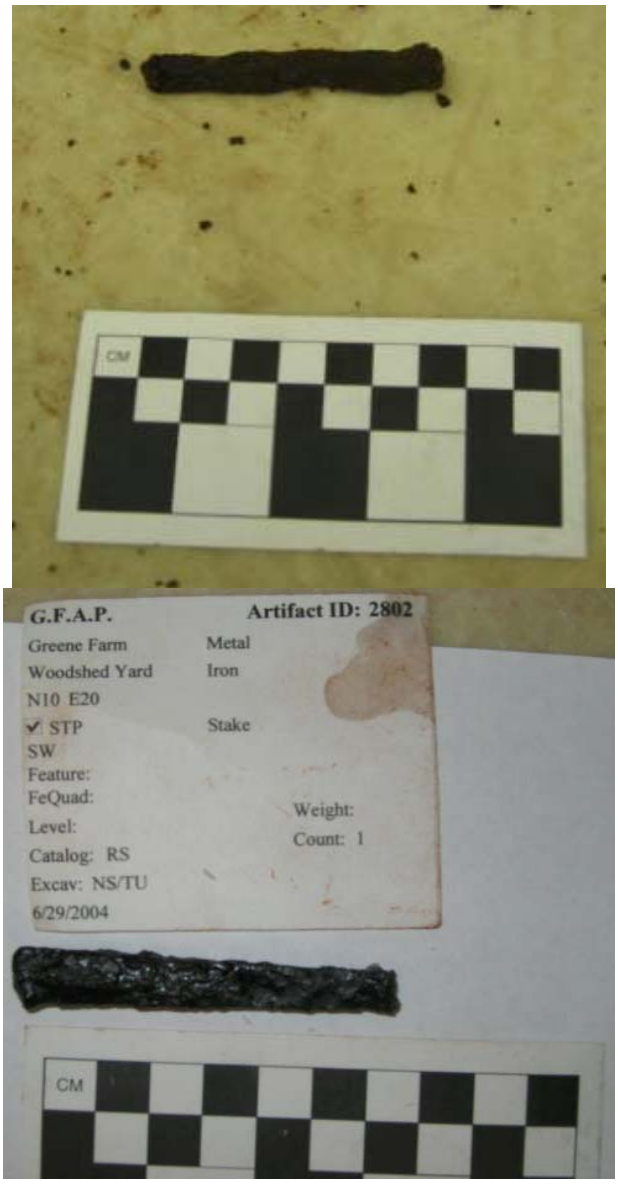
Iron Conservation and High School Outreach

Ninian Stein

As part of our outreach to the community, Greene Farm Archaeology Project team members supervised the project of high school student, Tyler Miller in Spring 2007. A high school junior from Jamestown RI, Tyler is interested in archaeological science and hopes to continue in the field. For his project he experimented with a new nail conservation technique to see if it would work on iron from Greene Farm. Below please find the iron conservation protocol that Tyler followed. Kaitlin Deslatte and Krysta Ryzewski learned the technique and introduced Tyler to the lab, Caroline Frank purchased necessary supplies and Ninian Stein supervised Tyler's lab work.

Tyler at Work (Stein 2007)

Overall, the conservation technique Tyler used appeared to remove the majority of the corrosion from the iron artifacts and will be adopted as a method for future conservation use at Greene Farm. Please see the before and after pictures below for a visual indication of the success rate. Lighter coatings of wax will be applied in subsequent applications. Tyler was a responsible dedicated worker and received high marks for his paper and presentation made before his class, other teachers and interested community members.



A Stake Before and After Conservation (Miller 2007)

GFAP Iron Conservation Procedure

Tannic Acid Solution

Tannic acid is a mild/non health risk powder, but do not inhale.

Mixture method for 1 liter of solution: acid powder/distilled water/ethyl alcohol
1. Measure ingredients: Use tannic acid powder A310-500; weigh 200g of acid powder into 1000mL beaker. Measure 950mL of distilled water in another 1000L beaker and then add 50mL of ethyl alcohol to distilled water.
2. Mix water solution to powder: Pour water mix into powder beaker. Stir for 10-15 minutes. Set solution aside for 1 hour; mixture will un-clot itself.

*Use fresh as possible solution when processing.
*Do not contaminate solution with iron; always pour a little out of container into a dish for use (do not dip scrub brushes into solution).
*Solution stains REALLY BADLY, always wear protective gloves and apron.

Nails Before and After Conservation (Miller 2007)

Conservation Process (can do multiple artifacts at one time)

5 Steps: Photograph before, Water soak/boil, Acid treatment, Waxing, Photograph after

1. Before Pictures:
   - Take photograph of artifact and write its information on the conservation photo log.

2. Water Soak/Boil:
   - Boil artifact in distilled water for 5-10 minutes to remove salts. (use beakers to separate multiple context while boiling).
   - Use impact drill to gently beat/remove corrosion. Do not use drill near the head of nails because they may fall off. Magnetite is black = close to metal, while Gurrtite is red/brown = corrosion iron oxide. Look for sudo-marks: artifact can have wood or textile impressions. These are special and are hard to save during conservation process, so you need to take photo and make note on conservation log.

3. Acid Treatment (3 days/3 mintues/3 times)

- Wet artifact with distilled water and begin to brush (use steel brushes). Always support object with your hand wherever the brush is applied. You can use pliers or scissors to pop off corrosion pustules/bubbles/domes. Define with brush/tools according to what object is.
- Place a little acid solution into bowl. Dip artifact into bowl and scrub (back & forth). Just get acid on artifact, do not leave object in acid solution. Spend 3 minutes on object and then move it to a towel for drying. When acid solution in your scrub bowl looks brown/red in color it is inactive – empty bowl and replace with fresh solution.
- Let object sit for 1 day (24hrs) to dry. Store artifacts in open plastic containers on trays. This gives time for tannic acid to work. Then repeat acid treatment process again for the following 2 days.

4. Wax Process:

- Do not start this step until artifact is completely dry. You can use a lamp or oven to dry humidity from objects.
- Melt wax on hot plate (takes hours- to shorten break wax into pieces if glass rods are not present.). Heat at lower setting for 30 minutes, then high setting for melting, but set at middle for dipping artifacts.
- Use tongs to drop artifact into wax. Wear gloves because wax is extremely hot. Pull artifact out and remove excess wax by blotting with towel. Place artifact down on fresh towel for drying.
- After dipping objects, place glass stir rods in wax to cool. This is to avoid wax splatter when heated during the next use.

5. After Pictures:

- Take photographs of finished artifacts and note completion in conservation log.
- Apply label to artifact: either attach tag with context information or place artifact on valara foam and put into plastic bag marked with context information.

*95% success rate with this conservation process.
*Can retreat artifact is necessary: boil object in distilled water to remove wax coating and continue process from the beginning.

Woodhouse Nails Before and After Conservation (Miller 2007)

FUTURE DIRECTIONS

Greene Farm Archaeology 2007-08

In 2007, we are planning a field season that will focus solely on excavating the Old House. The aim of the excavations will be to uncover key architectural elements that will provide information on the layout of the house, the identity of possible additions, outbuildings, and other features (e.g. chimney, structural components, etc). The plan for the 2007-08 academic year is to focus on researching this and already excavated materials in order to produce publications that can be disseminated in professional journals, books, and online.

The project personnel will continue in 2007-08 as in 2006, with some modifications. Ninian Stein and Krysta Ryzewski will remain as Project Archaeologists and Caroline Frank will continue as Project Historian. Ninian Stein has received her PhD in Anthropology and accepted a faculty position at UMass Boston as Associate Director of Environmental Studies and Lecturer in Environmental, Earth and Ocean Sciences with a joint appointment in the Department of Anthropology. Caroline Frank plans to complete her PhD in 2007, after which she will be faculty in the Department of History at Brown. Krysta Ryzewski is currently in the dissertation stages of her PhD research at Brown. Kaitlin Deslatte remains involved as GFAP Crew Chief and will complete her MA thesis at UMass Boston in 2007, which focuses on the Old House midden. With the graduation of our former Research Assistants, Randi Scott of URI is our new undergraduate Research Assistant and Thomas Urban of Brown University's Environmental Geophysics Group is now Project Geophysicist.

In May of 2007 the Greene Farm Archaeology Project received official support from and affiliation with the Brown University Joukowsky Institute of Archaeology and the Ancient World. GFAP is listed under current projects on the Institute's webpage http://www.brown.edu/Departments/Joukowsky_Institute/fieldwork/projects.html. This affiliation will undoubtedly strengthen the quality of our project and allow us to provide the Brown University community with additional opportunities to engage with archaeological research in Rhode Island.