The Search for the Hidden People of St. Michael's Cemetery

PENSACOLA, FLORIDA

VOLUME I

Lists of Figures, Tables and Appendices; Acknowledgments; Chapters I-IX

Cryptic Message #2. David S. Hinks.
Courtesy of the Arts Council of Northwest Florida

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Table of Contents

**VOLUME I:**

| List of Figures | v |
| List of Tables  | xiv |
| List of Appendices | xv |
| Acknowledgments | xvii |
| Abstract | xx |

**Chapter I**

Introduction

1

**Chapter II**

Environmental Setting

Physiography and Geology

3

Drainage Characteristics

Climate

Flora

Fauna

Project Setting

Summary

**Chapter III**

Archaeological and Historical Settings

Previous Research

9

Historic Chronology

**Chapter IV**

Project Design and Methods

The Research Team

18

Testing

Methodology for the Project

**Chapter V**

A Discussion of the Transformational Funerary Landscape

Margo Stringfield

26

Interments at *Santa Maria de Galve* and *Isla de Santa Rosa* Pensacola (1698-1757)

Re-establishment on the Mainland: *San Miguel de Penzacola* (ca 1754-1763)

A Proper Town: British Pensacola (1763-1781)

A Community Cemetery is Defined

The Return of Spanish Rule: 1781

**Chapter VI**

St. Michael’s Cemetery: A Formal Identity

Margo Stringfield

69

Spatial landscape of St. Michael’s Cemetery
Ancillary Surveys
Soil Profile Development
Visible Disturbance in Soil Profiles in Trenches
Surficial Disturbance of Soils
Reconstruction of Original Topography
OCR Age of Soil Surface

Summary and Conclusions

VOLUME II:

Chapter X  Into the Archives  197
Kendra A. Kennedy and Siska M. Williams
Introduction
Churches and Ministers
Doctors and Hospitals
Military and Navy
Cemeteries
Unproductive Sources
Suggestions for Future Research
Conclusion

Chapter XI  Conclusions  242
Margo Stringfield

References Cited  248
Chapter I
Chapter II
Chapter III
Chapter V
Chapter VI
Chapter VII
Chapter VIII
Chapter IX
Chapter X
List of Abbreviations
Chapter XI

Appendices
Chapter IV
APPENDIX 4.A
Artifact Analysis: Soil Survey

APPENDIX 4.B
Public Component and Exhibit
Chapter V
APPENDIX 11
19th century newspaper report of unmarked burials encountered northwest of St. Michael's Cemetery

Chapter VIII
APPENDIX 8.A
Grid Key
Key to Depths
Overall Map
Jamaica Crinum

APPENDIX 8.B
GPR Results

APPENDIX 8.C
Plot Survey

APPENDIX 8.D
Potential Mass Graves

Chapter X
APPENDIX 10.A
Deaths in Pensacola Database 1763-1821

APPENDIX 10.B
Full Bibliography for Deaths in Pensacola Database 1763-1821

APPENDIX 10.C
Total Number of Named Deaths by Year

Survey Log
Historical Cemetery Form, Florida Master Site File
Survey Log Sheet
# List of Figures

## Chapter II

| Figure 2.1: | Project location in Escambia County, Florida and the City of Pensacola | 6 |
| Figure 2.2 | St. Michael’s Cemetery location on U.S.G.S. Pensacola topographic map | 7 |

## Chapter IV

| Figure 4.1: | Test Area 3, Transect 1-04 Area of interest | 20 |
| Figure 4.2: | Test Area 3, Transect 1-04 Example of GPR raw data | 20 |
| Figure 4.3: | Test Area 3, Transect 1-04 Composite image | 21 |
| Figure 4.4: | Test Area 3, Transect 1-04 Resistance pseudo section | 21 |
| Figure 4.5: | Trench 5, south profile showing condensed trash deposits | 23 |
| Figure 4.6: | Trench 3, south profile showing shaft of unmarked burial | 24 |

## Chapter V

| Figure 5.1a: | 8ES1354 Santa Maria de Galve site on Naval Air Station, Pensacola. 1719 Fort San Carlos map | 27 |
| Figure 5.1b: | Burials under the church floor | 27 |
| Figure 5.2: | Dominic Serrés drawing of Presidio Isla de Santa Rosa ca 1743 | 28 |
| Figure 5.3: | Spanish Chapel in *San Miguel de Panzacola* ca 1763 | 30 |
| Figure 5.4: | Digitized overlay of the 1763 and 1765 town showing Spanish structures | 32 |
| Figure 5.5: | Plan of The New Town of Pensacola and country…1765 | 35 |
| Figure 5.6: | A view of Pensacola in West Florida ca 1765 | 36 |
| Figure 5.7: | Henry Bouquet | 37 |
Figure 5.8: Plan of The Fort of Pensacola (1777) showing Bouquet’s monument

Figure 5.9a: Example of headstone style. New England ca 1757

Figure 5.9b: Example of headstone style. New England ca 1787

Figure 5.10: Detail of Western Wetlands (watering place)

Figure 5.11: Plan of Savannah and its environs in 1782

Figure 5.12: Plan of Mobile surveyed by P. Pitman 1763

Figure 5.13a: 1781 Mobile

Figure 5.13b: 1813 Mobile

Figure 5.14: St. Augustine, the Capital of East Florida 1762

Figure 5.15: Spanish Perspective of the British fortifications at the entrance to Pensacola Bay 1781

Figure 5.16: French survey showing a British hospital on Gulf Breeze peninsula ca 1769

Figure 5.17: Plan of the Stockade Fort at Pensacola ca 1767 showing hospital

Figure 5.18: Plan of the Fort at Pensacola ca 1778 showing hospital

Figure 5.19: Overview map of Pensacola ca 1780 showing field hospital

Figure 5.20: Location of barrel features and burials on Deadman’s Island

Figure 5.21: Coffins recovered from Deadman’s Island

Figure 5.22: Digitized map showing late 19th Century quarantine station on Gulf Breeze Peninsula

Figure 5.23: Gerrge Gauld map Pensacola Bay ca 1769 showing Campbell Town

Figure 5.24: A Plan of Pensacola and its surroundings 1778
Figure 5.25: Map showing George Street and Charlotte Street bridge with cemetery ca 1780

Figure 5.26: 1781 maps showing burials on both sides of the Charlotte Street extension

Figure 5.27: Aerial photograph (1999) showing 1765-1778 roads and tributaries in relationship to St. Michael’s Cemetery

Figure 5.28: Aerial photograph (1999) showing 1778 “Burying Place” and 1781 burials in relationship to St. Michael’s Cemetery

Figure 5.29: Map showing “cemetery” ca 1781

Figure 5.30: View north (Alcaniz St.) from the contemporary site of the British era Charlotte Street Bridge

Chapter VI

Figure 6.1: Vincent Pintado survey of “The Catholic Inhabitants Claim to 30 Arpens of land” ca 1810

Figure 6.2: Survey of Pensacola ca 1827 showing cemetery plat

Figure 6.3: GIS of St. Michael’s Cemetery showing period usage

Figure 6.4: Spanish hearth feature ca 1754

Figure 6.5: Jose Roig box tomb ca 1812

Figure 6.6: South gate and southern road ca 1890s looking east (Pensacola Historical Society)

Figure 6.7: Southern road seen from west entry ca 2008 looking east

Figure 6.8: Glass negative photograph of St. Michael’s Cemetery. Site unknown ca 1890

Figure 6.9: Glass negative photograph of St. Michael’s Cemetery. Site unknown ca 1890

Figure 6.10: Lardner monument ca 1821 showing wood cross background

Figure 6.11: Lardner monument ca 2007
Figure 6.12: Metal marker of Gregorio Caro (died 1816, marker produced post 1850) 80
Figure 6.13: Tomb of John Hunt ca 1851 83
Figure 6.14: St. Michael’s Cemetery from Alcaniz Street ca 1897 85
Figure 6.15: Gertrude Bonnauer wood marker (Replica) 86
Figure 6.16a: Bird’s Eye view ca 1885 showing Cadet Creek (Ayrro San Miguel) drainage 87
Figure 6.16b: Bird’s Eye View of Pensacola ca 1896 showing Cadet Creek as filled 88
Figure 6.17: Deaths during Yellow Fever epidemic years 89
Figure 6.18: The city dump ca 1919 (1919 Fire District Map of Pensacola. Copy on file at UWF Archaeology Institute) 91
Figure 6.19: Contemporary land surface at south end of St. Michael’s Cemetery 92
Figure 6.20: Perspective looking west from the south road ca 1897 93
Figure 6.21: Perspective looking west from the south road ca 2006 showing landscape changes 93
Figure 6.22: St. Michael’s Cemetery showing Alcaniz Street to west and housing on former cemetery land to east and south, and filled wetlands, ca 1896 94
Figure 6.23: Bird’s Eye View of Pensacola ca 1896 95
Figure 6.24: Funeral notice of S. Bronnum 1887 97
Figure 6.25: Brosnaham map of Pensacola ca 1819 showing cemetery 98
Figure 6.26: Goldstrucker vernacular above ground tomb (Magnolia Cemetery ca 1920) 99
Figure 6.27: Hughes above ground tomb (St. Michael’s Cemetery ca 1898) 99
Figure 6.28: Shell cultural marker at Creole site in St. Michael’s Cemetery (John Holley ca 1907) 101
Figure 6.29: Shell cultural marker at African American site in Zion AME Cemetery (Leamon Smith ca 1951) 101

Figure 6.30: Entrance to St. Michael’s Cemetery ca 1936 102

Figure 6.31: Sanborn Fire map showing Aragon Apartment complex ca 1960 on eastern extreme of the ca 1807/1810 St. Michael’s Cemetery plat 103

Figure 6.32: Aerial view (2007) of St. Michael’s Cemetery and surrounding development 106

Figure 6.33: Mooney site vandalized in 1999 107

Figure 6.34: Mooney site following conservation treatment 2003 107

Figure 6.35: Archaeologist Pat Garrow conducts a probing workshop for UWF faculty, students, and St. Michael’s Foundation Members 109

Figure 6.36: UWF archaeology graduate students probe and map a plot prior to an interment 109

Figure 6.37: UWF graduate students ground truthing SMC GIS database 2002 110

Figure 6.38: UWF historians and archaeologists translating Spanish tombstones 2002 110

Figure 6.39: Master gardeners conducting the botanical survey 111

Figure 6.40: U.S. Marines working on site 112

Figure 6.41: Area high school students volunteer 112

Figure 6.42: Living history at St. Michael’s Cemetery 113

Figure 6.43: Cemetery Workshop Flyer 115

Figure 6.44: Hurricane Ivan damage 2004 116

Figure 6.45: Extent of trees and canopies 2004 117

Figure 6.46: Burial plot receipt ca 1915 119
Figure 6.47: Child’s interment notice (ca June 9, 1915) for Davis child

Figure 6.48: Clean up in St. Michael’s Cemetery ca 1988

Figure 6.49: Repositioned tombstones ca 2002

Figure 6.50: Documenting an unmarked burial encountered during restoration of Bright underground tomb 2003 (burial orientation N/S)

Figure 6.51: Bright underground tomb following restoration 2003

Chapter VII

Figure 7.1: Surveyed graves

Figure 7.2: Website customized interface

Figure 7.3: Query run on “Gonzalez”

Chapter VIII

Figure 8.1: GSSI SIR2000 GPR, Trimble ProXR GPS, and custom GPS to GPR antenna mount

Figure 8.2: An example of the interpolated GPS readings (far left), GPR slice 4 (second from left), GPR slice 6 (second from right), and GPR slice 8 (far right)

Figure 8.3: An example of the GIS, including monuments (pink), grave borders (maroon lines), paths (blue), roads (yellow), and cemetery grid (black), along with GPR slice

Figure 8.4: Polygons added to the GIS identifying anomalies in GPR slice 4 / depth 1

Figure 8.5: An example of the Split Feature tool in GPR Slice

Figure 8.6: An example of an edited set of polygons. An estimate of the number of burials for each polygon is indicated with the label

Figure 8.7: Population estimate for GPR depth 1

Figure 8.8: Population estimate for GPR depth 2
Figure 8.9:   Population estimate for GPR depth 3  

146

Figure 8.10:   GPR profile showing the Daniel R. Sullivan burial, visible in the center of data as a black and white pattering beginning at about .7 meters. Depths are estimated based on a hyperbola fit procedure  

147

Figure 8.11:   GPR Slices for the Sullivan survey area 

148

Figure 8.12:   An overlay of slices 3, 4, and 5 covering depths from about .6 to 1.5 meters with an interpretation  

148

Figure 8.13:   A three dimensional visualization of the GPR data at a depth of .7 meters. The burials are visible as red patterns, indicating a strong GPR reflection. The perspective is looking to the northeast  

149

Figure 8.14:   An isosurface rendering of the GPR data for the Sullivan survey area. The burials are the largest two anomalies. The perspective is looking to the northeast  

149

Figure 8.15:   Resistivity survey areas 

152

Figure 8.16:   Area A resistivity transects results 

154

Figure 8.17:   Area A three-dimensional volume of resistivity 

155

Figure 8.18:   Area B resistivity transect results 

156

Figure 8.19:   Plan view of Area C 

157

Figure 8.20:   Oblique view of Area C 

157

Figure 8.21:   Area D resistivity transect 

158

Figure 8.22:   Diurnal variation in temperatures of soils and rocks compared to water 

159

Figure 8.23:   The thermal infrared camera mounted on the helium blimp  

161

Figure 8.24:   An example of color (left) and thermal infrared (right) Image 

161
Chapter IX

Figure 9.1: Topography of St. Michael’s Cemetery based on total station survey 167
Figure 9.2: Location of undisturbed areas and soil description trenches 169
Figure 9.3: West wall of trench T9 171
Figure 9.4: North wall of trench T7 177
Figure 9.5: Location of trenches (T), small soil pits (SM), and auger holes (A) 178
Figure 9.6: Schematic representation of soil profile types observed at St. Michael’s Cemetery 180
Figure 9.7: Spatial distribution of soil profile types 182
Figure 9.8: Interpolated depth to original surface, as marked by top of original A horizon (1A horizon in Figure 9.6) 186
Figure 9.9: Topography of original surface, as marked by top of original A horizon (1A horizon in Figure 9.6) 187
Figure 9.10: Calculated (circles) and interpolated OCR age for surface Horizon 194
Figure 9.11: Interpolated map of year of death inscribed on grave markers 195

Chapter X

Figure 10.1: Elias Durnford’s Plan of the Fort at Pensacola, 1778 204
Figure 10.2: Joseph Purcell’s Plan of Pensacola, 1778 205
Figure 10.3: Vicente Pintado’s Map of Pensacola, 1813 208
Figure 10.4: Plan of the Fort at Pensacola, 1763 212
Figure 10.5: Diego Ortíz Parilla and Phelipe Ferringan Cortéz’s Map of the Fort of Pensacola, 1763

Figure 10.6: Diego Ortíz Parilla and Phelipe Ferringan Cortéz’s Plano del Presidio de San Miguel de Panzacola, 1763

Figure 10.7: Archibald Robertson’s Plan of the Fort at Pensacola, 1764

Figure 10.8: Elias Durnford’s Plan of the Fort at Pensacola, 1767

Figure 10.9: Henry Heldring’s Plan of the Town of Pensacola, 1780

Figure 10.10: Henry Heldring’s Plan of the Town of Pensacola, 1780. Close up view of the cemetery area

Figure 10.11: George Gauld’s Plan of the Harbour of Pensacola, 1764

Figure 10.12: James Kearney’s Plan of Pensacola Harbor and Bar / Ft. San Carlos de Barrancas, 1822
List of Tables

Chapter III

Table 3.1: Historic sequence for northwest Florida 11

Chapter VII

Table 7.1: Attributes Listed 125

Chapter IX

Table 9.1: Description of soil profiles in trenches 172
Table 9.2: Particle size analysis [%] and bulk density [g/cm$^3$] of samples from trenches 174
Table 9.3: Depth and thickness of current and original A horizons [cm] 183
Table 9.4: Statistics for some of the OCR dating parameters for all horizons in the small soil pits 189
Table 9.5: OCR dating parameters and results for surface horizon in small soil pits 191
List of Appendices

Chapter IV

APPENDIX 4.A
Artifact Analysis: Soil Survey

APPENDIX 4.B
Public Component and Exhibit

Chapter V

APPENDIX 11
19th century newspaper report of unmarked burials encountered northwest of St. Michael's Cemetery

Chapter VIII

APPENDIX 8.A
Grid Key

Key to Depths

Overall Map

Jamiaica Crinum

APPENDIX 8.B
GPR Results

Figure B-8.1: GPR interpretation, northeast section

Figure B-8.2: GPR interpretation, north central section

Figure B-8.3: GPR interpretation, northwest section

Figure B-8.4: GPR interpretation, east central section

Figure B-8.5: GPR interpretation, center section

Figure B-8.6: GPR interpretation, west central section

Figure B-8.7: GPR interpretation, southwest section

Figure B-8.8: GPR interpretation, south central section

Figure B-8.9: GPR interpretation, southeast section
APPENDIX 8.C
Plot Survey
   Figure C-8.1: Example transect from the trial GPR survey

   Figure C-8.2: Example transect from the trial electrical resistivity survey

APPENDIX 8.D
Potential Mass Graves

Chapter X

APPENDIX 10.A
Deaths in Pensacola Database 1763-1821

APPENDIX 10.B
Full Bibliography for Deaths in Pensacola Database 1763-1821

APPENDIX 10.C
Total Number of Named Deaths by Year

Survey Log

   Historical Cemetery Form, Florida Master Site File

   Survey Log Sheet
Acknowledgments

From the onset, The Search for the Hidden People of St. Michael’s Cemetery Project has been a team effort and the application of an interdisciplinary approach to research has resulted in a multi-component product that reflects both the cultural and physical landscape of this historic cemetery. The initial collaboration effort began in 2000 when The University of West Florida Archaeology Institute partnered with the Department of Environmental Studies to plan a mapping project to record all surface features and associated information at the cemetery. A summer field school funded by UWF President Morris Marx and taught by Dr. Johan Liebens resulted in the creation of the cemetery’s Geographic Information System (GIS). The associated database of information for each surveyed feature was designed by UWF student Anita Cook with assistance from UWF faculty. This initial mapping project opened the door to broader research on the cemetery. The site has become a teaching lab for UWF and a number of faculty and students are involved in ongoing research and public outreach. The Search for the Hidden People of St. Michael’s Cemetery project builds on the initial mapping project and now includes layers of data contributed by a broad range of participants who have been steadfast in their support of the preservation of St. Michael’s Cemetery.

In addition to surveying the site and conducting the soil survey associated with the current project, Dr. Liebens and his students volunteer for every public event on site, sharing with the public the technology used on site and the results of their research. Stuart Hamilton, UWF GIS manager, has been imaginative in his approach to documentation and data storage and creative in his approach to problem solving on site. Hamilton, who has recently joined the College of William and Mary as Director of the GIS Program, layered all information collected from the cemetery into the interactive website program available to the public at http://www.uwf.edu/gis/research/smc/. Hamilton was also a regular volunteer at public events and was always standing ready to help with the project and its associated components. One such component is the botanical survey. Under the direction of Beth Bolles, the Escambia County Extension Service Master Gardeners conducted the year long comprehensive botanical survey that is layered into the cemetery’s GIS. Special thanks go to Grady Lea, Lois Wright and Katherine Stumbaugh who worked with Liebens and Hamilton on this special project.

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Throughout the project, a number of UWF undergraduate and graduate students have volunteered on the project, both in the field and participating in the historical research associated with the project. Over the past three years, approximately twenty research papers have been generated. In particular, Christina Roth’s research on yellow
fever epidemics and Steve Raby-Smith’s research on the changing landscape surrounding the cemetery, have added greatly to the body of knowledge regarding the site.

Historical research has been in-depth and far reaching, involving the help of many individuals. Siska Williams and Kendra Kennedy have done an outstanding job, literally looking for the needles in the haystacks to find traces of Pensacola’s colonial dead. They were not only persistent, but also innovative and thoughtful in their search for information. Prior to this project, little has been known of the men, women, and children who lost their lives in Pensacola during the colonial period. The body of information provided by Kennedy and Williams adds greatly to what we know of the many unseen individuals who lost their lives on the Florida Gulf Coast Frontier. Along with the in-depth research that produced positive results, future researchers will be particularly grateful to find in this report, detail of the many unfruitful avenues the two pursued in the course of their research, which will save countless hours for those who come after them.

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Finally, it is with great appreciation that the project team acknowledges the generous support of the State of Florida, Department of State, Division of Historical Resources, assisted by the Florida Historical Commission. This support made possible a project that adds greatly to the body of knowledge regarding Pensacola’s history, by documenting the subsurface cultural resources of the oldest and most significant historical site that survives above ground in Pensacola, and by giving voice and meaning to many of the unseen people of Pensacola’s past.

Margo S. Stringfield
Abstract

Within the microenvironment of St. Michael’s Cemetery, an interdisciplinary approach to investigations has led to a better understanding of the site and its relationship to the cultural and physical landscape associated with the community. Initially organized on the outskirts of the colonial settlement, contemporary St. Michael’s Cemetery is today an eight-acre green space in the heart of the modern urban environment. The impact of 240 years of urbanization has altered the original colonial landscape, and most of the infrastructure of the early community is reflected primarily in the archaeological record. This is not entirely the case at St. Michael’s Cemetery where flora and fauna reflect the early community’s over and understory and funerary architecture dating to Pensacola’s Second Spanish occupation dots the landscape. While much information can be discerned from surface features in the cemetery, there is another dimension to the site that is unseen by the naked eye- the unmarked burials that underlie the marked burials on the site.

A primary objective of the Search for the Hidden People of St. Michael’s Cemetery project was to identify potential unmarked burials using remote sensing techniques. The contemporary surface of the cemetery contains approximately 3200 marked graves dating from 1812-2008. The remote sensing survey has identified 3,915 subsurface anomalies originating in three distinct depths throughout the cemetery. In conjunction with the remote sensing survey, a soil survey documents changes to the landscape over time.

Historical research focuses on the transformational funerary landscape of the area beginning with European occupation in the 16th century, the relationship between St. Michael’s Cemetery and the physical and cultural landscape of the community it served beginning in the 18th century, and the identification of individuals who lost their lives in Pensacola during the British and Second Period colonial periods (1763-1821).
Chapter I. Introduction

No where else in our society are we as cognizant of the cultural landscape of our community as in our cemeteries. Funerary architecture is directly linked to individuals who lived in the community, and the cemetery itself is part of the built environment of a community. Burial grounds are integral components of communities and are generally established adjacent to the critical resource needed for their support—a population base. St. Michael’s Cemetery (SMC), once a rural cemetery serving a colonial population, is today an eight acre green space in the heart of urban historic Pensacola, Florida. It is one of the two oldest extant cemeteries in the State of Florida (the other being Tolomato Cemetery in St. Augustine), on the National Register of Historic Places, and is an official project of Save America’s Treasures, a historic preservation initiative of the National Park Service. The 3,198 marked graves and mausolea and the masonry and iron enclosures in St. Michael’s Cemetery reflect the rich and diverse social history of Pensacola.

Pensacola drew immigrants from around the world, people who came to West Florida to make their fortunes or merely to seek a better life for themselves and their families. The cemetery is the resting place of captains of industry, victims of yellow fever epidemics, and steam ship explosions, along with those who died of old age and in childbirth as infants. Tombstones in the cemetery reflect not only the status and ethnicity of individuals but also reflect society as a whole on the Florida Gulf Coast frontier.

As preservationist Sharyn Thompson notes in Florida’s Historic Cemeteries: A Preservation Handbook documenting our historic cemeteries is imperative to preserving them. “A vast amount of information can be contributed to the historical record through the study of cemeteries and graveyards. Such sites provide us with a sense of place” and information related to a community’s settlement patterns, socioeconomic diversity, ethnicity, and religious beliefs, trade patterns, epidemiology, and demographics can be discerned (Thompson 1989: 5). Until relatively recently, however, cemetery research has focused on the physical remains of a site that can be discerned from surface features. Unfortunately, cemeteries are often “lost” or abandoned over time and the information associated with them is lost as well. Even cemeteries that survive through time experience a certain amount of loss of surface information; St. Michael’s Cemetery is no exception. The architectural landscape of the cemetery has been affected by natural aging, forces of nature, cycles of neglect and aggressive clean-up efforts, and vandalism. All of these factors contribute to the loss of surface documentation. This process not only leads to the loss of personal information about an individual and their relationship to the community, it often results in the lost documentation of their physical place in the cemetery.

The University of West Florida (UWF) has been involved at the cemetery on a limited basis since the 1980’s; however, UWF involvement increased significantly in 1999, following a violent episode of vandalism. Initial efforts focused on helping the not-for-profit St. Michael’s Cemetery Foundation (the owner of record) update the site’s management plan and document the site. A Geographic Information Systems map and data base of funerary architecture and information was produced in 2000 to document extant funerary architecture and record personal information about the people associated with the markers. This field school experience was such a success that the University has used the site as a teaching lab for a number of projects.
While the survey documented approximately 3,200 marked graves at the site, it became obvious as historical research moved forward that there were a large number of unmarked graves. Additionally, historical research also suggested that the area in and around St. Michael’s Cemetery had been used as the primary burial ground for the community from at least the late British Period occupation (1778-1783) through the Second Spanish Period occupation (1783-1821) (Stringfield 2007). The site remained the primary burial ground for the community until St. John’s Cemetery was established to serve a growing suburban population in 1876 (Bancroft 1995).

Not only were the historical accounts of the use of St. Michael’s Cemetery pointing to a large unmarked population on the site (Preston 1829), but also physical evidence was regularly documented both during restoration efforts (Stringfield 2007) and during excavations for the infrequent modern internments (St. Michael’s Cemetery Foundation Files [SMCFF] 2000-2007).

The frequency of encountering unmarked burials raised three questions:

- Who were these people and where exactly did they lie sub-surface in the eight acres of the contemporary site?
- Could the location of an unmarked British era cemetery be better defined? And, if so, what relationship did that site have to St. Michael’s Cemetery?
- How best to protect the sub-surface cultural resources of the site?

The answers to these questions would aid in interpreting the cemetery’s relationship to the physical and cultural landscape of the early community it served and the modern community it continues to serve. It would also enhance understanding of how the community was organized and grew. Documenting and interpreting the unmarked burials of St. Michael’s Cemetery would not only serve to protect the sub-surface cultural resources of the site but also would give voice and meaning to the heretofore undocumented individuals who are also intimately associated with the physical and cultural landscape of historic Pensacola, Florida.
Chapter II. Environmental Setting

Physiography and Geology

Escambia County is located within the East Gulf Coastal Plain physiographic province (Hunt 1974, Fenneman 1938). Sediments of the Citronelle Formation which blanket this province were deposited during the Plio-Pleistocene epoch approximately one million years ago (Puri and Vernon 1964). During this epoch, high energy streams deposited upland sediments of sand, clays, and gravels in alluvial fans which have coalesced on the coastal plain. These soft sandy deposits have been deeply eroded by streams and form a relatively flat, yet highly dissected, land surface. The present project area falls within Coastal Lowlands subdivision of the Coastal Plain (Marsh 1966). The Coastal Lowlands are characterized by relatively non-dissected, nearly level plains that lie less than 100 ft above sea level.

During the Pleistocene Epoch (the last million years) a series of cold (glacial) and warm (interglacial) climatic episodes occurred. The glacial periods witnessed a substantial lowering (100-200m: 300-600 ft) of the sea level which increased stream velocity and caused the rivers and streams to cut deeply into their valleys. Subsequent rapid rises in sea levels associated with the interglacial periods flooded these deeply incised stream valleys and bays and greatly reduced stream velocity. The aggrading streams filled the valleys with sediments of the soft Citronelle formation, which continually erode from the uplands. In addition, during the interglacial periods, drifting sediments in the Gulf of Mexico regularly formed barrier islands off the mainland, which narrowed the bay mouths. Each succeeding interglacial period apparently produced a relatively lower sea level, causing former peninsulas and barrier islands to be incorporated into the mainland. The sounds behind the former peninsulas and islands filled with sediments forming swamps in these long troughs. The modern barrier island, Santa Rosa Island, lies south of a former ridge or barrier island called the Gulf Breeze Peninsula, which, in turn, lies south of the modern mainland, a series of marine beaches and terraces and filled wetlands upon which downtown Pensacola is situated.

Drainage Characteristics

The Pensacola region is drained by two main river systems: the Perdido and the Escambia. The Perdido is a relatively short river that drains the northwestern portion of Escambia County before emptying into Perdido Bay in the southwestern area of the county. The Perdido River and its tributaries are relatively narrow drainages with correspondingly narrow flood plains. The Perdido valley is characterized by eroded sand hills with a natural forest cover of longleaf pine with an admixture of xeric hardwood forest and mesic slope and bottomland hardwood forest.

The Escambia River drains the eastern side of Escambia County and is the largest and longest river in the region. The river is relatively broad with wide flood plains marked by extensive wetlands. The Escambia River valley uplands are characterized by eroded sand hills with a native forest cover of longleaf pine and hardwood forest. The Escambia River flood plains are characterized by cypress-gum swamp or bottomland hardwood forest.
The project region includes portions of Santa Rosa Sound, four large bays, and many of miles of bay and sound coastline. From west to east these bays are Perdido, Pensacola, Escambia, and East. Pensacola and Escambia Bays are especially deep, and in several locations deep water lies close to the shoreline, providing excellent harbors, anchorages, and careening grounds. The pass from the Gulf of Mexico into Pensacola Bay is also deep and rarely closed by bars, thus providing deep draft ships ready access to Pensacola, Escambia, and East Bays. Topography near these lowland shorelines is characterized by low relief, sluggish streams, tidal creeks, and some extensive marshes. Hardwood hammocks are present in the lowland areas on better drained soils in areas protected from fire.

There are two large peninsulas, which extend into the bays: Garcon Point and Gulf Breeze. The Garcon Point Peninsula is characterized by extensive wetlands in the central and southern area and well drained sandy soils in the northern portion. These areas are separated by the well defined slope of the Penholoway Terrace which drops over 20m (60 ft) in less than a mile. Both sides of this triangular-shaped peninsula are eroding. The west shore erodes from winter storms and the east shore erodes from summer storms. The Gulf Breeze Peninsula is a long and narrow landform stretching 30 miles west from the Holley/Navarre area to the City of Gulf Breeze on the western tip, and it ranges from 0.5 to 2 miles wide. The narrow peninsula is characterized by low relief, stabilized sand dunes and short spring-fed drainages. The dominant vegetation communities are pine flatwoods or sand pine scrub; however, hardwood hammocks are frequent along the shore. As on the Garcon Point Peninsula, both shorelines are eroding from summer and winter storms.

Three locations in the Pensacola region were settled sequentially in colonial times. The first documented Spanish settlement, Presidio Santa Maria de Galve, was on the mainland just inside Pensacola Pass on a small peninsula, which today is dominated by the Naval Air Station-Pensacola. This settlement was on a low marine terrace known locally as the Barrancas, which had a freshwater seep spring at its base. The location was selected to defend the pass from colonial European intruders. The second Spanish presidio, Isla de Santa Rosa, was near the tip of Santa Rosa Island, across the Pass from the former location of Santa Maria de Galve. Santa Rosa was next to a deep anchorage on the sound side of the island and was in a strategic location in relation to the pass. The settlement was on a low, sandy barrier island, however, with no access to timber, wildlife, or agricultural soils. Supplies, materials, and food had to be brought to the presidio from the mainland or from Havana and Veracruz. The low-lying settlement was destroyed when a hurricane washed over the island. The third location of colonial Pensacola was on the mainland seven miles the east of the pass. San Miguel de Panzacola was established on a low sandy ridge or terrace on the shore of Pensacola Bay. The rise was surrounded by wetlands drained by two small freshwater streams: Washerwoman Creek on the West and Cadet Creek on the East. The sandy soil was not conducive to agriculture, and during the subsequent British occupation, the surrounding wetlands were transformed into garden lots in a futile attempt to make the colony self-supporting. Important mainland resources exploited by Spanish and British colonists included pine trees and live oaks, which were tapped for building and naval supplies or harvested and processed at water powered mills; clays for brick making; and marginal soils for growing crops for food, forage, and export.
Climate

The Northwest Florida area has a warm-temperate and humid climate (Weeks et al. 1980). While the summers are long and warm, the winters are short and very mild. The summer temperature averages about 80 degrees Fahrenheit; the average winter temperature is 54 degrees Fahrenheit. There are approximately 300 frost-free days in a typical year. Annual precipitation averages 65 inches and about half of this rain falls during the summer months. Prevailing winds blow from the south and southwest during the spring and summer; these winds generally blow from the north and northwest during the fall and winter. Severe storms in the form of hurricanes occur regularly during months when the waters of the Gulf of Mexico are warm. The hurricane season presently extends from June through November.

Flora

The Northwest Florida Gulf Coast is marked by vast longleaf pine forests (Braun 1950). The forests exhibit a number of vegetation communities. The mixed pine-oak forests of the uplands consist of an overstory of longleaf, sand and slash pine, post oak, black jack oak, turkey oak, and live oak and of an understory of saw palmetto, pineland threeawn lopsided Indian grass, and chalky bluestem (Weeks et al. 1980). The stream terraces are covered in longleaf pine, live oak, red oak, hickory, magnolia, and dogwood. The bottomlands adjacent to streams are forested in slash and long leaf pine, tity, dogwood, silver leaf bay, and water tolerant oaks; the understory consists of gallberry, wax myrtle, huckleberry, and greenbrier. The larger bottomland swamps consist of an overstory of cypress, sycamore, sweetgum, blackgum, juniper, longleaf pine, and water tolerant oaks and of an understory of tity, wax myrtle, ferns, greenbrier, and muscadine.

Fauna

The local environment supports a wide variety of wildlife. Among these are small and medium sized mammals such as the Eastern cotton tail, common skunk, opossum, gray squirrel, gray fox, raccoon, armadillo, and deer. Avian species characteristic of the area include several species of waterfowl, doves, woodpeckers, owls, hawks and other raptors, and a wide variety of small songbirds. Among the reptiles found in this environment are the box turtle, spotted turtle, diamond back terrapin, water snake, ring-necked snake, black snake, cottonmouth snake, pygmy rattlesnake, common anole, fence lizard and blue-tailed skink. Aquatic animals include shellfish, sunfish, catfish, and several species of minnows.

Project Setting

St. Michael’s Cemetery is located in the heart of downtown Pensacola—surrounded by development associated with the growth of the urban city (Figures 2.1 and 2.2). Roadways, an interstate terminus, a civic center, private businesses, and housing encircle the site. The eight-acre cemetery is land locked by a modern man-made environment. While the site is surrounded by a constructed setting, within the cemetery’s eight acres, the nature of the landscape has been relatively unaltered over the past two hundred years. Soils at the north end of the cemetery are
Figure 2.1. Project location in Escambia County, Florida and the City of Pensacola.
Figure 2.2. St. Michael’s Cemetery location on U.S.G.S. Pensacola topographic map.
sandy, gradually giving way to dark, organically rich sediments (mixed with trash deposits) associated with landfill south of a low ridgeline overlooking filled wetlands.

A comprehensive botanical survey of the site (Lea 2002) has identified trees, shrubs, bulbs, wild grasses, and flowers. The grasses include native as well as introduced species such as *Eragrostis amabilis* (commonly known as feather love grass) (Davis 2007; Quattrocchi 2006: 807-808), an Old World (African) species found along road ways, adjacent to fields, and at house and cemetery sites in the New World (Niering 1963).

Historic photographs of the site ca. 1900 show a dense overstory covering much of the site. The modern landscape includes a remnant hardwood hammock that survives along the low terrace overlooking filled wetlands as well as a scatter of trees throughout the site. Along with several varieties of oak, the overstory also includes palms, magnolia, cedar, and mulberry. Crepe myrtle, camellia, azalea, persimmon, and saw palmetto dot the landscape along with bulbs introduced to the site, such as lily, amaryllis, and daffodil. Grasses and wild flowers include, among others, common ragweed, Spanish needle, Hyssop spurge, Butterfly pea, Spiderwort, Daisy fleabane, Morning glory, Gopher apple, Yellow wood sorrel, Horse nettle, etc.

Small rodents, such as mice, as well as non-poisonous snakes and lizards inhabit the eight-acre site. At times, feral bee populations have been observed in hollows of oak trees in the cemetery (Stringfield 2003) and the ant population is unsuppressed.

**Summary**

Northwest Florida has a diverse environment that has undergone significant change in the last 16,000 years, little of which is precisely understood. Modern conditions began about 3,000 years ago. The region is marked by considerable topographic relief and by a dendritic network of drainages that provided transportation corridors and ample fresh water resources for settlement and water-powered industries. The interior reaches are marked by highly acidic sandy deposits on marine terraces that are generally not well suited for agriculture. Clay pockets in the Pleistocene deposits are exposed along the eroding bluffs of the area. The region is characterized by a natural fire sub-climax pine forest vegetative community that is interspersed with xeric pine-oak communities. These pine and pine-oak communities provided extensive timber resources.

In colonial times, the deep water bay was the main attraction to settlement. The area’s forests supported a naval supply and stores industry focusing on live oak, pine, and cypress. The sandy, acidic soils made it difficult for Spanish and British colonists to become self-supporting or to export agricultural goods. Localized clay resources, however, were targeted for the manufacture of bricks. Pensacola served primarily as an administrative center as the capital of West Florida and as a hub for trade with Native American groups who acquired deerskins from the interior.
Chapter III. Archaeological and Historical Settings

Previous Research

There have been several attempts to document burials in the cemetery, specifically a 1930s avocational survey of marker names (Bruington 1934) and a mapping project conducted by middle school students in 1974 (PATS 1974). The Bruington survey is invaluable in recording individuals whose graves are no longer marked in the cemetery, as well as providing information that has since eroded from markers and is no longer legible. Unfortunately, aside from dividing the site into arbitrary sections, no map accompanies the work. Copies of the book are limited, but can be found in local libraries: the Pensacola Historical Society Resource Center, Special Collections; John C. Pace Library at the University of West Florida; and the UWF Archaeology Institute.

The mapping project undertaken by a group of Escambia County eighth grade students enrolled in the Program for Academically Talented Students resulted in detailed scale drawings of individual features and the collection of limited data associated with each person. This survey is also very useful in documenting features no longer present on site. All grid maps and files related to this project are housed at the University of West Florida Archaeology Institute curation facility.

In the late 1980s, a state funded project resulted in the professional restoration of a number of weathered and damaged stones and fences and production of interpretative materials (Thompson 1989). A general map of the site was also produced at this time; however, it is problematic in that only copies of the original exist: there is no scale, and it includes undocumented references to the location of unmarked burials (Coling 1989). In conjunction with the restoration project, limited remote sensing tests were conducted by Judith A. Bense (Bense 1989a). A report and associated raw data is on file at the UWF Archaeology Institute curation facility.

One of the first problems identified by UWF archaeologists who began working on the site in 2000 was the lack of an accurate site map and lack of a current survey of information from existing markers. An accurate site map was produced by UWF geographer Dr. Johan Liebens who conducted a field school on the site during the summer 2000. A computer-based Geographic Information System (GIS) yielding a high-quality, true-to-scale map accurate to within 1/10" was produced. The map is linked to a comprehensive database of information on each gravestone (Liebens 2002; www.uwf.edu/gis/smc).

Historical research suggested that a large number of unmarked burials were present on the site. In addition to mapping above ground features, strategies for identifying subsurface features were also being explored. In 2000, NASA archaeologist Dr. Marco Giardino and UWF archaeologist Dr. Judy Bense collaborated on a pilot study assessing the usefulness of new ground penetrating radar (GPR) technology on archaeological sites and used St. Michael’s Cemetery as a test site for their research. Preliminary testing in five areas in the cemetery indicated that a substantial number of unmarked graves were probably present within the
boundaries of the site and possibly outside the modern boundaries of the cemetery as well (Giardino 2000).

Close interval systematic probing is another technique that appeared to be a useful tool to delineate buried features (such as coping, grave markers, walkways, and unmarked graves). Archaeologist Patrick Garrow, who has extensive experience in delineating unmarked graves using probing, conducted a two-day workshop to train UWF archaeologists and graduate students in this technique in 2002. During the initial testing, one area of the site was of particular interest. In the Northwest corner of the cemetery, close interval probing delineated a dense concentration of small unmarked graves, suggesting this area of the cemetery was utilized in the past as a communal location of a “baby cemetery” within the cemetery as a whole (Stringfield 2002).

A comprehensive, year-long botanical survey was conducted by master gardeners with the University of Florida /Escambia County Extension Service. Using sectional maps of the overall GIS map of the site, volunteers mapped all trees, shrubs, and ornamental plants, as well as cataloged and located, by section, wild grasses and flowers. This exercise proved to be very productive: over the course of the survey, master gardeners identified over 450 species of wild grasses and wild flowers on the site. The project is invaluable in documenting one of the last relatively unaltered areas of urban Pensacola where examples of flora native to the area may still exist. The survey is on file at the UWF Archaeology Institute curation facility (Lea 2002).

In 2003, a restoration project focused on repairing features damaged by vandalism in 1999 (conservation forms and photographic documentation are on file at the UWF Archaeology Institute). This project was funded in part with Historic Preservation Grant assistance provided by the Bureau of Historic Preservation, Division of Historical Resources, Florida Department of State, assisted by the Florida Historical Commission.

Over the past six years, a number of research papers and papers have been produced by UWF students and faculty. A sample of the many topics that have been addressed includes research on landscape evolution along the Alcaniz corridor, typology of above-ground tombs, the history of yellow fever in West Florida, etc. In addition to general topics related to the cemetery, students have also researched individuals buried in the cemetery. Many of these have been published in the Pensacola News Journal. Copies of research produced by UWF students and faculty are on file at the Archaeology Institute.

The microenvironment of St. Michael’s Cemetery is an integral component of the modern community of Pensacola. It is no longer just adjacent to, but is surrounded by, the critical resource needed for its support—a modern population base. The multi-disciplined approach to research, site preservation, and management being applied at the site assures that, as we move into the future, St. Michael’s Cemetery will remain a vital component of the community.
Historic Chronology

As can be seen in Table 3.1, the historic chronology of Northwest Florida begins with the Spanish explorers who sailed into the Pensacola Bay system. Pensacola was included in two well-known Spanish explorations, those of Pánfilo de Narváez and Hernando de Soto.

<table>
<thead>
<tr>
<th>Period</th>
<th>Date Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colonial</td>
<td></td>
</tr>
<tr>
<td>First Spanish</td>
<td>1528 - 1763</td>
</tr>
<tr>
<td>British</td>
<td>1763 - 1781</td>
</tr>
<tr>
<td>Second Spanish</td>
<td>1781 - 1821</td>
</tr>
<tr>
<td>American</td>
<td></td>
</tr>
<tr>
<td>Antebellum</td>
<td>1821 - 1860</td>
</tr>
<tr>
<td>Late 19th/early 20th century</td>
<td>1860 - 1917</td>
</tr>
<tr>
<td>World War I/World War II</td>
<td>1914 - 1945</td>
</tr>
</tbody>
</table>

The first Europeans to see present-day Northwest Florida were probably members of the ill-fated Narváez expedition in 1528 (Hodges 1907:37-40). Cabeza de Vaca's narrative of this expedition produced the first description of the Northwest Florida natives. The next known Spanish visitor to Pensacola Bay was the pilot of the Soto expedition Diego Maldonado, who sailed into the bay during the winters of 1539 and 1540 to resupply the expedition. Soto never arrived, choosing to remain inland, and there are no known descriptive documents from the Maldenado visit. During his sojourn in the Pensacola Bay region, Maldonado probably explored the rivers and bayous (Lewis 1907:193).

Europeans returned to the Pensacola area in 1559. Under pressure to establish a foothold in the New World north of Mexico, the Spanish sent Tristan de Luna y Arellano with a large contingent of colonists to establish a colony at Santa Elena in Georgia. The viceroy chose to set up a colony at Pensacola to serve as a “beach-head” colony (John Worth, Personal communication 2008). Within weeks of landing at Pensacola, a hurricane destroyed 7 of the 11 vessel fleet (John Worth, Personal communication 2008). This setback, in combination with diseases and dissension, doomed the Luna colony and it was abandoned in 1561 (Priestly 1928). The location of the de Luna settlement on Pensacola Bay is unknown. One of Luna's ships was discovered in 1992 (Smith et al. 1995) and another in 2006, which is currently being excavated by UWF archaeologists.
Nearly one hundred fifty years passed before the Spanish once again became interested in colonizing the Pensacola area. In 1698, fearful of French expansion, the Spanish founded the fort of Santa Maria de Galve on Pensacola Bay, and the long Spanish colonial period commenced. The French attacked Santa Maria de Galve in 1718, burning the outpost, and occupying its remains for several weeks. In 1722, following a treaty between the two warring nations, France restored Northwest Florida to the Spanish (Parks 1986).

Today’s downtown Pensacola was initially settled during the colonial period by the Spanish. In 1741, Captain Nicolas Ximenez de Florencia built a warehouse in the area for storing supplies after a hurricane had destroyed most buildings at Presidio Isla de Santa Rosa in 1740. In 1743, the Spanish also drew up plans for a fort called San Miguel and a brick works on the mainland. The “great fort of stakes” appears to have been dismantled by 1753 (Autos 1756). These structures have not been found archeologically.

After the Presido Isla de Santa Rosa was destroyed by another hurricane in 1752, the Spanish made today’s downtown the location of their third presidio, San Miguel. The Spanish officially occupied the area from about 1754 until the British took possession of Florida in 1763. In 1757, construction began on a palisaded fortification to protect the military and administrative center from the threat of Indian attacks. Although private residences were built outside the fort walls, they were demolished and civilians moved inside the fort in 1760. The Spanish garrison included administrators, soldiers, and prisoners along with a few clergy, families, merchants, and slaves. Living nearby were remnants of the Apalachee, Yamassee, and other friendly Native American groups. Hostile Native Americans in the region included the Talapoosa, Alabama, and other Creek-related groups (Dysart 1999, Harris 1999, Benchley et al. 2002). In 1763, the Spanish evacuated the settlement, selling their houses to British officials or land speculators and taking their possessions, families, slaves, and Native American allies with them to Veracruz, Mexico. A detailed historical discussion of the First Spanish occupation can be found in Childers, et al., “Settlers, Settlement, and Survival: A Comparative Study of Spanish San Miguel de Panzacola (1754-1763) and British Pensacola (1763-1781)” (Benchley 2002).

The material culture of the First Spanish Pensacolians reflects their strong ties to Mexico, particularly Veracruz, Puebla, and Mexico City, through which they received the situado and the bulk of their supplies. Colorful Mexican majolicas from Puebla are the signature of First Spanish occupations in downtown Pensacola. Colonial Spanish households during this time also incorporated Native American elements, particularly in the kitchen ceramic assemblage. First-Spanish Pensacola also had broader ties to the Caribbean and the Gulf Coast, which brought legal and illegal goods from French colonies, particularly Mobile, and even from British smugglers.

The documentary record reveals that the British trader, William Walton, was smuggling British goods to Pensacola in cooperation with the governor Miguel Roman de Castilla y Lugo (1757-1761). Walton had been licensed by the Spanish to deliver British goods to St. Augustine, but not to Pensacola. In 1760, Walton stored his goods in the king’s warehouse at San Miguel while he sailed to New Orleans. When he returned, the warehouse and its contents had been damaged in a hurricane. Roman allowed Walton to auction the entire cargo, which
included slaves, cloth, flour, beer, foodstuffs, and fine china to the San Miguel’s citizens and soldiers (Childers 2000, Benchley 2005). A Spanish map dating to 1761 labels the point and bayou east of downtown Pensacola “English Point” (Punta Yngles) (now Emanuel Point) and “English Inlet” (Estero Yngles) (now Bayou Texar). Perhaps this area is where the British smuggler moored his ships.

In 1763, the British military took over the settlement of Pensacola at the end of the Seven Years War. When the civilian government arrived in late 1764, the governor planned a proper British colony, which he hoped would become self-supporting. The British imposed a town grid with formal streets, blocks of house lots, and garden lots surrounding the centrally located fort. The British Fort of Pensacola, which incorporated the remains of Fort San Miguel at its center, was expanded and modified numerous times. The British military found, like the Spanish before them, that maintaining a wooden fort in the sandy soil and humid, stormy climate was a daunting task.

The British made Pensacola the capital of West Florida, the 14th British colony, and from it, they tried to govern western towns of Mobile, Biloxi, and territory as far away as Natchez, Mississippi. Ethnically, West Florida consisted not only of British families and indentured servants, but also French Huguenots; immigrants from Germany, Ireland, and other European countries; and settlers and slaves from the Caribbean (Fabel 1988). The Indian trade was an important part of Pensacola’s commerce during the British period, and maintaining relations with groups who had become known as Creek, Choctaw, and Chickasaw was an ongoing effort. Creek settlements were present as close as the lower reaches of the Escambia River, and various Creek groups came to Pensacola to trade and to meet with government officials (Dysart 1999, Fabel 1988). During the American Revolution, West Florida remained loyal to the British, and the population of the Pensacola region swelled with loyalists from other colonies. The Spanish in New Orleans allied themselves with the Americans, however, and took advantage of Britain’s over-extended condition to retake the Gulf Coast. Pensacola fell to Bernardo Galvez in 1781, and Florida once again became Spanish territory.

The material culture of British Pensacola is markedly different from First Spanish remains. For archaeologists, probably the most important British import was ceramics. By around 1760, British tin-enameled wares (delft) were replacing Spanish tin-enameled wares (majolica) in global trade (Council 1975:90), although French tin-enamedeled wares (faience) were still available along the Gulf Coast. British slipwares were also distinctive, as were the stonewares, which included red or black teapots and white salt glazed tablewares, especially plates, platters, and bowls. British refined earthenwares, including a variety of colorful creamwares, became increasingly popular for table and kitchen use after 1750. Some of these ceramics may have been introduced to Pensacola through illicit trade during the First Spanish period (Benchley et al. 2002, Benchley 2005). Plain creamwares were produced after 1760 and probably were not used in Pensacola until after 1763. In downtown Pensacola, the British assemblages often include earlier Spanish materials because British trenches and pits were excavated through the Spanish midden and incorporated the earlier materials into the feature fill (Bense 1999). In some cases, the British appear to have continued to use Spanish goods, as is evidenced by the presence of a Spanish olive jar used as a bucket in a British well (Stringfield 1996).
When the Spanish returned to Pensacola in 1781, they found a substantial town with formal streets and blocks of houses with fenced lots. The fort in the center of town continued to be difficult to maintain, however, and the Spanish allowed it to fall into disrepair. They focused their defensive works at the pass from the Gulf into Pensacola Bay, on the hill north of the town (Gage Hill / North Hill), and in several blockhouses near the edge of the town. During Pensacola’s Second Spanish period (1781-1821), the ethnic composition of the community grew even more diverse with Spanish settlers from Spain, Canary Islands, Cuba, Mexico, and the Gulf Coast. Hispanic residents included Peninsulares (Spanish born), criollos (New World born) or creoles, and mestizos and other categories of mixed-bloods. British settlers remained in West Florida as well, and many French colonists arrived from the Caribbean. Enslaved and freed Africans were also an important part of the population. Native American groups, particularly Creeks, continued to visit the settlement to exchange deer hides for supplies. After the United States purchased Louisiana in 1803, Pensacola once again became the administrative center of West Florida and experienced an influx of Spanish and French settlers from Louisiana and the Gulf Coast. Trade with Native Americans continued to be critically important to the economy.

During the Second Spanish period, the nature of global production and trade had changed substantially from First Spanish times. The British Empire now controlled production and trade of many commodities, including cloth and ceramics. British refined earthenwares, including plain creamwares (beginning date 1760) and pearlwares (beginning date 1775) (Noel Hume 1969), dominated the world market by 1780, and majolicas and faience become rare in Pensacola’s archaeological record. Adding to the British dominance of goods in Second Spanish times was the fact that Panton, Leslie and Company became the principal Indian trader in Pensacola. Although Panton and Leslie were Scottish, their supply connections were with England and the Bahamas, and they, therefore, could provide the British goods most desired by the Native Americans of the interior Southeast (Coker and Watson 1986). They also undoubtedly supplied Pensacola’s residents with materials and supplies. A few distinctive majolicas (Blue Green Bacin, Triana Blue on White) were also imported from Spain during the Second Spanish period. Florida archaeologists have noted that Second Spanish residents maintained a preference for cream colored wares and earthen tones pearlware, even after whiteware began to dominate American markets after 1830 (Cusick 1993, Mullins 2001). In downtown Pensacola, Second Spanish assemblages often included earlier Spanish and British materials due to mixing with earlier deposits (Bense 1999), which makes it difficult to decipher the range of contemporary activities represented in features and middens.

The Second Spanish period ended in fits and starts between 1814 and 1821. During this time, Andrew Jackson brought American troops to Pensacola three times. Jackson first arrived in 1814 to drive out the British who were using the Spanish town as a staging area during the War of 1812. As Jackson’s troops marched down Pensacola’s streets, the British fled and burned Fort San Carlos de Barrancas at the pass as they left. In 1818, Jackson returned to Pensacola while chasing Indian combatants during the First Seminole War. Jackson captured the Spanish Commandant at Fort Barrancas and forced the Spanish officials to leave Florida temporarily. The U.S. President and Congress were extremely upset by this action because the U.S. was not at war with Spain and talks were underway to purchase Florida. By 1819, the
Spanish returned to take control of Pensacola. In 1821, the Adams Onis Treaty was signed, and
Jackson returned to Pensacola to receive Florida from Spain as its new Territorial Governor.

The Early American Period was initiated with the establishment of Escambia County
with Pensacola as the temporary territorial capital. The first Legislative Council met here in
1822. The council decided to alternate meetings yearly between Pensacola and St. Augustine;
however, because of the difficulty of travel to St. Augustine, an intermediate site, Tallahassee,
was selected as the third capitol (Tebeau 1971: 122-123).

Much military activity and construction took place in Pensacola during the Early
American Period. From this point on, the town of Pensacola was de-militarized, and the focus
of military activities was the entrance to the bay. In 1826, the Pensacola Navy Yard was built
near Barrancas. Two settlements, Warrington and Wolsey, were laid out on the Navy Yard and
workers at the yard leased lots for homes (Parks 1986: 54). Construction of the three brick forts
to protect the pass and Navy Yard began in the 1830s. Barrancas was completed in 1844, Fort
Pickens was completed by 1834 and Fort McRea was completed in 1840 (Coleman and
Coleman 1982: 47, 57). The demand for bricks and labor spurred both the brick and slave
industries in the Pensacola area and initiated free labor immigration (Coker 1971: 46).

General business in Pensacola prospered, and banks and land companies invested in
speculative land development and railroad projects. However, the financial panic of the 1830s
broke this trend. Large brickyards also were built, initially for fort construction and later for
export. The largest brickyard was one owned by Bacon and Abercrombie at Gaberrone, which
produced eight million bricks in 1860 and had 102 employees (Polk 1971: 85, 97). The sawmill
industry also grew during this period, spurred by the advent of the circular saw and the steam
mill.

The population in Pensacola was approximately 712 when the Americans took over in
1821 (Coker and Inglis 1980: 93), declining primarily due to the departure of the Spanish and
the first of many attacks of yellow fever. The population increased slowly and was only 2,164
in the 1850 census. Yellow fever attacks continued to hamper population growth, especially
when the 1853 epidemic touched many families in Pensacola (Parks 1986: 61-62). The 1850
census revealed the cosmopolitan makeup of the population, with people from 18 different
countries living in Pensacola. One hundred and fifty-eight people owned 741 slaves; however,
there were 350 free Negroes who were craftsmen and who owned considerable property (ibid:
351-352).

While most of the town was still located within the colonial limits, small communities
were established outside, including Warrington and Wolsey at the Navy Yard and the brickyard
area along Escambia Bay between Gaberrone and the Escambia River. Three public springs
supplied water to the main town.

During the Civil War, Pensacola saw limited action. Federal forces overtook Fort
Pickens and held it throughout the war. The town was vacated, leaving approximately 100
people for the duration of the war. Union troops moved in and occupied Seville Square, using
Old Christ Church as a barracks and hospital, as well as for religious services (Williams 2004).
After the Civil War, Pensacola began an unparalleled economic boom. The lumber industry, fueled by the worldwide industrial boom, marked the yellow pine forests of the Southeastern United States as its most marketable resource. Railroads played a major role in not only bringing logs to the mills and to the docks, but also in transporting lumber throughout the Eastern United States. Much of the timber cut in Northwest Florida made its way to the European market (Stringfield and Phillips 1997: 40). This interaction between the timber industry, shipping, and railroads created a vast transportation empire based in Pensacola (Parks 1986: 75). Most of the lumber cut in West Florida passed through the port of Pensacola, and by 1900, Pensacola ranked first in timber exports in the United States (Ellsworth and Ellsworth 1982: 66).

In the 1880s, the naval stores industry began to tap the pines for turpentine and other products. By 1905, six distilling plants were established in the Pensacola area, two were within the current city limits: Newport Industries on Bayou Chico and Pensacola Tar and Turpentine at Gull Point. These industries depended on railways and ships to receive raw materials and to transport finished products (Ellsworth and Ellsworth 1982: 66).

Commercial fishing also became an important business during the last two decades of the 19th century (Ellsworth and Ellsworth 1982: 70). Large fish companies employed hundreds of workers. After the advent of manufactured ice in the 1870s, Pensacola produced 100 percent of the commercial supply of red snapper, as well as a large percentage of other types of fish by the mid 1890s (Ellsworth and Ellsworth 1982).

Industries tied to the bays and interior of Northwest Florida affected the growth of the business district in Pensacola. The Pensacola business district developed along Palafox Street between the wharf and Garden Street where buildings were upgraded to “fire proof” structures (Rosenbleeth 1981). The waterfront underwent dramatic change as wharfs were constructed by the railroads, the city, and private businesses. An organized program to expand the waterfront involved the construction of cribs, which were made of heavy timber and bolted together into apartments approximately 12x15ft (3x5m) in size. The cribs were then filled with ballast. Over time, almost sixty acres of dry land was created by five million tons of ballast dumped along the shore of downtown Pensacola (Parks 1986: 78).

With this commercial growth, the town expanded outside the wetlands surrounding the "Old City" of Garden, Cavallos, 8th and A Streets. Railroads or streetcars connected Pensacola to Warrington and provided ready access to North Hill and East Hill where the first suburban residential neighborhoods were established (Parks 1986: 85). "Company towns" grew up around industrial plants in areas such as Hawkshaw, Gull Point, West Pensacola, and Brownsville. Pensacola's first public schools opened also during this time.

This economic boom changed the Pensacola community in many ways. One of the first results was that immediately after the Civil War; the population began to grow at unprecedented rates. By the late 1860s, the population almost doubled, reaching 8,000 by 1870 (Ellsworth and Ellsworth 1982: 60). Most of the new immigrants were Southerners from the interior farming
areas or Europeans. Other immigrant ethnic groups included Greeks, Italian, Jews, Germans, and Irish, along with a Creole community.

Pensacola did experience prosperity during World War I, primarily from the expansion of the Navy and the shipyard. With the coming of the First World War, a naval aviation school was established at the old Naval Yard, which had closed in 1911. Military ship building became a prominent industry with the establishment of the Pensacola Shipbuilding Company which produced a range of vessels from steel hulled ships to wood hulled submarine chasers (Blount 1917). The population grew to 31,105 (Ellsworth and Ellsworth 1982: 97) with most of the immigrants coming from the interior of the south.

The period between World War I and World War II, however, was marked overall by a depressed economy. Uncontrolled and extensive logging, coupled with two devastating hurricanes, had decimated the once great forests of West Florida. With no raw material to support the continued operation of the mills, many were closed (Stringfield and Phillips 1997: 1).

Land development and the advent of the automobile opened Pensacola to new businesses and people in the 1920s. However, the town was deeply affected by the Great Depression of the 1930s, although the presence of the Navy and Army and their growth during this time cushioned the blow to Pensacola (Parks 1986: 94). By 1933, Pensacola joined the rest of the United States in record unemployment, and it had a "hobo city" which grew up near the L&N tracks at 18th Avenue (Parks 1986: 96). A Civilian Conservation Corps center was located at Fort Barrancas and work relief efforts built highways, bridges, buildings, utilities, recreational facilities, and schools. Federal funds were also used to build the first Pensacola public housing in the late 1930s (Ellsworth and Ellsworth 1982: 115).

Automobile access to the beaches was possible during this time, and a network of paved roads connected Alabama and Pensacola, which allowed the tourist trade to begin. Motels, restaurants, and amusement parks were constructed along the beaches (Ellsworth and Ellsworth 1982: 111) drawing people to the area. Today, Pensacola is a vibrant community experiencing continued growth.
Chapter IV. Project Design and Methods

Documenting our historic cemeteries is imperative to preserving them. As preservationist Sharyn Thompson notes in *Florida’s Historic Cemeteries: A Preservation Handbook*, “a vast amount of information can be contributed to the historical record through the study of cemeteries and graveyards. Such sites provide us with a sense of place.” Information related to a community’s settlement patterns, socio-economic diversity, ethnicity, religious beliefs, trade patterns, epidemiology, and demographics can be discerned.

While documenting existing conditions and tombstone information can be accomplished by surveying features evident on the contemporary land surface, historic cemeteries often contain a wealth of information below the contemporary land surface. Documenting this “hidden” layer provides a more complete understanding of how the cemetery was originally structured, how it related to the community over time, as well as identifies the remains of individuals lost to the historical and archaeological records. Additionally, a comprehensive understanding of what lies below, allows for effective management of a historic site’s cultural resources. The Archaeology Institute works closely with St. Michael’s Cemetery Foundation to help with management of this historic site. St. Michael’s is still an active burying ground (about one or two interments a year), and identifying unmarked burials protects them from disturbance associated with modern interments. In order to preserve the cultural landscape of the cemetery, it is necessary to understand the character of the site (marked burials, locations of unmarked graves, depositional sequence, micro topography, etc.). The goal of The Search for the Hidden People of St. Michael’s Cemetery Project is to document, preserve, interpret, and protect the subsurface resources of St. Michael’s Cemetery; advances in subsurface survey techniques can facilitate efforts to achieve these goals.

This project was designed to identify unmarked burials in St. Michael’s Cemetery using three remote sensing techniques. In addition to the remote sensing survey, an in-depth historical research component was incorporated. There has been no substantial research on the location of the 1754-1763 Spanish burial ground or the British cemetery (1763-1781). Moreover, little is known of the individuals who died in Pensacola during the earlier Spanish occupation or during the eighteen years Great Britain held West Florida. Much of the funerary tradition of Pensacola’s Second Spanish Period was also vague. Additionally, it was hoped that some information regarding deaths in the African population of British and Spanish Pensacola could be found.

The Research Team

The core team assembled to coordinate the project included University of West Florida archaeologists Margo Stringfield and Elizabeth Benchley, Co-Principal Investigators; Jay Johnson, Professor of Anthropology and Director of the Center for Archeological Research, University of Mississippi, who directed the remote sensing survey; and Bryan S. Haley, Coordinator of Remote Sensing Applications, University of Mississippi Center for Archeological Research. Undergraduate and graduate students from the University of West Florida and the University of Mississippi also worked on the survey. Stuart Hamilton, UWF GIS Coordinator worked with Johnson and Haley to integrate the remote sensing data into the
cemetery’s GIS. Johan Liebens, UWF geographer, conducted the soil survey, and UWF Archaeology senior graduate students Siska Williams and Kendra Kennedy conducted extensive historical research.

**Testing**

In preparation for the project, two phases of testing were conducted by Johnson and Haley in 2005 to evaluate the effectiveness of using remote sensing techniques to delineate unmarked burials at St. Michael’s. Results from these two testing phases indicated that Ground-Penetrating Radar (GPR) would be very effective and that two other techniques, Soil Resistivity Measurements (SRM) and Thermal Imaging (TI), might also be effective. Several areas in the cemetery were tested including the Northwest corner of the cemetery which was designated Test Area 3. In order to get a comprehensive view of the subsurface, the area of interest is covered in a set of parallel transects, spaced 1 m apart across the entire area. This area of the cemetery contains some relatively open space along with marked burials; additionally, based on probing exercises in the area, unmarked burials were possibly present. Two techniques were employed in this area: Ground Penetrating Radar and Soil Resistivity Measurements. Thermal Imaging techniques were not employed during site testing. Interpretation of data associated with the testing phase is on file at the University Mississippi Center for Archaeological Research.

Ground-Penetrating Radar (GPR) is probably the best known of the geophysical survey techniques that are commonly used by archaeologists. This fact may be the result of television crime shows, but it is also due to the often spectacular results that can be achieved using this technique. In a typical GPR survey, a number of parallel transects are walked, dragging an antenna that both sends electromagnetic energy and receives the reflections of this energy created by buried objects. When the soil conditions are optimal and the buried objects show a strong contrast with the soil, these reflections can be quite strong. In addition, the relative amount of time that it takes for the energy to bounce back to the antenna is a direct function of the depth at which the object is buried. Therefore, GPR data can produce a three dimensional plot of the location of buried features. However, even under ideal conditions, the raw data recorded by a typical GPR instrument configuration can be difficult to interpret. This is primarily due to the complex geometry of the way that energy is propagated and reflected. Consequently, the data processing software used in converting GPR data into a format that is useful to archaeologists is likewise complex. Add this to the fact that GPR can be limited in its effectiveness by dense clays and subtle contrasts between the soil and the buried objects and one ends up with a technique that is often difficult to apply. Fortunately, the soil conditions at St. Michael’s Cemetery are nearly ideal for GPR survey.

Resistivity survey is much easier to understand on a basic level. Electromagnetic energy is introduced into the soil and measured using probes located in specific configurations and at specific locations in order to determine the resistance of the soil at those locations. Dry soils are generally more resistant, while wet soils are more conductive. Depending on the soil, ditches and pits often hold water and show a lower resistance. Another feature of resistivity surveying makes it useful for archaeologists and other people interested in mapping buried features is that the distance between the probes determines the recording depth for the resistivity readings. If a matrix of probes is set up in a survey area and multiple readings are taken at several different
probe separations, a three dimensional model similar to that derived using GPR can be generated. Once again, the data processing needed in order to derive these models is based on complex computations and numerous variables need to be taken into consideration (Figures 4.1, 4.2, 4.3, 4.4).

![Figure 4.1 Test Area 3 Transect 1-04.](image1)

![Figure 4.2 Test Area 3 Transect 1-04. Example of GPR raw data slice showing a profile running south to north crossing marked graves in the northwestern corner of the cemetery. Four strong returns are evident, marking probable burials. These can be seen as multiple hyperbolas located about halfway down the slice.](image2)
Figure 4.3 Test Area 3 Transect 1-04. A composite image created by processing each GPR profile to remove noise and redundant data, refining the image so that it displays the relative strength of the reflection of the signal at each point in two dimensions. All of the profiles are then aligned with one another and placed in their original locations. The space between them is filled with data by extrapolating from the profiles. The resulting 3D data cube allows vertical and horizontal slices to be displayed. In the image of Test Area 3, Transect 1-04, the strength of the reflections is displayed using a color scale ranging from black to dark green to yellow to red to white with areas of strong reflection showing as white. The four probable burials show as isolated white ovals about a third of the way down the profile. These appear to be north-south sections through burials that are oriented east-west. The broad area of high return at the base of the profile is probably the water table.

Figure 4.4 Test Area 3 Transect 1-04. This is a resistivity pseudo section made along the same transect line (as shown in Figure 4.2 and 4.3) by taking multiple resistance readings at 25 cm intervals, up to a maximum separation of 2 m. The same color scale as used in Figure 4.3 is displayed here. Areas of high resistance correspond in depth with the probable burial locations as revealed by the GPR.

Another technique, Thermal Imaging, as the name implies, uses infrared instruments to measure heat from infrared emissions. For example, an image of an asphalt parking lot on a
sunny day will show the hot spots in the front of the parking areas created by automobiles that have driven off. Thermal prospecting in archaeology is useful when subsurface disturbances create areas where water collects. These will be cooler in the morning and warmer in the evening since moist soil typically heats and cools more slowly than dry soil. Depending on soils conditions, ground covered, and the time elapsed since the last rain, it is sometime possible to detect grave shafts in historic cemeteries.

**Methodology for the Project**

Beginning in January of 2006, several periods of fieldwork were scheduled to conduct the remote sensing survey. A preliminary phase of about a week focused on hardware and software adjustments needed to conduct the survey effectively. The primary goal of this phase was to work out the bugs in the systems and gather enough data using ground penetrating radar (GPR) and soil resistivity measurements (SRM) to modify equipment to allow relatively rapid 2D resistivity profiling. A rented Siscal system, which allows for the collection of 3D resistivity data, was also used. In addition to ground based geophysical survey, the team also made use of a thirty foot long, helium-filled tethered blimp to record low level images of the cemetery. Images were generated using digital video and still cameras, color infrared film and a broadband thermal infrared sensor. The thermal sensor is particularly useful in detecting disturbances in the soil. After refining the approach, the team returned for several sessions of fieldwork gathering data. Along with the eight-acre parcel of St. Michael's, limited areas outside the contemporary boundaries of the cemetery were also surveyed to test for the absence/presence of burials. Following completion of fieldwork (December 2007), the survey team concentrated on data interpretation. Both GPR and resistivity data were transformed into three-dimensional models, to better identify burial pits, buried coffins, and crypts. For a more detailed description of remote sensing methods, see Chapter 8.

Use of remote sensing instruments requires precise control of location. The instruments used were integrated with survey grade global positioning system instruments in order to control the horizontal and vertical coordinates of the remote sensing instruments. Collected data was tied to the existing St. Michael's Cemetery Geographic Information System (GIS) using the UWF Trimble 4700 base station, software, TTS300 total station, and 4800 RTK rover. Architectural and Engineering Services at UWF provided a technician to assist in equipment use in the field.

In conjunction with the remote sensing survey, UWF geographer Dr. Johan Liebens, and UWF Environmental Studies students produced a topographical (topo) map of the site. The topo map was integrated into the GIS. Following remote sensing fieldwork, Dr. Liebens conducted a comprehensive soil analysis of the site. Samples were gathered using augers and the testing of discretely placed excavation units. The goal of this phase of the project was to reconstruct the 18th century landscape and assess fill episodes on the site.

In order to assess the effectiveness of the remote sensing technology employed on the project, limited ground truthing was conducted by UWF archaeologists and students over a four week period (August 2006). This was done in conjunction with the soil survey to disturb the site as little as possible. Six 6x3 foot trenches were excavated at strategic sites in the cemetery.
that, based on the preliminary remote sensing data, appeared to be devoid of burials. The areas chosen for trench placement were also selected to reflect a broad sample of soils from the site as a whole. Along with a trench positioned in the south end of the cemetery to document, fill episodes in the wetlands that occurred in the late 19th century (Figure 4.5), the northern roadway, and the cemetery’s mid section (Figure 4.6).

Figure 4.5: Trench 5, south profile showing condensed trash deposits
Due to the tightly compacted concentration of late 19th century trash known to be present at the south end of the cemetery, soils were not screened, rather, a sample of the refuse (including machine made bottles, ceramics, masonry material, and metal) was arbitrarily hand collected. All material recovered from the site was analyzed at the University of West Florida archaeology lab (Appendix 4.A). For a more detailed description of soil survey methods, see Chapter 9.

The purpose of ground truthing was to test the accuracy of the preliminary remote sensing data. At St. Michael’s Cemetery, all invasive work (restoration, basic maintenance, etc.) is approached with caution so as not to disturb marked or unmarked burials. However, because of the nature of the site and its age, unmarked burials are often encountered during routine activities associated with maintenance or restoration projects. When this happens, the burial is documented but not disturbed. If the situation warrants (human remains exposed following vandalism, acts of nature, etc), UWF bioarchaeologist Joanne Curtin is consulted. The Medical Examiners office is also notified when unexpected situations arise. Because trenches were being excavated throughout the site, the possibility of encountering an unmarked burial was a consideration. For purposes of this project, if a burial was encountered during excavation of soil survey trenches, the trench was to be relocated. The edge of an unmarked burial pit was exposed in one trench.

Trench 3 was positioned in the area of oldest marked burials. To test the preliminary remote sensing data, this trench was positioned to extend approximately one foot beyond an area interpreted as likely devoid of unmarked burials. Soil was processed through ¼” screens. At
the south end of the trench approximately one foot beyond the boundary area cleared for the trench, the outside edge of an unmarked burial shaft was exposed (see Figure 4.6). Because there was little definition between the pit fill and matrix, the burial shaft was not identified until excavation had exposed the base of the pit in the south wall. Due to the sandy soils of the area, it is common for colonial era burials to be discrete in the archaeological record. Because excavation of the trench was accomplished before the pit was defined, and because only the edge of the burial pit was exposed, the trench was not abandoned. Soil samples were obtained from the west wall. Several observations concerning the burial shaft exposed in the south profile were noted. The burial shaft was relatively shallow, approximately 3.5 feet (1.06m) below a layer of redistributed top soil and the root mat of the contemporary landscape. Moreover, the shaft did not appear to contain a vault or exhibit organic staining suggestive of a decomposed wood coffin. The trench was backfilled following Dr. Lieben’s sample collections (the unmarked burial was not impacted by sampling). A full description of the soil survey and resulting data is contained in Chapter 9.

As data was collected and analyzed, Stuart Hamilton, University of West Florida GIS Coordinator and UWF students expanded the St. Michael's GIS and incorporated data produced from the remote sensing survey, the topo map, and soil analysis.

Along with survey data, in-depth research of the historical material was inventoried and death records for Pensacola were gathered. Historical material related to the cemetery was added to the GIS SMC web site. This research includes information on town planning, landscape usage, the history of St. Michael's Cemetery, avenues of research for death records for Spanish and British occupations, and a database of those who died in Pensacola but are unmarked. For a more detailed description of historical research methods, see Chapter 10.

Public events included a number of talks on the project to civic groups, a workshop for the Florida Trust for Historic Preservation, papers presented to the Society for Historical Archaeology, a number of public radio and television interviews, newspaper coverage, two large open houses at the cemetery and numerous tours directly focused on the project (Appendix 4.B).

The UWF Archaeology Institute exhibit design team, Margo S. Stringfield and Nancy Miller, designed the exhibit component of the project housed at the exhibit hall of the Archeology Institute and open to the public at no charge, Monday through Friday 8:00AM-5:00PM (Appendix 4.C).
Chapter V. A Discussion of the Transformational Funerary Landscape

by:

Margo Stringfield

As long as people have been present in the environs of Pensacola Bay, burying the dead has been a part of the circle of life. Prior to European arrival, native people moved into and out of the area, hunting in the forests surrounding the bay and harvesting the bays’ abundant marine resources. Along with shell middens, mounds, and village areas, several cemeteries associated with these cultures have also been identified. (Bense 1999: 263; Phillips 1997: 72-96; Harris 1992: 22; Lazarus 1967 Mozingo 2001).

Just as European-born disease decimated native populations at the time of contact between the two cultures (Milanich and Hudson 1993: 239), early European expeditions experienced loss of life on a large scale at times, as evidenced by the loss of life that occurred in Pensacola Bay in 1559 when a hurricane destroyed much of the fleet associated with a settlement expedition led by Tristan de Luna y Arellano (Priestly 1928: 2: 245). To date, the site of the ephemeral Luna land settlement has not been located; however, a cemetery would have been associated with that effort.

Interments at Santa Maria de Galve and Isla de Santa Rosa Pensacola (1698-1752)

The first known Spanish settlements in Pensacola Bay had cemeteries directly associated with the formal place of worship. Burials documented during archaeological investigations at the Spanish Presidio Santa Maria de Galve (Figures 5.1 a and b) at Pensacola Naval Air Station represent the oldest European cemeteries investigated to date in the Pensacola area (Bense 2003: 153). Intact burials documented in a burial trench under the church floor at Santa Maria de Galve were orientated primarily on an east-west axis (one burial was oriented north to south with the head to the north). Individuals were buried in extended positions with arms folded over the chest. No coffins or vaults, nails, or coffin hardware were documented. A few glass seed beads and straight pins were recovered, suggesting that individuals were interred unclothed and wrapped in shrouds (Bense 2003: 154). The documentation of burials under the church floor and in the church yard reflects burial practices that were established in Europe beginning in the 8th century (Sims 2001: 121). Burial in close proximity to the church’s alter was a privilege controlled by the clergy and reflected an individual’s socio-economic standing within the community (Clune 2000, Voekel 2000: 3). The French destroyed the community of Santa Maria de Galve in 1719, and rather than rebuild, the Spanish relocated to a site across the bay on the barrier island of Santa Rosa (Figure 5.2) (Harris 2006: 31).

The Spanish continued the custom of burying under the church floor when they established Isla de Santa Rosa Pensacola in 1722 (Harris 2006: 35). After much consideration, locating a settlement on the barrier island was deemed sound in terms of defending the bay entrance and as a deterrent to Indian attacks from the rear of the settlement (Harris 2006: 30). However, the selection of this location posed other problems, as the community was exposed to the brunt of storms moving onshore from the Gulf of Mexico. The settlement was severely
Figure 5.1. 8ES1354 Santa Maria de Galve site on Naval Air Station, Pensacola: (a) 1719 Fort San Carlos map; (b) burials under the church floor.
Figure 5.2. Dominic Serres drawing of *Presidio Isla de Santa Rosa* ca 1743.
damaged in the storm of 1740, and first hand accounts of the hurricane of 1752 note that burials under the church floor at Santa Rosa Pensacola were displaced as a result of storm surge (Quixano 1752, Harris 2006: 37). Although artifacts reflecting religious practices at Santa Rosa Pensacola have been recovered from areas believed to be house sites, to date the chapel has not been identified archaeologically and no burials associated with the community have been documented (Harris 2006: 221).

Frontier burial locations in Pensacola from 1698-1752 appear to conform to European customs of the time; however, change was in the wind. During the second half of the 18th century, a major shift occurred in funerary practices in the Spanish world; church burials were banned, and the placement of cemeteries away from urban areas was encouraged (Clune 2000, Staples 1997: 15). While the main thrust of the movement was targeted at reducing the power of the church, issues of sanitation and public safety were also a consideration.

Dr. Jay Clune suggests that a shift in funerary customs in the frontier settlement of Pensacola may have occurred because of changes affecting the church in Europe (Clune 2000). In approaching town planning for a new settlement on the mainland, government officials and clergy in Pensacola may have been influenced by reforms occurring in Spain as well as by recent events. The image of bodies washing out from under the church floor at Santa Rosa Pensacola would have been fresh in the community’s memory and might have influenced where the cemetery was established when the settlement was again moved. When the community relocated to the mainland, it may not have been bound by as strong a cultural tradition to bury under the church as earlier communities had been.

Re-establishment on the Mainland: San Miguel de Pensacola (ca 1754-1763)

With the exception of an eighteen year period (1763-1781), there has been a Catholic church in modern Pensacola since the mid 18th century. The ancestor of St. Michael’s Church, in what is today downtown Pensacola, was a small chapel located inside the Presidio San Miguel de Panzacola (Figure 5.3). The stockade, like its predecessors, was the physical embodiment of Spanish power on the Gulf Coast and provided the military hub for an urban settlement effort, which between 1754 and 1763 averaged around 420 settlers and soldiers. The citizenry was composed primarily of people of Spanish, Mexican, Indian, and African ethnicity (Stringfield and Benchley 2004: 16; Benchley 2007: 22). Although located on the Florida Gulf Coast frontier, the multicultural settlement was part of the Spanish Empire and reflected the influence of the mother country.

Formal town planning was a major component of Spanish settlement efforts, as it was in all Spanish settlements in the New World. Overall, earlier Spanish efforts at the settlement in the Pensacola Bay area appear to have been varied in their adherence to the Recopilacion de Leyes de los Reynos de los Indios (Laws of the Indies), a comprehensive set of ordinances that governed many aspects of colonial life in the New World. Town planning was one area addressed by the laws.

While designed to allow for local adaption, the ordinances dealing with town planning dictated that settlements conform to the established Iberian town concept with community
Figure 5.3. Spanish Chapel in *San Miguel de Panzacola* ca 1763.
components laid out on a grid around a main plaza. The church and government buildings were to be situated around the plaza. Some houses fronted the plaza, and then blocks of houses spread outward from the center of town (Lloyd 1986: 255). In Pensacola, there was a good deal of adaptation.

Early drawings of the town and fort offer some indication of how the laws were adapted to comply with ordinance requirements in Pensacola (Figure 5.4). While there was no formal plaza, the fort sat at the center of the community and housed a chapel, various governmental buildings, the governor’s house, and small dwellings for the military. The position of the three gates leading into and out of the fort suggests the initial grid pattern for the town. The gate on the north face opened onto a street or path radiating a short distance to the northeast, toward the upper reaches of *Arroyo San Miguel* (the drainage system surrounding the settlement on the east). The road continued into the interior and branched off towards the brick kiln located on a bayou east of town. Two gates on the southeast and southwest faces radiated east and west affording access to the fort for residents living primarily along the shoreline and in close proximity to the gates of the fort.

Along with other elements essential to complying with the laws, a structure serving as a chapel was centrally located at the hub of the settlement. The formal place of worship was a small wooden building located inside the fort adjacent to the shoreline (Benchley 2007: 32-33) (see Figure 5.3). Descriptions of the chapel do not mention the location of an area designated for burials, and no burials associated with the early community have been archaeologically documented. The area where the chapel stood has been substantially impacted by successive construction activities associated with buildings and roadways (Bense 1999: 121-122). If skeletal remains were uncovered during construction episodes in the area, they were not reported.

Along with the chapel and government house, the fort contained another structure crucial to the support of the community; a hospital, which is shown to be in close proximity to the north gate (see Figure 5.3). The hospital has not been identified archaeologically and little detail is available regarding the health of the community. Nevertheless, based on health concerns at earlier Spanish settlements in the bay area, it can be assumed that disease continued to be a major threat to the population at *San Miguel de Panzacola*. At *Santa Maria de Galve* (1698-1719), yellow fever epidemics were frequent and settlers also suffered from a number of maladies ranging from scurvy to beriberi, as well as from the threat of Indian attacks (Bense 2003: 30-31). The same health threats were present at *Santa Rosa Pensacola* (1722-1752) where reports of a malaria outbreak in 1752 prompted the summons of an additional priest to serve the community (Harris 2006: 41). Hospitals, churches, and cemeteries would have been intrinsically linked.

In all probability, if burials were not occurring under the chapel floor, it is likely a burial ground was established at a short distance outside the fort and most likely along one of the roads or paths that led out of the fortification. The threat of Indian attack was not an unfounded one. In 1760, with the fear of attack looming, people living outside the fort walls moved inside the fortification for protection (Benchley 2007: 30). And, since armed guards routinely escorted
Figure 5.4. Digitized overlay of the 1763 and 1765 town showing Spanish structures.
expeditions to and from the “watering places” (Griffen 1959: 261), it is not likely that the small Spanish community would have situated the cemetery too far from the protection of the fort.

There are two areas that appear to offer the most protection for activities occurring outside the fort. One area is between the smaller Southwest bastion of the fort and a fortified enclosure to the west of the fort. Another protected vantage point was to the north of the fort where the larger bastion on the Northeast corner of the stockade overlooked the road to the brick kiln, the “watering place,” and surrounding countryside beyond the Arroyo de San Miguel gate (see Figure 5.4).

Because of the frontier nature of the settlement, the cemetery was probably not very formal. Moreover, because armed guards were necessary for protection outside the fort, maintaining the cemetery may not have been carried out on a routine basis. Given the time period and cultural group, the Spanish and Mexican dead were likely buried in shrouds and facing east with arms crossed over the chest—a mode of burial documented in St. Augustine, Florida. Moreover, Spanish burials documented in St. Augustine were relatively shallow (at the base, 2.92 feet below ground surface), a burial practice that might also have been common in Pensacola (Deagan 1983: 225; 202-203). During this period, simple wood crosses were also common (Potter and Boland 1992: 4). If any type of organizational grid existed, rows may have been laid out on a magnetic north grid, as were many structures in the community.

Africans often were buried in separate areas and often interred with grave goods or cultural markers such as beads, mirrors, pottery, pierced coins, shells, etc. (Russell 1997: 68, Jamieson 1995: 41, 49-50). Orientation of burials for this cultural group may have differed from orientation of Catholic burials.

The ephemeral cemetery of San Miguel de Panzacola is no longer evident on the contemporary landscape. Without historical or archaeological documentation, discussion regarding location or burial traditions is limited to studied assessment of likely locations and possible comparisons to known burial sites and traditions. While to date, no historical documentation regarding the exact location of the cemetery that served this small Spanish community has been found, the cemetery would have been an active component of the community. Its existence would have been evident on the landscape to those who came after the Spanish.

A Proper Town: British Pensacola (1763-1781)

West Florida was often a spoil of war in the European theater, and at the conclusion of the Seven Years War in Europe, the 1762 Treaty of Paris transferred West Florida from Spain to Great Britain (Johnson 1942: 10). Following the transfer, the Spanish community chose not to remain under British rule and virtually every citizen vacated the settlement. Military personnel and the civilian population (including Africans and converted Indians) left en mass for Havana and Vera Cruz, Mexico (Bense 1999: 22). Catholicism was no longer the religion of state; a protestant country now ruled Florida.
Following a survey of Pensacola Bay and its environs, the British chose to establish a
town around the small double bastioned stockade of San Miguel. Along with renovations to the
fort, town planning was a priority (Minutes 1765). Orientating the town on an arbitrary grid
parallel to the shoreline (approximately 11-13 degrees west of magnetic north), the British
established streets and house lots and began building the basic infrastructure to support the
influx of settlers expected to flock to West Florida (Figure 5.5 and Figure 5.6). Technically, the
Church of England provided the spiritual umbrella for the new colony. However, England’s
interest in West Florida was not focused on the religious growth of settlers; from the onset of
occupation, Pensacola was very much a frontier town whose real value to England lay in the
exploitation of the area’s natural resources (Rea 1984: 148). A business approach to settlement
may have affected the government’s priorities in terms of serving the community’s spiritual
needs. Initially, the existing Spanish chapel inside the fort was used for Anglican services;
however, by 1765 the structure was no longer standing. And, although discussion touched on
the need for a formal church and the Church of England did initially assign rectors to Pensacola,
no church was ever built (Benchley 2007: 51, Gold 1969: 138). Additionally, as rectors did not
serve continuously, only limited information is available regarding church related activities

Some information regarding births and deaths was recorded in parish registers (Durnford
1770); however, the general public in England presumably did not receive in-depth reports of
illness and death in West Florida. English papers focused more on the positive aspects of the
colony to encourage immigration. In one instance, an image of Pensacola that was actually
drawn of Isla de Santa Rosa de Panzacola in 1743 (Universal Magazine 1764) was used to
represent the town vista (see Figure 5.2). The British wanted to encourage immigrants;
however, many of those who came to West Florida found life less than idyllic. Disease and
death affected soldier, citizen, and clergy alike (Cotton 1768).

Death from disease and accidents was a common occurrence from the onset of European
settlement of the Bay area (Smith 1999: 6, Bense 2003: 30, Harris 2006: 34). It is not surprising
that when the British arrived in West Florida, their community was also impacted by disease
and accidents. In 1764, Governor George Johnstone wrote that yellow fever was present
throughout West Florida (Rea 1969: 345-49). The epidemic surfaced again in 1765, affecting a
quarter of the soldiers stationed in Pensacola and one in five civilians. Approximately, 131
people died from yellow fever alone in 1765 (Stroybt 1971: 43).

Among the dead was General Henry Bouquet, who arrived at his new station in
Pensacola on August 23, 1765, and was dead within twenty one days (Cort 1883: 77-78) (Figure
5.7). Bouquet was a well-respected British officer whose arrival in Pensacola came on the heels
of his victorious campaign to suppress the Indian uprisings in Ohio. His resting place in
Pensacola has been a subject of interest over the years (Cort 1883: 78-80). Certainly, there was
a place (or places) selected for burials in Pensacola from the onset of British occupation;
however, there is little mention of burial practices and almost no mention of the exact location
of any cemetery. A burial place may have been so commonly known by those within the
community that it did not need to be formally delineated. For example, John Aikins, a resident
of Jamestown, requested in his will that he be buried “at the usual place outside of town” (Kelso
2006: 163). As a frontier town with no formal church, the burial ground may have been
Figure 5.5. Digitized PLAN of the NEW TOWN of PENSACOLA and COUNTRY...ca 1765.
Figure 5.6. *A View of Pensacola in West Florida* ca 1765.
Figure 5.7. Henry Bouquet.
commonly known but not depicted on maps of the town. Perhaps, because Bouquet was an important personage, some detail of his burial was noted.

Approximately five years after his death, a monument constructed with one thousand imported English gray bricks was erected in Bouquet’s honor inside the British fort (Hutchins 1770) (Figure 5.8). Under other circumstances, as a British war hero, Bouquet may have actually been buried inside the fort as an honor to him. However, that would seem unlikely given the cause of death. In the 18th century, there was limited knowledge of how yellow fever was spread; the British might not have buried him in the middle of a close quarter fortification. Although no British era structures survive above ground in Pensacola (including the monument to Bouquet), archaeological remains are surprising intact in many areas under the streets and buildings of modern Pensacola. No burials have been documented during archaeological investigations within the fort area.

Rather than being buried inside the fort, it would appear more likely that Bouquet was buried at a designated site outside the fort. An account associated with the death of Governor John Eliot in 1769 notes that Eliot was buried twelve feet to the north of Bouquet and in the same row (Durnford 1769). This suggests that not only was there an organized cemetery when Bouquet died in 1765, but also that at least some specifics regarding individual burial sites were known and may have been recorded and mapped. Bouquet and Eliot were important men, and it is possible their graves were marked. Other burial traditions common to the British might also be associated with the burials of Bouquet, Eliot, and others who died in Pensacola under British rule.

It was common during the American Revolution for soldiers to be buried in existing burial grounds near a place of battle (Potter 1992: 6). In the late eighteenth century, burial arrangements were generally made by the deceased person’s family or in the case of a soldier by the military. Wood coffins (with hand wrought iron nails) were commonly used, and while the trade in undertaking had not yet evolved, Pensacola, like most communities, had one or more carpenters (Potter 1992: 6; Fabel: 1988: 214) who would be able to provide that product.

Eighteenth Century British burial practices documented in St. Augustine offer insights on how the British may have approached burial in the sister city of Pensacola. Spanish and British burials have been documented at *Nuestra Senora de la Soledad*, a Spanish church with 17th – mid 18th century burials both under the church floor and in the church yard. Although the British utilized an established Catholic burial ground at *Nuestra Senora de la Soledat*, they buried on the periphery of the church yard away from the dense core of Spanish burials. At the Soledad site, there were several notable differences between burials of these two cultural groups. Like the Spanish, the British were buried in an extended position, however, with arms by their sides rather than crossed on the chest. The 17th century Spanish burials were incased in shrouds (with some simple tapered wood coffin burials occurring in the 18th century), while the British sometimes buried their dead dressed in simple funerary clothing. The British also utilized decorated hexagonal shaped wood coffins and burials were orientated to the west. The British buried their dead deeper than the Spanish, approximately 3.38 feet below the ground surface on average at the base of the burial pit. Many interments intruded on earlier burials, and burial pits often were indistinguishable from surrounding undisturbed soil, often identified when
Figure 5.8. Plan of The Fort of Pensacola (1777) showing Bouquet’s monument.
the faint staining of the wood coffin was identified or bone encountered (Deagan 1983: 190-227).

No African burials were documented at the Nuestra Senora de la Soledad site. However, Africans were present from the onset of British occupation of both East and West Florida. Pensacola received at least 6 African slaves in 1765, 59 in 1766, 120 in 1767, and 23 in 1769. More came between 1770 and 1781 (Fable 1988: 25).

The death rate among this cultural group is unknown; however, there were certainly deaths in the African population. This segment of the population may have had a separate burial ground or space set aside in the general area where Anglican burials were taking place. One such example is documented in Barbados, where, from the 1600s up through the 1780s, slaves were responsible for burying their own dead in their own cemetery (Jamieson 1995: 46). Orientation of African burials has been shown to vary within a group depending on intercultural traditions. Additionally, grave goods or cultural markers such as shells, ceramics, charms, etc. may have been incorporated, and by the mid 18th century, wood coffins were in use for slave burials on plantations (Russell 1997: 68, Jamieson 1995: 48, 53). No burials associated with the African population of colonial Pensacola have been documented to date.

Pensacola and St. Augustine were occupied by the British at approximately the same time, and supplies coming into both colonies were similar. Burial practices may have been similar as well. In the 18th century, markers carved from local and regional stone sources, as well as imported stone, were used in British cemeteries along the eastern seaboard (Little 1998: 52-53) (Figure 5.9a and b); however, given the lack of a local quarry source, if stone was used in Pensacola, it would have been imported. While Pensacola would have had access to stone markers via trade, wood markers might be more readily used. And, a major material at hand was brick. A brick kiln was located to the west of the colonial community (Howard 1947: 68)(see Figure 5.4) No stone markers associated with British burials have been documented in Pensacola. If the British were utilizing an existing burial ground in Pensacola, as they did in St. Augustine, it would have been the burial ground associated with the previous community of San Miguel.

Interest in the location of a community cemetery associated with the initial British occupation surfaced in the late nineteenth century with the publication of historical and biographical sketches focused on Pensacola history, as well as on Henry Bouquet. Biographer Cyrus Cort asked for assistance in locating the gravesite of Bouquet from the War Department Adjutant General’s Office in 1883. The commanding officer at Fort Barrancas made local inquires and was unable to find any information on Bouquet’s burial place. He noted that his inquires pointed to the fact that “all the cemeteries at that place were destroyed prior to 1780, and that there is no trace of them left.” If not destroyed prior to 1780, he noted that they must have been destroyed in 1781, when the Spanish besieged Pensacola (Cort 1883: 79). Given the lack of documentation to support this theory, the commanding officer was probably speculating. The British were still occupying Pensacola in 1780, and the Spanish noted the site of a cemetery to the north of town on maps following the 1781 campaign to take Pensacola (Rush 1966: 120,131).
Figure 5.9a. Example of headstone style. New England ca 1757.

Figure 5.9b. Example of headstone style. New England ca 1787.
Richard L. Campbell posed in his 1892 *Historical Sketches of Colonial Florida* that there was no evidence of the British cemetery because the Spanish raided it for building materials when they returned to the city in 1783. If graves were marked, wood (for crosses) may have been a major construction material just as it was in the construction of structures in the colonial town, with brick used primarily for underpinning (piers) and chimneys (Dodson 1974: 246). While re-cycling of building materials (such as brick) was a common practice in colonial Pensacola (Benchley 2007: 104), no building materials that can be identified as funerary in nature have been archaeologically documented during investigations in the colonial downtown area.

Campbell did propose that the British cemetery was on the Western edge of town and was washed away by erosion between 1860 and 1870 (Campbell 1975: 72). This story may be related to another similar anecdotal account from 1911 of burials moved from an early cemetery on the water to St. Michael’s Cemetery where they were marked with iron crosses, which were later melted down for bullets during the Civil War (Pensacola News Journal 1944). If skeletal remains eroded from the shoreline in the 19th century, they might not necessarily have been British or even European. The Western edge of the settlement, where the stream system empties into the bay, has a substantial pre-Columbian component, as does the area along the drainage system on the west side of the colonial town (Stringfield 1996: 58, Bense 1985). While no burials have been encountered in archaeological investigations focused on the Western edge of the colonial community (or the eastern edge), some burials associated with past land use could have been present. Burials were noted to the north of town in 1887 (Appendix 11).

A ca. 1754-1763 Spanish cemetery could have been located on the Western side of the fort; however, there are two compelling reasons for the British not to place a cemetery on the western edge of town in the area of the stream system. First, the British were using the Western stream as a major source of water for the community and to supply water for the navy. There were stringent laws in place to protect the quality of water in the streams and protect surrounding wetlands (Rea 1987; 46, Stringfield 1996: 25-26). It is unlikely that the British would place a cemetery adjacent to the settlement’s primary source of fresh drinking water (Figure 5.10). Moreover, the Western side of town along the shoreline was occupied by high status individuals such as Sir John Lindsay, Commander of Naval forces in Pensacola, and James Bruce, the customs collector (Stringfield 1996: 59-61). It is also unlikely that the high status individuals coming into Pensacola would choose to place their homes in, or immediately adjacent to, a Spanish cemetery (which would have been evident to all arriving ca. 1763).

Based primarily on Campbell’s 1892 *Sketches*, the urban legend of a British cemetery on the Western perimeter of the colonial town was born and carried forward into the twentieth century. Undocumented reports of skeletal remains uncovered (but not officially reported) during a ca. 1960s construction episode in the filled wetlands on the edge of the colonial community fueled further talk of a cemetery in that location (Sutton 1994). It is not uncommon to encounter substantial deposits of bone (and trash) in low lying areas in Pensacola. The stream and wetlands on the west edge of the colonial community (as well as on the east side of the community) were filled in the late nineteenth century (Koch 1896, Raby-Smith 2004). These fill episodes resulted in the re-deposition of cultural material from a number of sites associated with the colonial community (Stringfield 1995: 64). Bones could easily have been
Figure 5.10. Detail of western wetlands (watering place).
encountered during twentieth century construction episodes in the area. To date, no primary sources contemporary with the British occupation indicate that a cemetery was located adjacent to the wetlands at the Western edge of the colonial community.

Clearly, determining where the burial ground or grounds for the British community were located during the eighteen years they occupied Pensacola has been somewhat problematic. No sign of a 1763-1781 cemetery survives above ground. Secondly, references to cemeteries in British documents and on maps associated with Pensacola are vague. There is some evidence of how the British were managing burials in other towns. By the mid to late 18th century, cemeteries on the outskirts of towns were common. More over, the British utilized existing cemetery sites.

In Savannah, the cemetery was located just outside a north bastion gate into the fort and appears to have been enclosed (Figure 5.11). Additionally, the British were utilizing existing Catholic cemeteries to serve the predominately Anglican populations that moved into other newly acquired towns in West and East Florida. In Mobile (Figures 5.12, Figure 5.13a and b), Pensacola’s closest neighbor, the British buried in an existing French cemetery to the north of town. This area remained in use as a community cemetery after the Spanish regained control of Mobile in 1781. In St. Augustine, an existing Spanish cemetery site was utilized (Figure 5.14).

Troops arriving in East and West Florida from Havana were plagued by a variety of maladies, and their weakened immune systems left them vulnerable to diseases more deadly than the severe scurvy many suffered from (Vickers 1990: 29). Utilization of a burying ground would have begun at once. Along with isolated deaths, it would have been especially difficult to deal with disease and death during yellow fever outbreaks. In Pensacola, during the epidemic of 1765, five out of six officer’s wives, four officers, and around 100 enlisted men died between August and September. Dealing with mortality rates on that scale would, at the very least, present logistical problems. In all likelihood, during outbreaks of yellow fever epidemics, the dead had to be buried quickly, probably without much ceremony and, perhaps, in mass graves. One or more burial sites may have in use.

There are several areas around the bay where burial grounds could have been located in association with hospitals and quarantine stations. The British established a defensive position at the entrance to the bay in close proximity to the site of the 1698 Spanish Presidio Santa Maria de Galve (Figure 5.15). Although the location is unknown, there was a quarantine station located on the barrier island of Santa Rosa and in the area of the careening station across the bay from the fort (Figure 5.16) (Haldimand 1768). A hospital was also located within the fort (Figures 5.17 and 5.18) and a field hospital was established to the north of the fort and near the advanced redoubt of Fort George as tensions mounted during the American Revolution (Figure 5.19).

In 1781, the Spanish (led by Bernardo Galvez) advanced on Pensacola and laid siege to the city. An artillery assault on the queen’s redoubt north of the fort resulted in a catastrophic explosion that killed around 110 men (Rush 1966: 33). There is no mention of where the dead who were killed in the explosion were buried; however, it is not un-likely that the soldiers were buried close to the site of the explosion. While the site of burial for these men is unknown, one
Figure 5.11. Plan of Savannah & its environs in 1782.
Figure 5.12. Plan of Mobile surveyed by P. Pitman 1763.

Figure 5.13a. 1781 Mobile.

Figure 5.13b. 1813 Mobile.
British Cemetery at site of earlier Spanish Cemetery

Figure 5.14. St. Augustine: The Capital of East Florida 1762.

Figure 5.15. Spanish perspective of the British fortifications at the entrance to Pensacola Bay 1781.
Figure 5.16. French survey showing a British hospital on Gulf Breeze peninsula ca 1769.
Figure 5.17. Plan of the Fort of Pensacola ca 1767 showing hospital.
Plan of Fort at Pensacola, 1778

REFERENCE
A The four Blockhouses each containing two Four Pounders.
B Outworks to secure the lower part of the Blockhouses from insult mounting Cannon to secure the Front of the Stockade, Pallisaad and a Ditch.
C Stockade 8 Feet high, loopholed at proper distances with a Wooden Banquette to fire through. The parts at the Salient Angles and each side of the Blockhouses are raised four feet to fire over the Stockade with the Swivels and Musquets.
D Trou de Loup's before the Stockade and Outworks.
E Advanced Redoubt, mounting Cannon, Pallisaad, and a Wet Ditch.
F Prison, a Brick Building.
G The Front of the Garrison toward the Bay of Pensacola, which was constructed with Earth and Facines before the Hurricane.
H The Batteries which are now fit for service and have Cannon mounted on the Platforms.
I These Works are constructed with large logs filled with Earth Sand.
J The lower and upper Floors occupied by the Men, the middle Floor by Officers.
K House building for the Governors residence now converted into an Ordnance Storehouse and Barrack.
L Kitchens built for use of the Troops in the Blockhouses.

Figure 5.18. Plan of the Fort of Pensacola ca 1778 showing hospital.
Figure 5.19. Overview map of Pensacola ca 1780 showing Field Hospital.
18th century burial has been documented in the area of the Fort George redoubt. During renovations to Temple Beth El (corner of Palafox and Cervantes) skeletal remains of an 18th century woman of around eighteen to twenty years old were uncovered. The burial appeared to be isolated, and no cause of death could be determined (Curtain 2003).

In addition to the chance opportunities to document unmarked burials in the area, evidence of burials on both the peninsula, as well as on Santa Rosa Island, have been reported over the years. In 1938, skeletal remains eroded out of the shoreline on the barrier island. Although the wood coffins had decomposed, nails were recovered in association with the burials. No investigation into the age or cultural association of the burials was conducted (PNJ 1938).

In 2005, in the general area of the colonial (and post colonial) era quarantine station on the Gulf Breeze peninsula, skeletal remains were documented along with approximately five hexagonal shaped wood coffin lids (and/or possibly bottoms) washing out from the eroding shoreline (Figure 5.20 and Figure 5.21). The site (commonly known as “Deadman’s Island”) was utilized as a careening station throughout the colonial period and as the site of a hospital and quarantine station up until the turn of the twentieth century (Davidson 1876) (Figure 5.22). Barrel features eroding from the shoreline and containing medicine bottles and personal items associated with the late nineteenth century usage of the site have been documented archaeologically (Stringfield 1994).

Hexagonal shaped coffins began to go out of fashion by the late 19th century, and Dr. Joanne Curtin noted that the teeth of the recovered skull showed no sign of modern dental work and exhibited more wear than might be expected in a person eating a modern, highly refined diet (Curtin 2005). Investigations are underway to further define the age of the burials and their cultural association.

Along with institutional or community cemeteries, small family plots were probably utilized. Outlying farms and plantations located on the upper reaches of the bay, and those situated throughout West Florida, may have had small burial grounds associated with them due to their remote locations. One outlying cemetery was located at Campbell Town, a community approximately ten miles northeast of Pensacola established in 1765 to encourage French settlers to immigrate to British West Florida (Halifax 1765). Elias Durnford designed the town, which appears to have been laid out on a grid similar to the one Durnford applied to Pensacola (Figure 5.23). Unfortunately, no maps survive to indicate the spatial layout of components within the community and little is known of the settlement from the historical record. Moreover, the site has not been archaeologically identified. What is known is that the settlers struggled to support themselves for about six years and, by 1772, had abandoned the settlement (Starr 1976: 532-574). While no information survives to indicate the overall infrastructure of the community, there is documentary evidence of a burial ground associated with Campbell Town. Death records for June 24-December 24, 1770, list seven-month-old Jane Catherine Cooker, who was born at Campbell Town, died of flux, and was buried there in 1770 (Chester 1770). It is possible that this cemetery was servicing both Campbell Town and Pensacola. Given the frequent yellow fever outbreaks, it might have been thought prudent to locate the cemetery well away from the
Figure 5.20. Location of barrel features and burials on Deadman’s Island.
Figure 5.21. Coffins recovered from Deadman’s Island.
Figure 5.22. Digitized map showing late 19th century quarantine station on the Gulf Breeze peninsula.
Figure 5.23. George Gauld map of Pensacola Bay ca 1769 showing Campbell Town.
general community of Pensacola; however, with the site being removed from Pensacola proper, transportation could have been a problem.

The first firm indication of the location of a cemetery associated with the British town is found on a 1778 plan of Pensacola (Figure 5.24). The burying ground is denoted by the letter “E” in the map’s legend and located just north the stream system that formed a natural boundary for the colonial town. By this date, the British had been in Pensacola about 15 years, and it would seem unlikely that a community cemetery was just being organized; the cemetery was, however, being discussed. Governor Chester noted that the community did not have a “proper” burial ground (Minutes of the Council 1778a); and the British Council proceeded to formally set aside 4 acres on the North side of the stream system for the cemetery, directing Elias Durnford to survey the site (Minutes of the Council 1778b). Other instructions included that the land be cleared, enclosed, gated, and bound by drainage ditches. Additionally, paths were to be cleared to the site from the Charlotte Street bridge and George Street, the two main north/south streets running through town and to the north of the community (Minutes of the Council 1778b) (Figures 5.25, 5.26, 5.27).

While at first glance, it might appear that the Council was establishing a brand-new burial ground, they may actually have been formally delineating a site that was already being utilized as a cemetery; for if there was no proper burial ground, it may have been because one was not enclosed. Enclosure was an important component of land management in England and the influence of the British enclosure movement (Scrutton 1887: 117, 146, 153, 160) is reflected in requirements for acquiring and retaining property in Pensacola. Along with house size requirements, lots had to be enclosed with a five-foot-high fence within eighteen months of acquisition (Johnson 1959: 263-280). Failure to comply with the conditions resulted in eventual forfeiture of the property. The use of drainage ditches was also a major component of the English enclosure protocols (Scrutton 1887: 117). In the late eighteenth century, the mention of the use of enclosures (for fields, pastures, gardens, lots, etc.) was commonly employed in property descriptions, and generally, if enclosures were noted, the description would be a positive one (Hawkings 1916: 59-65). If land was not enclosed, it was not seen as settled in a satisfactory manner, as evidenced by measures taken by Robert Carkett, Captain of the HMS Lowestoffe. Carkett took possession of a portion of the grounds on the Western edge of town set aside for Navy purposes by Governor Johnson “as they had never been enclosed or made use of” (Carkett 1770) (see Figure 5.10). Carkett enclosed the land and proceeded with substantial improvements—planting gardens in the organically rich midden deposits present on the site (Carkett 1770 Stringfield 1996: 65). Just as Carkett imposed order on an unenclosed area, it is possible that in taking action in 1778, the council was attempting to bring an established cemetery into compliance with existing community standards. Maps note the cemetery to be located to the north of town; however, it is not shown as being enclosed.

The Archaeology Institute at the University of West Florida has been successful in reconciling colonial maps of the downtown area to the modern landscape. If the British mapped a structure or indicated an enclosed lot line, evidence of these features can generally be identified in the archaeological record. Because the 1778 cemetery is not shown as enclosed, it is impossible to determine its exact size or location; however, if the letter “E” is reconciled to the contemporary landscape, the location of the cemetery falls within a block of the Northwest
Figure 5.24. A PLAN of PENSACOLA and its ENVIRONS... ca 1778.
Figure 5.25. Map showing George Street and Charlotte Street bridge with Cemetery ca 1780.
Figure 5.26. 1781 map showing burials on both sides of the Charlotte Street extension.
Figure 5.27. Aerial photograph (1999) showing 1765 - 1778 roads and tributaries in relationship to St. Michael's Cemetery.
corner of the contemporary boundary of St. Michael’s cemetery. Likewise, the crosses shown on a 1781 map fall partially within the boundaries of contemporary St. Michael’s Cemetery and to the north and northwest of the site. Because the cemetery is not shown as enclosed, there is some flexibility in reconciling the site on colonial maps with the contemporary landscape. It is evident; however, that the location of the British cemetery was in close proximity to contemporary St. Michael’s Cemetery (Figure 5.28). A section appears to fall where the confines of the contemporary boundary of St. Michael’s Cemetery. Colonial era roads cut across what is today the contemporary landscape.

The British occupied Pensacola for eighteen years, and throughout that period, illness and death were common occurrences. The community cemetery would have been a prominent feature on the landscape; however, no physical evidence of the ca. 1778 cemetery or of any other burial site for the colonial community, other than St. Michael’s, has been physically documented. There may be several reasons for this lack of physical documentation.

Given the area’s semi-tropical climate, vegetation would quickly take over any unmaintained area. Additionally, the area in the immediate vicinity of the cemetery indicated on 18th century maps has been impacted significantly by urbanization efforts and modern road building episodes (Raby-Smith 2004). If human remains or grave markers were exposed in any modern construction episodes that have impacted the area, they have not been reported. Although no physical evidence of the British cemetery has been documented to date, the apparently close proximity of a British burial ground to modern St. Michael’s Cemetery suggests that the colonial era cemeteries are either adjacent to each other or that perhaps the British era cemetery and possibly the earlier Spanish cemetery wholly or partially underlay contemporary St. Michael’s.

While it is interesting that so little information is readily available regarding the location of a British community cemetery, it is not surprising. The British were trying to encourage immigration to West Florida and drawing attention to the mortality rate or death in general may not have been in the best interest of promoting settlement. In fact, the population remained relatively small, with a peacetime population that averaged around 1000 individuals (Johnson 1959: 287). Additionally, with no formal church throughout its occupation and no church leader for much of that time, records related to a cemetery could be expected to be scarce. Perhaps, the cemetery was such a utilitarian component of the community that it was not routinely commented on. It was, however, clearly present on the outskirts of the colonial town and was noted by the Spanish in 1781. At this time, the Spanish military and observers of the siege were documenting the overall physical condition of Pensacola as they prepared to reclaim the area (Pardon 1989: 173-175).

The Return of Spanish Rule: 1781

When the Spanish returned to Pensacola, rather than alter the town plan, they retained its spatial configuration and, taking advantage of existing infrastructure, moved into British-built homes and government buildings (Dodson 1974: 291) (Figure 5.29). As there was no church (Protestant or Catholic), and Catholic priests began conducting services for parishioners in a warehouse, a site they would use for that purpose for many years (Dawkins 1991: 30) (Figure
Figure 5.28. Aerial photograph (1999) showing 1778 "Burying Place" and 1781 burials in relationship to St. Michael's Cemetery.
Figure 5.29. Map showing “Cemetery” ca 1781.
Figure 5.30. View north (Alcaniz St.) from the contemporary site of the British era Charlotte Street bridge.
There is no indication that the practice of burying under the church floor was implemented, and there is no indication a cemetery was positioned adjacent to the building.

Little is known of the early years of Spanish re-occupation of Pensacola; however, disease remained a constant at the small frontier town where priests conducted last rites and took the last testaments of the sick. In the “List of Names Extracted From the Report of the Holy Visit of 1791,” the church recorded payments associated with the dead and dying and wordage suggests that a cemetery was associated with St. Michael’s Church and actively in use in 1786 (Coker and Inglis 1980: 54). Aside from the mention of interment fees and such, little is known of the cemetery serving the now primarily Catholic community in the early years of re-occupation. Between 1781 and 1810, there is no known map that shows the cemetery’s location. Further, many documents associated with Pensacola’s Second Spanish occupation are assumed to have been lost or destroyed following the handover of Spanish West Florida to the United States in 1821. Catastrophic events also affected the survival of records. One such event was a fire in 1882 that destroyed the Catholic Church and its stored records, many of which were associated with the early congregation (Dawkins 1991: 84). Some documents do survive and offer insights on the population as a whole and death within the population. To date, a minimum of 242 individuals who died and were buried in a cemetery associated with St. Michael’s Church between the years of 1781 and 1819 have been identified (see Kennedy and Williams 2008).

Among them are Jose Barela, boatswain of a ship; storekeeper D. Blas Gonzalez; Maria Suarez; and Lieutenant Colonel Dn. Francisco Cruzat (Coker and Inglis 1980: 54-55). During the above mentioned time span, the overall population averaged around 420 people (Coker and Inglis 1980:143). The community was composed primarily of people of Spanish, Mexican, and African ethnicity, and many Hispanic men married or lived with African or Mulatto women and their children (Coker and Inglis 1980: 31-32; 48; 52). The dead were likely buried in wood coffins, in extended positions with arms crossed over the chest. Shroud burials could also have still been taking place (Deagan 1983: 225). Given the community’s poor economy, wood crosses were likely common; however, citizens did have access to goods from outside Pensacola via the Panton Leslie, the company trading house, and other storekeepers in town (Coker and Watson 1986: 125). Along with Christian expressions, the African population may have incorporated more vernacular expressions. Grave goods or vernacular grave markers incorporating such items like seashells, beads, pots, pierced coins, etc., could have been common on African burials (Wilkie 1997: 89-90). To date, no markers associated with the Spanish community ca. 1781-1810 have been located. However, by 1810, a formal cemetery had been surveyed and mapped. The survey noted the community burial ground was called St. Michael’s Cemetery, a name that was associated with the Spanish community and its church beginning with the ca 1753 settlement of Presidio San Miguel. Based on a comparison of historic and modern map overlays, the site surveyed for the cemetery was in close proximity to (if not encompassing a part of) the site of the British era burying ground (see Figure 5.26).
Chapter VI. St. Michael’s Cemetery: A Formal Identity

by

Margo Stringfield

By 1781, Pensacola had evolved from a small frontier outpost serving citizens under Spanish rule into an orderly town of streets, homes, warehouses, with an infrastructure befitting a mercantilist venture of the British Empire (Padron 1989: 174). The British Fort of Pensacola functioned primarily to support and to protect trade and was the physical symbol of British power on the Northern Gulf Coast. When Spain regained control of West Florida in 1781, it acquired a prize with the potential for expanded economic growth (Padron 1989: 175). However, from the onset of re-occupation in 1781, Spain struggled unsuccessfully to build on the economic base established during the eighteen years England held West Florida and Pensacola. Although Spain inherited an economically viable, well-established town (Padron 1989: 173-176), it was unable financially to support sustained growth (Pitot 1979: 92). Twenty-five years after regaining Pensacola, officials were not only unable to support sustained growth but also unable to support basic needs. To meet these needs, the government looked to the possible assets at hand.

In 1807 (following an influx of people from New Orleans who chose not to live in American held Louisiana), there was an effort to identify abandoned property that could be converted to crown use and sold to support the government. To this end, the Spanish governor ordered the town to be re-surveyed (Flourish 1814). Streets and lot lines were not significantly altered, rather were re-established on the city grid initiated by the British (Pintado 1807). Individual petitioners had to present claims to re-surveyed town lots and open land, which were either upheld or denied (Morales 1807). Lots and open lands that were not firmly associated with the petitioners reverted to the crown.

Just as individual claimants petitioned for legal recognition of their house lots, the Catholic Church petitioned for legal recognition of the cemetery (Morales 1809). The intent of the survey implies that St. Michael’s Cemetery (like all of the land claims of private lot owners) was not being established in 1807; rather, it was confirmed as a burial ground in a re-survey of the city. When citizens petitioned for legal recognition of thirty arpents of land (approximately twenty five acres) for use as a cemetery by the citizens of Pensacola, the area associated with St. Michael’s Cemetery probably had been utilized as a burying ground for many years (see Chapter 5).

Maps of the town, along with legal descriptions, indicate that, by 1810, the cemetery was defined as a rectangular, twenty-five acre tract of land that conformed to the British grid (approximately 11-13 degrees west of magnetic north) and was located north of the colonial community (Pintado 1807, Morales 1809) (Figures 6.1 and 6.2). Arroyo de San Miguel (known by the British as Cadet Creek) and its attendant wetlands dissected the Southern end of the cemetery. The space allotted to the cemetery was relatively large given the town’s population, which at a peak of population in 1807 and stood at around 1200 (Coker and Watson 1986: 88).
Figure 6.1. Vincent Pintado survey of “The Catholic Inhabitants Claim to 30 Arpens of Land” ca 1810.
Figure 6.2. Survey of Pensacola ca 1827 showing Cemetery plat.
Moreover, the burying ground was well removed from the small structure designated for use as a church, which was located in the old British fort grounds (see Figure 6.2).

Because the Spanish utilized the existing British town plan and its associated facilities, it is not unlikely that the Spanish would also utilize the same area chosen by the British as a burying ground. They might not, however, have chosen to directly mingle their dead among Anglican burials given religious differences between the two. In 1781, the location of the British cemetery was clearly defined on maps of the town (see Figures 5.24 and 5.27) and would have been evident to individuals returning to re-occupy Spanish-held Pensacola. There is no indication that the Spanish maintained British gravesites, and in Pensacola’s subtropical climate, rapid overgrowth would easily overcome and obscure neglected burials. At some point after 1781, surface documentation associated with the British era cemetery was lost. In its place, an expansive cemetery that conformed to the British grid continued to serve Spanish Pensacola.

The Spatial Landscape of St. Michael’s Cemetery

Cemeteries reflect many aspects of the communities with which they are associated. In St. Michael’s one reflection is evident in a spatial sense. Although the boundaries of the ca. 1810 cemetery conform to the British grid, many burials within the cemetery do not. In the area around the south road, a number of generally east/west grave markers and enclosures are positioned on a magnetic north axis; others are positioned with no apparent attempt at alignment within the cemetery (Figure 6.3). This spatial characteristic is commonly documented in architectural remains associated with ca. 1754-1763 Spanish-built structures in Pensacola (Bense 1999:146) (Figure 6.4). During the Second Spanish occupation and on into the early Territorial period, burying east/west on the magnetic north axis was common (Figure 6.5). This tendency to position burials at an angle, not aligned with the town grid, was noticeable. Robinson Preston described the cemetery in his journal in 1829, noting the spatial distribution of graves:

*Walked up the hill in the rear of the city--surveyed the ruins of the old fort [Fort George redoubt]. Discovered a road leading in the direction I had understood the burying ground was-- determined to follow it-- discovered the ground-- unfenced-- among the bushes-- no order as to position among the graves, many without palings--the Spaniards lay the coffin on the ground-- turned a cemented brick arch over it-- in process of time the arch gives way & the coffin & bones are left bare-- saw many bones scattered on the ground...* (Preston 1829).

And, in 1897, an article in Bliss Quarterly noted the obvious difference between burial orientation in the older, marked section to the south as opposed to the town itself and more contemporary marked burials in the Northern section of the site.

“It is noticeable in going over the ground that many of the tombs and graves do not lie exactly east and west, some of them varying several degrees, the older ones appearing to vary the most from present established lines, the variation decreasing and finally disappearing entirely as the interment came down to a late date” (Bliss Quarterly, January 1897).
Figure 6.3. GIS of St. Michael’s Cemetery showing period usage.
Figure 6.4. Spanish hearth feature ca 1754.
Figure 6.5. Jose Roig box tomb ca 1812.
In St. Michael’s Cemetery, the oldest extant markers are concentrated on either side of the Southern roadway that parallels a low ridge bordering the filled stream bed and wetlands of Arroyo de San Miguel (Figures 6.6 and 6.7). Extant markers and tombs illustrate the use of marble for tablets, markers, ledgers, and statuary (Figures 6.8, 6.9, and 6.10). Brick and mortar box tombs and above-ground tombs with stucco coatings are also common (Thompson 1988: 3-4) (Figure 6.11). One example of metal funerary material recovered from the site is a “replacement marker” associated with an early 19th century death. A 20x13 cm metal plate was recovered (disturbed context) from the Southern end of the cemetery in a shallow construction trench associated with ca. 1940s concrete coping (Figure 6.12). The information on the plate, etched in Spanish, notes the death of a young man in 1816.

GREGORIO CARO
MAURIO MARZO
5 DE 1816 EDAD 16
ANOS Y 8 MESES

While Gregorio Caro died in 1816, the plate itself may postdate the death date by some 50 years or more based on a preliminary assessment of the style of the stencil template. This style was not in use until after ca. 1850/1860; the style remained popular into the early 20th century (Kindel 2008). The marker material has the appearance of bronze; however, it may more likely be an alloy of brass and lead (Smeijers 2008). A two inch band of iron corrosion evident on the back side of the plaque suggests the plate was attached to an iron stake or a band.

The marker memorializes the death of a young man from a Creole family of shoemakers who probably came to Pensacola from Louisiana around 1804. At that time, the census listed a family of five. By 1860, the family had grown to around 25 members (Coker and Inglis 1980: 110; Escambia County Florida Census 1860). University of Reading Lecturer Mr. Eric Kindal notes that there is a Hispanic tradition (e.g. Mexico) of using stencils on grave markers and headstones, as well as using a possible Portuguese model. However, because stencils are utilitarian and produce a ‘regulated’ result, they may have been used commonly for this purpose in other cultures as well (Kindal 2008).

The age of extant markers clustered around the south road and possibly the orientation of marked graves suggests that this section of the tract was favored during Pensacola’s Second Spanish Period (1781-1821) and into the Territorial period when the community’s culture was still heavily influenced by the Spanish tradition. Although there is some elasticity in delineating the exact paths of roads outside the colonial core, reconciliation of colonial maps to the contemporary landscape suggests that the contemporary roads that cut through the cemetery are remnants of colonial era thoroughfares (see Figure 5.26).

At the extreme Northern end of the cemetery, gravesite orientation generally conforms to an 11 to 13 degree west of magnetic north alignment (the British designed grid) and, with few exceptions, legible markers postdate 1861 (see Figure 6.3). Although included in the boundaries of the ca. 1810 cemetery, based on surface documentation, this section of the site was not used by the post-1781 population until well into the 19th century.
Figure 6.6. South gate and southern road ca 1890’s looking east. (Pensacola Historical Society).

Figure 6.7. Southern road seen from west entry ca 2008 looking east.
Figure 6.8. Glass negative photograph of St. Michael’s Cemetery. Site unknown ca 1890.

Figure 6.9. Glass negative photograph of St. Michael’s Cemetery. Site unknown ca 1890.
Figure 6.10. Lardner monument ca 1821 showing wood cross in background.

Figure 6.11. Lardner monument ca 2007.
Figure 6.12. Metal marker of Gregorio Caro (died 1816, marker produced post 1850).
Support for partitioning Catholic from non-Catholic burials was evidenced as late as 1830, when the Catholic community in Pensacola proposed erecting a physical barrier midway through the cemetery, formally separating Catholic and Protestant burials (Pensacola Gazette January 30, 1830). At the same time, citizens also proposed raising the monies to erect a five-foot-high “permanent brick wall around the burying ground” (Pensacola Gazette (PG) 1830). The specified height of the wall conforms to British fence enclosure heights required in the mid to late eighteenth century (Scrutton 1887: 117, 146, 153, 160, Johnson 1959: 263-280). There is no indication that the brick wall was erected to separate religious groups; however, there is some evidence that an east/west wire fence was in place in the mid to late 1800s to demark the extent of burials to the north at that time. When burials began to extend over into the extreme Northern section of the cemetery in the late 1800s, the fence was removed and a sidewalk installed (Bruington 1986).

For a small community with no great expectations for growth, Pintado surveyed a large tract for use as a cemetery. The location of the earliest marked burials along the south road and the absence of early marked burials in the north end of the site suggest that as Pensacola became more culturally and religiously diverse and possibly, as time and the elements obscured the evidence of any earlier burials around the Northern end of the cemetery, a shift to the north may have been a natural and sensible approach to land use.

A Democracy of the Dead

A diverse mixture of people lived in Pensacola during the Territorial and Antebellum periods. New American settlers, old French and Spanish citizens, immigrants from Germany, Ireland, Italy, and other European countries hoped for economic advantages in the wake of American sovereignty. Growth was slow, however, and between 1822 and 1860, the population remained steady at around two thousand inhabitants. Of these, slaves and free Blacks accounted for around one half of the population (Rucker 1990: iii). St. Michael’s Cemetery remained the central burial ground for the community. Several isolated burial grounds, such as “Old Cantonment Clench cemetery” located outside the Western edge of town and active ca. 1821-1870 (Pensacola News Journal 1934) (Rucker 1990: 51, 59, 83), were in use on a small scale.

Aside from a few public notices, little is known about the physical state of the cemetery during the Antebellum and Civil War periods. Although under the umbrella of the Catholic Church, letters and newspaper articles regarding the cemetery suggest that citizens regarded the site as a public place, for use by Catholic and Protestants alike. In 1841, the Pensacola Gazette carried a lengthy article regarding the state of the cemetery. The Trustees of the Catholic Congregation requested that the public discontinue the practice of “shooting a mark” in the graveyard, and the Gazette further noted that the “roads leading through the cemetery are to be blocked up in order to prevent the passage of carts and carriages.” The paper then strongly rebuked citizens for the lack of a decent fence around the cemetery and remarked that there was “no other town of equal size with Pensacola, in any Christian country, that has so utterly neglected the care of its dead” (PG 1841).

Although never a boom town, the capture of Pensacola by Union troops in 1862 led to a drastic decrease in the civilian population as families fled the city. Dr. John Brosnaham noted
in his diary that as of 21 July 1863 there were only seventy-two “Whites” and ten “Colored” people left in the city (Brosnaham 1863). The small community and its occupying force faced disease together. The yellow fever epidemic of 1863 claimed 380 lives (Stroybt 1971). Given the low number of civilian occupants in the city, much of the death toll would have been military. Union forces controlled Fort Pickens and Fort Barrancas at the entrance of the bay and a separate cemetery was associated with the navy yard (Rucker: 1990: 51; 59; 83). Union forces also set up a field hospital in the Episcopal Church located at the center of the mostly deserted town (Stringfield and Benchley 2004, Williams 2004). Only one marked grave in St. Michael’s Cemetery is dated 1863 (Roth 2006), suggesting that the dead were either transported to the navy yard or left to lie unmarked graves in the community cemetery close to the Union field hospital.

Although the town remained virtually untouched, there is some evidence that St. Michael’s was impacted by the occupation. Union forces were given an order to destroy tombstones and structures in the cemetery to prevent Confederate soldiers from using them as shields. This order was apparently not carried out on a large scale (Holbrook 1882), however, and given existing conditions and the impact of a military occupation, funerary material was likely lost.

Prior to 1861, construction materials (other than brick) were imported into Pensacola via regional trade (Thompson 1988: 65-66). The marble tomb of John Hunt, who died in 1851, was procured from New Orleans stone carver Flourville Foy at a cost of $4300 dollars (Hunt 1851, Thompson 1988: 40) (Figure 6.13), a sum equivalent to approximately $106,000 in 2007 dollars (Harper 2007). Hunt was buried in a hexagonal shaped lead lined wood coffin resting on the brick floor of the elegant above ground tomb (Stringfield 2006). Hunt was a wealthy man with access to the best of materials. Had he lived a few more years, his heirs may have chosen a different coffin as a major shift in the popularity of casket material was occurring. In 1848, the cast iron casket was patented, and by 1854, models began to be produced (Allen 2002).

The evolution of the profession of undertaking began in the late eighteenth century with actual funeral directors emerging in the late nineteenth century (Allen 2002). In Pensacola, one of the first to practice the profession was Francis Pou (F.R. Pou Feed and Livery Stable and Funeral Director), who opened his business in 1897 (L&N Railroad Magazine 1905). At least some of the products used by Pou were imported regionally. An example of the type of materials used was exposed in the cemetery following Hurricane Ivan in 2004. A marked, but undated, burial located in the plot of a well to do family in St. Michael’s Cemetery (burials date from 1862-1923) was encased in a wood coffin. The associated wood shipping crate was utilized as a vault to hold the coffin. The coffin and crate were shipped from New Orleans to “Pou and Co.” in Pensacola (Stringfield 2005). The burials of Hunt (documented following exposure after a vandalism episode in 2006) and the unknown Pfeiffer burial (documented following exposure after Hurricane Ivan in 2004) offer insights (albeit limited) into burial practices of prominent and well-to-do individuals buried in St. Michael’s Cemetery in the mid to late 19th century to early 20th century. It is generally thought that rural communities lag behind urban centers in picking up stylistic changes (Allen 2002), and this theory may explain why an individual from a well to do family who died in Pensacola around the turn of the 20th century was buried in a wood coffin rather than a metal one.
Figure 6.13. Tomb of John Hunt ca 1851.
While Hunt and “Pfeiffer” represent a well-to-do segment of the population, their burial site was still subject to much neglect. In 1871, the cemetery was fenced; however, *The Weekly Commerce* lamented the poor condition of the cemetery and specifically mentioned that the fence on the north and east side of the cemetery “is in very dilapidated condition” (*Weekly Commerce* (WC) 1871). The mid-nineteenth century fence was probably a wooden palisade fence as shown in a ca. 1897 photograph published in *Bliss Quarterly* (*Bliss Quarterly* (BQ) 1897) (Figure 6.14). This photograph also shows a structure inside the cemetery (by the south road) noted to be a caretakers house. The cemetery appears to be well kept from this photograph and several of the above ground tombs appear to be whitewashed. Brick and marble continued to be the material of choice; however, wood remained a construction material as well. Along with simple wood crosses (see Figure 6.10), more elaborate carved markers were utilized by members of the German community. The tablets of Gertrude Bonnauer and Wilhelm Voss were hand carved of cedar in the Bavarian tradition (Figure 6.15). Replicas of the two markers were produced by the Flora Bama Cut Ups, a local wood working club (Robertson 2008). The original markers are curated at West Florida Historic Preservation, Inc. This photograph along with others of the time captures the landscape, showing a dense over-story of oak. By 1898, the Southern section of the cemetery was being referred to as the “older, historic end” by those pushing for preservation of the site (*Daily News* (DN) 1898).

**Landscape Changes and Urban Growth**

By the late-nineteenth century, major changes were occurring in the community as Pensacola experienced an economic boom related to the shipping, timber, and fishing industries (Stringfield and Phillips 1997: 31-33). The town grew beyond the confines of the natural border of the colonial community, and the cemetery was no longer in a rural setting outside the town limits; rather, it was surrounded by a growing urban expansion (Figure 6.16a). Urban growth and development caused many changes to the landscape, and one change in particular affected the cemetery. At the end of the nineteenth century, the two stream systems that surrounded the colonial community were filled in (Raby-Smith 2004). This was probably done for a variety of reasons. By the late 19th century, the stream systems were degraded due to overuse and neglect. In 1886, the city sank wells to meet the urban water needs of the growing community (Rosenbleeth 1981). Health concerns were also an issue. In the mid to late 19th century, yellow fever was thought to be somehow associated with poor sanitation (Crosby 2006: 79). Filling in the streams and wetlands could have been an attempt to control disease. The streams, which are clearly delineated on an 1885 drawing of the town (Beck and Pauli 1885), appear to have been filled in by 1896 as they are not shown on a map drawn in that year (Koch 1896) (Figure 6.16b).

Physicians working for years to find the cause of and cure for, yellow fever triumphed as the twentieth century began: the disease was proven to be mosquito-born, leading to the successful development of a vaccine (Crosby 2006: 203-205.). While yellow fever was not caused by impure water, it was, in a sense, water-born. The protected, free flowing streams used by the British were not as fertile a breeding ground for mosquitoes as the degraded water system cutting through the postcolonial town. The last yellow fever epidemic in Pensacola occurred in 1905, causing 68 deaths (Stroybt 1971). Yellow fever wrought death in Pensacola for over 132 years; only 65 markers in St. Michael’s Cemetery date to years when yellow fever epidemics occurred (Roth 2007) (SMC/GIS) (Figure 6.17).
Figure 6.14. St. Michael’s Cemetery from Alcaniz Street ca 1897.
Figure 6.15. Gertrude Bonnauer wood marker, (replica).
Figure 6.16a. Bird’s Eye view ca 1885 showing Cadet Creek (Ayrro San Miguel) drainage.
Figure 6.16b. Bird’s Eye view of Pensacola 1896 showing Cadet Creek as filled.
Figure 6.17. Deaths during Yellow Fever epidemic years.
Beginning in the late 19th century, the stream bed at the Southern end of the cemetery that had once served as a boundary for the community and as a principal water source was used as a trash dump for the town (Bense 1985: 148), an activity which would lead to an accretional build up of sediments and refuse that obscured the features of the original stream bed and, eventually, resulted in the creation of a new land surface on the Southern end of the cemetery (Figures 6.18 and 6.19, see Figure 4.5). Burials at the extreme south end of the cemetery do not occur until after 1891 (see Figure 6.3).

By the late 19th century, Pensacola was enjoying a booming economy associated with the shipping, timber, and fishing industries (Parks 1986: 75). Along with goods flowing out of the area, merchandise also flowed in. A shift in consumer preference based on the introduction of new technology is reflected in the cemetery. Hand-carved marble, the primary stone material in use from 1812, was displaced in the late 1800s as a marker material of choice by granite. In the 1860s, a diamond embedded circular saw that was able to cut granite was developed, and by the 1890s, the technology was refined, ushering in a new fashion in funerary construction material. This trend is exhibited in St. Michael’s Cemetery. Of the seven marked burials extant from 1894, three are granite. By 1910, one half of burials are marked by granite, and by 1930, all but one of the eighteen dated markers is granite; the exception is a marble confederate veteran commemorative marker (SMC/GIS 2007). Another trend was a shift from wood paling fences to cast iron fencing (Thompson 1988: 96-97) (Figures 6.20 and 6.21). New trends were not only reflected in marker and fencing materials, as the nature of the old community was changing.

With a population base of four thousand and growing, affluent citizens were moving out of the urban core and into new neighborhoods to the north and east of the downtown. By the 1880s, downtown Pensacola and the suburbs were serviced by a growing transportation system (Pensacola Commercial 1882). While the city grew to the north and northeast, the area around St. Michael’s Cemetery declined. The east side of the colonial town was historically a middle to lower socioeconomic area (Stringfield 1996: 24, 36, 156) and remained so into the late twentieth century. With a shift of population away from the downtown core, the establishment of a garbage dump adjacent to the cemetery to the south and a major rail spur to the west (Raby-Smith 2004) (Figure 6.22), the area around the cemetery became more industrialized, and housing in the area was targeted toward laborers and their families (Raby-Smith 2004). In 1876, for the first time since the formal survey of a community cemetery was conducted in 1807, a new twenty-six acre burial ground was established adjacent to the booming suburb of North Hill and christened St. John’s Cemetery (Bancroft 1995) (Figure 6.23). In 1876, Temple Beth El, the oldest congregation in the state was founded, and a cemetery was established several blocks west of the Temple. More cemeteries began to dot the landscape, including St. Joseph Cemetery established in 1899 to serve not only the Creole parishioners of St. Joseph Catholic Church (an outgrowth of St. Michael Church), but also the wayfarers and seafarers who lost their lives in Pensacola (Lewis 1997: 12). Residents of Pensacola had a choice of burial grounds, and many chose to use the new suburban cemetery.

While some areas of St. Michael’s Cemetery were obviously maintained (see Figure 6.20) much of the cemetery was not. Images from the late 1800s indicate that the cemetery was overgrown and that the funerary architecture in a deteriorated condition (see Figures 6.8, 6.9, and 6.10). Building materials and architectural styles seen in the photographs indicate the use of
Figure 6.18. The City Dump ca 1919 (1919 Fire District Map of Pensacola. Copy on file at UWF Archaeology Institute).
Figure 6.19. Contemporary land surface at south end of St. Michael’s Cemetery.
Figure 6.20. Perspective looking west from the south road ca 1897.

Figure 6.21. Perspective looking west from the south road ca 2006 showing landscape changes.
Figure 6.22. St. Michael’s Cemetery showing Alcaniz Street to west and housing on former Cemetery land to east and south, and filled wetlands, ca 1896.
Figure 6.23. Bird’s Eye view of Pensacola ca 1896.
brick and mortar for structures such as box tombs and above ground tombs as well as marble for tablets and wood for vernacular crosses. Although granite features are not in evidence in these photographs, they were introduced around the time the photographs were taken.

Wood fences appear to have been used extensively; however, many of the picket fences surrounding individual plots and grave sites were falling down. None of the wood fences survives into the 21st century. The actual overall condition of the cemetery is in stark contrast to the image presented on the funeral notice of S. Brohnam who was buried in St. Michael’s in 1887. Mr. Brohnam’s funeral notice suggests a serene garden setting (Figure 6.24); however, if Mr. Brohnam’s burial was marked, the marker no longer stands in the cemetery. Along with neglect, the cemetery was also being encroached upon.

As early as 1819, a hand-drawn map indicates “lots” on the south side of the stream system within the cemetery that were reserved to protect the stream bed from damage (Brosnaham 1819) (Figure 6.25). However, once the streams were filled in, the land in and around the Southern end of the site began to be used for other purposes. In 1887, the Catholic Church detached land from the Northeastern and Southern borders of the original parcel, effectively reducing the formal cemetery from 25 to 8 acres in size (Mead 2001). A Birds Eye View of the town ca. 1896 shows houses on the west perimeter of the cemetery (see Figure 6.18) and along the Southern border and Eastern section included in the original survey. These modest wood structures primarily provided housing for laborers working on the docks, rails, and mill complexes in the immediate area (Bense 1985: 180). By 1918, the city dump was operating at the Southern end of the original 1810 surveyed cemetery (see Figure 6.18). While the cemetery proper was reduced in size, the need for burial spaces was ongoing.

After 1905, yellow fever was no longer a threat in Pensacola; however, other diseases as well as natural disasters affected the community. The hurricane of 1917 inflicted a good deal of damage to the downtown area, and while there is no record of damage in the cemetery, some must have occurred given descriptions of damages to buildings (Lewis 1997: 26). The following year, a major influenza outbreak occurred, reminding some of the old yellow fever epidemics that affected half the city at a time. Undertakers were all busy burying the dead. Among them was Goldstrucker Brothers Funeral Directors and Embalmers, serving the Creole/African American community (Lewis 1997: 27).

While St. Michael’s remained open to burials by all ethnic groups, by the first quarter of the 20th century several cemetery, associations formed to serve the Creole and African-American communities. Along with St. Joseph’s serving the predominately Creole and African-American congregation of St. Joseph’s Catholic Church, Zion AME and Magnolia Cemeteries were established to serve as burial grounds for the African-American community (Lewis 2008). The architectural influence of St. Michael’s Cemetery is reflected in monuments found in cemeteries associated with ca. 1920s African-American burial associations, and vernacular cultural makers are common in both St. Michael’s and the Creole and African-American burial grounds. The vernacular above-ground tomb of Mr. Goldstrucker’s family, located in Magnolia Cemetery, is one of several reflections of architectural styles found in St. Michael’s Cemetery (Figures 6.26 and 6.27). Other expressions of the vernacular in evidence at St. Michael’s Cemetery and at later African-American cemeteries of Pensacola include the use of shell and
The friends and acquaintances of Mr. S. BRONNUM, are invited to attend his funeral from his late residence on East Gregory Street, to-morrow (Sunday) afternoon at 4 o'clock.

Interment in St. Michæl's Cemetery.

Pensacola, March 12th, 1887.
Figure 6.25. Brosnaham map of Pensacola ca 1819 showing cemetery.
Figure 6.26. Goldstucker vernacular above ground tomb (Magnolia Cemetery ca 1920).

Figure 6.27. Hughes above ground tomb (St. Michael’s Cemetery ca 1898).
pressed concrete markers (Figures 6.28 and 6.29). Vernacular markers (made of wood or other marginal construction materials) and movable items like shells are easily lost, broken, or taken from cemeteries. When they are the only markers, the loss of these objects often results in the loss of surface documentation of a burial site.

Although the Catholic Church kept interment records for the cemetery beginning in 1841, no early maps of the site are known to exist. In the 1930s, a major survey of the cemetery was conducted by Mrs. Lola Lee Bruington, a local genealogist, who methodically recorded information inscribed on tombstones, noted types of fences surrounding plots, wood markers, and remnants of above ground tombs and walls. Additionally, Bruington included miscellaneous personal notes gleaned from family members, often regarding unmarked burials (Bruington 1986). The Bruington survey is the authoritative source for information regarding early sites that have since ceased to be evident on the land surface of the cemetery. Bruington recorded 2,700 marked graves. Based on a comparison of the cemetery’s GIS and Bruington’s survey, approximately 1,000 graves surveyed by Bruington are no longer evident on the contemporary landscape. At the time Mrs. Bruington began her survey, she noted that many of the tombs were dilapidated due to age and neglect and that she had to clean away trees and vines before reaching some sites. The condition of the site in late 1937 prompted another series of community clean ups (Bruington 1938: ix-x).

Although Bruington did not draw a map indicating the location of each site, she did describe the method she used, and it is possible to piece together the survey path, which is very helpful in reconstructing the location of sites no longer visible. She also sketched an outline “map” she used to arbitrarily separate sections. Bruington notes (via a dotted line) the existence of a ca. 1870 fence separating a section she labels “concentrated ground” (Bruington 1938). It does not appear that a fence separating sections was standing at the time of the 1938 survey.

While little information is available regarding management of the cemetery, it did have an official sexton, Frank Bonifay, who by 1938 had been overseeing the cemetery for a number of years (Bruington 1938: ix-x). Along with employing a sexton, some effort was being made to secure the cemetery; a welded wire field fence on Alcaniz Street was in place and, presumably, enclosed the entire eight acre site (Bruington 1938: vi) (Figure 6.30). There was also at least one formal entrance to the cemetery (with gate posts) leading into the cemetery from the north end of Alcaniz Street.

While the cemetery was being surveyed by Mrs. Bruington, a major change in land use to the east of the contemporary site was about to occur. In 1940, the Catholic Church entrusted the City of Pensacola with land to the east of the contemporary eight acre site that was part of the original 1810 plat. The city planned to build Pensacola’s first public housing project (Aragon Court Apartments) and the Catholic Church facilitated this effort to “benefit the poor” (Mead 2001). The 340 family units that made up the Aragon Court Apartments were constructed primarily of concrete and built to be fire proof (Sanborn Map Company 1940) (Figure 6.31).

Across the street, the cycle of neglect and concentrated cleanups continued; due to its overgrown condition in 1949, laborers were paid to “clean out the weeds, trash and other debris
Figure 6.28. Shell cultural marker at Creole site in St. Michael’s Cemetery (John Holley ca 1907).

Figure 6.29. Shell cultural marker at African American site in Zion AME Cemetery (Leamon Smith ca 1951).
Figure 6.30. Entrance to St. Michael’s Cemetery ca 1936.
Figure 6.31. Sanborn Fire Insurance map showing Aragon Apartment complex ca 1960 on the eastern extreme of the ca 1807/1810 St. Michael’s Cemetery plat.
that littered the graves” (Pensacola News Journal (PNJ) 1949). It was in this year that the first serious attempt to arrange for ongoing maintenance for the site appears to have been mounted.

In the late 1940s, concerned citizens pushed to have the Florida State Park Department take over the site, and a bill authorizing, but not requiring, the department to administer the cemetery was passed by the legislature. The bill provided that private lots could still be used but that no more lots could be sold (PNJ 1949). While development within the cemetery was being limited, development continued outside the modern boundary of the cemetery. In 1955, a new Pensacola Police Department facility was built on the filled wetlands that were part of the 1810 plat. of the cemetery to the south. In the 1960s, work began on an interstate connector with a terminus just Northwest of the cemetery. The cemetery was surrounded by urban development and new construction. The boom in development and construction prompted concern on the part of many in the community regarding the historical resources of the city and how they would be impacted by urban development.

In 1963, the Pensacola Historical Advisory Committee, a committee organized as an advisory panel for historic preservation issues, addressed the management of St. Michael’s Cemetery and proposed that the City of Pensacola maintain the site. The Catholic Church agreed to give the city a quit-claim to the property for this purpose (PNJ 1963). In February of 1964, the City Council voted (8-1) to take over the cemetery and to maintain it as a historical park. The Historical Advisory Committee or a similar group would act as an advisory board (PNJ 1964). In an effort to better secure the site and improve aesthetics, when the city took over the cemetery a new wrought iron fence was installed fronting Alcaniz Street. However, by 1965, the site was noted to be overgrown once again and the target of vandals (PNJ 1965).

The city did not oversee the site for long. In 1968, the city transferred the deed to the state via the Pensacola Historical Restoration and Preservation Commission (which later evolved into the Historic Pensacola Preservation Board [West Florida Historic Preservation, Inc]). In 1970, the site was added to the National Register of Historical Places as a contributor to the Seville Historic District (National Register Inventory 1970: ES36). In the early 1970s, a public school project for gifted students resulted in another survey of the cemetery. Students measured features to scale and recorded names and dates for individual sites (PATS SMC Survey 1974).

In 1977, the city’s Beautification Commission (called the Community Pride Task Force of the Pensacola Area Chamber of Commerce) embarked on a year-round beautification program for the city and St. Michael’s Cemetery was one of its projects. Although the group was enthusiastic, they were also pragmatic, noting that the cemetery could be easily cleaned—once. Ongoing care was a necessity (PNJ 1977b). That year the state undertook a project to better refine wordage in existing statutes. During this process, St. Michael’s Cemetery was firmly established as a state park. As a state agency, the Preservation Board continued to provide oversight and oversee landscaping maintenance. The Preservation Board also took steps to better manage the site. In 1981, the Preservation Board began working toward a plan that would involve a not-for-profit foundation in a leadership role for preservation of the site. In 1981, the St. Michael’s Cemetery Foundation was incorporated, and a new iron fence was installed (PNJ 1981a). In re-fencing the site, consideration was given to residents of Aragon Court who used a
foot path through the cemetery to reach downtown. City officials noted that foot traffic tended to go over cemetery plots and invited vandalism; however, they also recognized the need for a thoroughfare and suggested installing a sidewalk on the south side of the site between the cemetery fence and the police department. By 1981, another surge of development and construction around the I-10 terminus was beginning. A civic center was planned for land across from the cemetery to the north, and a high-rise hotel adjacent to the Louisville and Nashville Railroad depot were both underway two blocks to the north of the site. Along with commercial and public construction, plans were also drawn up to relocate the residents of Aragon Court, demolish the ca. 1940s public housing and to re-develop the property (Figures 6.32). There is no record of burials being encountered during any of the above urban development projects.

As modern urbanization bloomed all around the cemetery, the historic pattern of vandalism, neglect, and sporadic cleanups continued. The design of the road system around the I-10 terminus also presented a problem in preserving the site—one that occurred frequently. Because of a sharp curve abutting the cemetery at the junction of Garden Street and Alcaniz Street (see Figure 6.32), motorists regularly overshot the curve, crashed through the fence, and landing in the cemetery, causing great damage to not only the fence, but also to tombs and markers in their paths (PNJ 1977, 1985, 1986). This situation occurred often and usually at night (the problem was corrected by the city during a 2007 street improvement project). Due to the lack of funds, by 1984, the cemetery was again noted to be in poor condition, while all around the perimeter of the property, urban renewal was underway. In 1984, the Catholic Church pressed for and received the return of the deed for the cemetery from the state. The cemetery retained its designation as a state park.

In 1988, the cemetery received a Special Category Grant from the Florida Department of State, Division of Historic Resources, to address conservation needs. A preliminary survey and evaluation of the historical and cultural resources of the cemetery along with a preliminary conditions assessment was produced and under the direction of conservator Lynette Strangstad (Strangstad 1988) and historic cemetery preservation specialist Sharyn Thompson (Thompson 1988). Funerary architectural styles and contributing components were identified and documented, and a number of markers, tombs, and mausolea were identified as priority sites and addressed. During this same time, a map of extant surface features was produced (Coling 1988), and a pilot test of the effectiveness of ground penetrating radar to identify subsurface features at the cemetery was conducted (Bense 1989). As the 20th century came to a close, restoration and documentation projects overseen by St. Michael’s Cemetery Foundation and the Historic Pensacola Preservation Board had contributed greatly to the preservation of extant funerary architecture. Developing remote sensing technology offered a preview of what potentially was unmarked below ground.

Community Stewardship at the Turn of the 21st Century

In the late fall of 1999, a violent act of vandalism (Figures 6.33 and 6.34) again called public attention to the site which was now surrounded by the upscale Aragon development to the Southeast (site of the Aragon Court Apartments housing project), The University of West Florida Institute for Human and Machine Cognition on the south (in the renovated Police
Figure 6.32. Aerial view (2007) of St. Michael’s Cemetery and surrounding development.
Figure 6.33. Mooney site vandalized in 1999.

Figure 6.34. Mooney site following conservation restoration treatment 2003.
Department building), the Pensacola Civic Center and Pensacola Grand Hotel to the north (see Figure 6.31) and Alcaniz Street on the west. The community rallied once again. The existing foundation (St. Michael’s Cemetery Foundation, Inc) was dissolved and re-incorporated as The St. Michael’s Cemetery Foundation of Pensacola, Inc. (SMC Bylaws amended 2004). The organization expanded its board to include a number of new members from the community along with representatives from UWF who joined forces with HPPB and the foundation to look at possible solutions for the site’s needs.

An initial management plan was designed (Stringfield 2000a), and between 2000 and 2008, a number of steps were taken to better manage the site. A grant from the Florida Humanities Council funded planning initiatives; Sharyn Thompson, Director of the Center for Historic Cemetery Preservation, conducted workshops on cemetery preservation and public involvement initiatives. Thompson was also instrumental in the development of a comprehensive set of operating procedures for the site (Operating Procedures 2001). Archaeologist Pat Garrow conducted workshops with UWF staff and students on close interval probing as a means to delineate unmarked graves (Figures 6.35 and 6.36) and interpretative signage was installed at a number of individual sites in the cemetery.

Ground penetrating radar testing continued; the technology was assessed as likely to be effective in delineating unmarked burials (Giardino 2000, Johnson 2005). In 2003, a Special Category Grant from the state funded conservation/restoration measures to restore sites vandalized in 1999. Public workshops on appropriate cleaning methods and mortar repairs were conducted in conjunction with the project.

Today, many of the needs of the site are met via in-kind services. UWF geologists mapped the cemetery in 2001 (Liebens 2003), and along with UWF, archaeologists created a geographic information system (GIS) with an associated database of tombstone data (www.uwf.gis/smc) (Figures 6.37 and 6.38). A year-long botanical survey was conducted (Figure 6.39) and results layered into the cemetery’s interactive GIS (Lea 2001). The University utilizes the site as a teaching lab, and to date, approximately twenty-eight departments, institutes, and offices offer in kind services to support the cemetery. The Institute for Human and Machine Cognition provides a conservation facility on their property (a Quonset hut that served as the stolen property storage facility for the police department). In addition to these senior partners, the foundation has formed a number of other strong community partnerships. For several years, United States Marine Corps volunteers have worked on site every Saturday (under supervision) addressing conservation needs that do not require a professional conservator (leveling markers, vegetation removal, etc.). High school students also volunteer regularly and, with supervision, carry out age and skill appropriate maintenance tasks (Figures 6.40 and 6.41). Public events are common in the cemetery. These include an annual public All Souls Day service and annual public educational event: Get in the Spirit at Historic St. Michael’s Cemetery. This all-day event is focused on drawing attention to the conservation needs of the site as well as sharing what is being learned at this historic site about the people who are part of Pensacola’s culturally diverse past (Figure 6.42).

In an effort to foster stewardship at other not-for-profit cemeteries and impart what is being learned at St. Michael’s Cemetery, education has become a priority. The foundation
Figure 6.35. Archaeologist Pat Garrow conducts a probing workshop for UWF faculty, students, and St. Michael’s Cemetery Foundation members.

Figure 6.36. UWF archaeology graduate students probe and map a plot prior to an interment.
Figure 6.37. UWF graduate students ground truthing SMC GIS database 2002.

Figure 6.38. UWF historians and archaeologists translating Spanish tombstones 2002.
Figure 6.39. Master gardeners conducting the botanical survey.
Figure 6.40. U.S. Marines working on site.

Figure 6.41. Area high school students volunteer.
Dave Edwards, a British military reenactor, will help set the scene for the "Get in the Spirit" historical tour at St. Michael's Cemetery on Sunday. University of West Florida students and faculty also will be positioned throughout the cemetery to give historical insights of various cemetery sites and to raise public awareness of the conservation and preservation needs of historical cemeteries.

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Margaret Stringfield squinted in the strong afternoon sun to read the engraving on a weathered monument in St. Michael's Cemetery in downtown Pensacola. "Look at this," she exclaimed, as she gestured toward a detailed carving of a ship's wheel. "It tells us that this person was associated with the sea."

During the recent visit to the cemetery, she pointed out other gravestones and monuments, most bearing names familiar to Pensacola drivers—Blount, Moreno, Bobe.

"A lot of our city street names were named for people who are buried in St. Michael's. There's an incredible amount of Pensacola's past here," she said.

Stringfield's knowledge of and enthusiasm for the sprawling historic cemetery and its peaceful inhabitants have grown during the years she has served as its chief archaeologist. "We are always discovering more about Pensacola's past, here in this cemetery," said Stringfield, an archaeologist at the University of West Florida Archaeology Institute and a member of the St. Michael's Cemetery Foundation board of directors. "St. Michael's is an asset not only to archaeology, but to the entire community."

Members of the community are invited to learn more about St. Michael's and its historical importance during a special tour Sunday from 2 to 4 p.m.

Rebecca Ross
@PensacolaNewsJournal.com

Tracking landscape changes is part of an ongoing study of St. Michael's Cemetery. In these photos, from the collection of Philip Pfeiffer, the same view is seen circa 1890s with Eva D. Pfeiffer standing in the same spot, at left. If you have old photographs of St. Michael's Cemetery, contact the UWF Archaeology Institute at 474-3015.
along with the Archaeology Institute, the Florida Public Archaeology Network, the Pensacola Archaeology Society, and West Florida Historic Preservation, Inc. hosts regular workshops on topics of interest to cemetery stewards in the area (Figure 6.43).

Like most historic, not-for-profit, and family cemeteries, St. Michael’s experiences ongoing problems that are often addressed by volunteer stewards. Vandalism episodes in 2002 and 2003 resulted in moderate damages to marble and granite markers at St. Michael’s and prompted the installation of a motion detection alarm system (SMCF files 2002, 2003). Along with vandalism, acts of nature often impact cemetery sites. In 2004, Hurricane Ivan caused heavy damage to St. Michael’s Cemetery and much of the community of Pensacola (Figure 6.44). Much of the funerary architecture repaired in 2002-2003 was damaged as were a number of additional sites. The Hurricane Ivan Disaster Assessment of the site identified features damaged by the storm (SMCF/Ivan Assessment 2005). With financial help from Escambia County, the City of Pensacola, and community donations, damage began to be addressed (SMCF files/Restoration 2004, 2005, 2006).

The consequence of altering the wetlands in the late 19th century resulted in heavy damage to both the landscape and funerary architecture at the extreme south end of the cemetery during hurricane Ivan. Rising ground water combined with flooding from the bay front resulted in a very unstable land surface. Additionally, funerary features were heavily damaged (SMCF files/ Ivan damages: 2004; 2005). Several large trees were uprooted as well (SMCF files/ Ivan damages: 2004; 2005). The unstable land surface of the Southern end of the cemetery led to the cemetery’s closure to the public until the damages in that section could be addressed. Volunteers from the United States Marine Corps were of invaluable assistance in resettling ledgers and coping. Along with an assessment of damaged features, and initial restoration efforts, Escambia County GIS manager, Charlie Gonzalez conducted a tree survey, and added the trees of St. Michael’s Cemetery to the County’s tree survey (Gonzalez 2004) (Figure 6. 45).

In 2005, Hurricanes Katrina, Dennis, and Rita caused high winds in Pensacola, and while the cemetery did not experience much damage because of the storms, the alarm system was damaged and still under repair in January of 2006 when a vandal entered the cemetery and inflicted horrific damage to many of the oldest and finest examples of above ground tombs, underground tombs and mausolea. Human remains were disturbed and damage was extensive. The vandal was apprehended and (in a plea bargain) received ten years in federal prison for his actions (PNJ 2006). Repairs to damaged sites were carried out in 2006-2007 (SMCF files/Restoration/ 2006-2007).

In 2007, The National Park Service National Center for Preservation Technology and Training held the Southeast Workshop on Cemetery Monument Conservation at St. Michael’s Cemetery. That year, St. Michael’s Cemetery Foundation was also awarded a grant for $118,000 to support conservation and restoration projects (Impact 2007: 100). Currently, the University of West Florida is finishing a grant funded project focused on identifying unmarked burials in the cemetery.
CEMETERY PRESERVATION WORKSHOP

WHO:      REPRESENTATIVES OF AREA CEMETERIES
WHAT:     WORKSHOP FOR CEMETERY STEWARDS
WHEN:     SATURDAY, JUNE 23, 2007 from 9AM TO NOON
WHERE:    FLORIDA PUBLIC ARCHAEOLOGY NETWORK CENTER
          (L&N Marine Terminal 207 E. Main Street, Pensacola, FL)
WHY:      TO ADDRESS ISSUES RELATED TO VANDALISM
COST:     NO CHARGE

Cemeteries are integral components of communities. Whether old or new, large or small, they are part of the historic fabric of the living communities with which they are associated. They face a variety of ongoing problems related to management, conservation, vandalism, record keeping, repairs, funding, public interest, etc.

This is the second workshop in a series being conducted to bring together the people responsible for managing our cemetery resources to begin to address our common problems and concerns and to look for solutions.

The workshop is open, at no charge, to representatives of area not-for-profit cemeteries and family cemeteries, as well as to the larger for-profit cemeteries. Professionals who provide services to cemeteries are also invited.

THE TOPIC FOR THIS WORKSHOP IS:

VANDALISM

State statutes, local ordinances, law enforcement, and security methods

Please plan to send a representative (or two) to the workshop.

For reservations:
Call the Archaeology Institute at 474-3015

Sponsored by:
UWF Archaeology Institute
St. Michael’s Cemetery Foundation of Pensacola, Inc.
Pensacola Archaeological Society
Florida Public Archaeology Network

Figure 6.43. Cemetery Workshop Flyer.
Figure 6.44. Hurricane Ivan damage 2004.
Figure 6.45. Extent of trees and canopies 2004.
The idea for the *Search for the Hidden People of St. Michael’s Cemetery* grew from the realization that, while preserving surface information at SMC was essential, it was also necessary to understand the subsurface of the site. The purpose of the project is not only to document burials lost to the contemporary landscape, but also to protect them and facilitate better management of all the cultural resources of the site.

**Summary**

For much of its history, St. Michael’s Cemetery appears to have been a formal burying ground with informal burial practices. Historical research suggests that the area around (if not completely within) the contemporary site has been in use as a community burial ground since mid 18th century. The formal survey of the cemetery in 1810 appears to be a reaffirmation of existing spatial definition within the community. While the cemetery was formally delineated, there is no indication that, following the 1810 survey, there was any particular order to the placement of burials until late in the 19th century. Further, there is no indication that burials were mapped as they occurred.

There is also the question as to whether private ownership rights were granted in the cemetery. In the 1840s, discussions were held on whether the church should sell the land in the cemetery to the individual families who were burying there. This would be a means to raise monies for a fence for the site and suggests that no formal sales took place prior to that time (Pensacola Gazette (PG) 1841). By the turn of the 20th century, the Catholic Church did accept fees for burial; however, extant documents do not indicate exact locations of where plots are located (Bowen 2004) (Figures 6.46 and 6.47), and a fire in 1882 destroyed church records prior to that date, which might have held useful information (Dawkins 1991: 84-85). Original owners are no longer living and few certificates of interment rights have survived into the 21st century.

Along with a lack of documentation dealing with the site, throughout its history, St. Michael’s Cemetery has been subjected to cycles of neglect and bouts of attention. Descriptions of the site in 1829 note that the cemetery was unfenced, overgrown, and with no order as to position of the graves (Preston 1829). Calls for the community to address the needs of the cemetery were frequent, and clean up efforts, when undertaken, appear to have been conducted as “through overhauls” (PG 1841). The cemetery was not just subject to neglect; it was also subject to acts of nature, military actions within its borders, and natural aging. A changing urban environment also affected the site.

The cycle of neglect and clean up efforts continued into the 20th century. In 1988, concerned citizens conducted a clean up at the cemetery that included the removal of a number of dislodged markers and coping, as well as concentrations of “loose” bricks (Dean 2003) (Figure 6.48). Stones that were not discarded were repositioned in open areas of the site unrelated to their original position (Moss 2005) (Figure 6.49). Another common practice over the years has been the redistribution of excess soil from excavated burial pits to depressed areas within the cemetery in an effort to level the landscape (Nelson 2000). While the motivation behind such efforts was well intended, over the years, the landscape of the cemetery was dramatically altered and indicators of grave sites were lost.
Figure 6.46. Burial plot receipt ca 1915.

The little son of Mr. and Mrs. Charles D. Davis, 14 months old, died yesterday forenoon, and the funeral takes place this afternoon. Cortege will leave the residence on West Magnolia street at three o’clock, the services to take place at the house, Rev. Father Fullerton officiating. The interment will be made in St. Michael’s cemetery.

Figure 6.47. Child’s interment notice (ca June 9, 1915) for Davis child.
Loss of surface information has also occurred as a result of substantial damages caused by hurricanes, a number of vandalism episodes, natural aging, and other actions (both natural and human) causing damage to features in the cemetery. Unfortunately, when the physical evidence of a person is lost, their place in the cemetery is lost as well (Figures 6.50 and 6.51). The surface information contained in the cemetery is sometimes the only documentation available about a person and their relationship to the community. While the surface documentation may be lost, the sub-surface information is not. The Search for the Hidden People of St. Michael’s Cemetery project offers voice and meaning to a long unseen segment of the early community.
Figure 6.50. Documenting an unmarked burial encountered during restoration of Bright underground tomb 2003 (burial orientation N/S).

Figure 6.51. Bright underground tomb following restoration 2003.
Chapter VII. St. Michael’s Cemetery Geographic Information System (GIS)

by:

Stuart Hamilton

A Geographic Information System (GIS) plays an integral role in the Saint Michael’s Cemetery (SMC) project. A GIS is the primary data management and integration tool for SMC housing the majority of data related to the project. Additionally, GIS is an analysis tool helping to uncover the location of unmarked and mass burials. Finally, a GIS publishes the results of the research allowing the public or other interested parties to access and interact with the data. All of these GIS functions are funded in part by this grant and from other sources.

Upon completion of the field survey, 3,198 grave markers were identified and entered in the GIS (Figure 7.1). Dr. Johan Liebens and UWF students collected the SMC spatial and attribute data during the summer of 2000. The initial survey was funded by the UWF administration (Stringfield 2008). Information on the graves is stored in a relational database management system (RDBMS) housed at the University of West Florida. The grave data are stored as polygon features with the coordinates referenced to the Florida State Plane Coordinate System (0903) utilizing a Lambert Conformal projected system. Tying the graves into the standard referencing system utilized in Florida creates a permanent record of grave locations to assist in managing cultural resources of the site. Going forward it will be possible to locate graves when identifying markers are weathered or otherwise unreadable. Additionally, the GIS can assist in restoring the cemetery after events such as hurricanes or human modification. All grave locations are stored within one-foot of their actual ground location.

Aside from the coordinate information, the RDBMS stores numerous non-spatial attributes that provide additional information about each grave marker. All attributes are stored in related tables so if a user queries the database for a particular family member the GIS will provide attribute information such as the full name on the grave marker, the date of birth, the date of death, and twenty-seven other attributes listed in Table 7.1. These additional attributes give insight into the occupational background, birth location, and family relationships of the deceased. Other attributes also provide information about the condition, material, aspect, and style of the grave marker. All of these additional attributes provide a more thorough picture to researchers interested in people buried at the cemetery.

An additional related table within the RDBMS system stores photographs of all 3,198 grave markers within the cemetery. This portion of the project was completed by UWF graduate students in the summer of 2006 and funded by the Department of Environmental Studies. Each photograph is located within the cemetery as an x,y point coordinate conforming to the Florida State Plane referencing system and as an attribute of the grave markers. These photographs allow users interacting with the database to either view a photograph of an individual grave marker when querying a burial or turn on all photographs and view them one at a time. Additionally, when searching for a person buried in the cemetery, the option to view a photograph of the grave marker is offered to the user. The tables containing the location of the
Figure 7.1 Surveyed graves = 3,198.
<table>
<thead>
<tr>
<th>Attribute:</th>
<th>Object ID</th>
<th>First</th>
<th>Middle</th>
<th>Last</th>
<th>Suffix</th>
<th>Gender</th>
<th>Maiden</th>
<th>YR Birth</th>
<th>DT Death</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Explanation:</strong></td>
<td>Unique Grave Number</td>
<td>First Name</td>
<td>Middle Name</td>
<td>Last Name</td>
<td>Jr. Sr. etc</td>
<td>Gender</td>
<td>Maiden Name</td>
<td>Year of Birth</td>
<td>Month &amp; Date of Birth</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attribute:</th>
<th>YR Death</th>
<th>Age Years</th>
<th>Affiliation</th>
<th>Preservation</th>
<th>Enclosure</th>
<th>Comment</th>
<th>Aspect</th>
<th>Material</th>
<th>Design 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Explanation:</strong></td>
<td>Year of Birth</td>
<td>Age at Death</td>
<td>Military and other listed affiliations</td>
<td>Is Grave in an Enclosure</td>
<td>Additional Marker Information</td>
<td>Marker Aspect</td>
<td>Material of Marker</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attribute:</th>
<th>Design 2</th>
<th>Birthplace</th>
<th>Multiple</th>
<th>Time Period</th>
<th>Marker Type</th>
<th>Grave Area</th>
<th>Shape Length</th>
<th>Epitaph</th>
<th>Marker Art</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Explanation:</strong></td>
<td>Birthplace</td>
<td>Multiple Burials on One Marker</td>
<td>Century of Death</td>
<td>Square footage of grave</td>
<td>Grave Perimeter</td>
<td>Art work on marker</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7.1 Attributes Listed
grave markers, the attribute data tied to the markers, the 3,198 photographs of each grave marker, the potential mass grave data, and the unmarked burial data together provides a wealth of information about SMC that was not previously available. SMC will no longer lose information as markers weather over time or as graves become overgrown or are relocated.

Following the 2007 GPR survey of SMC, two additional layers of importance have been added to the SMC GIS database. The first layer depicts potential unmarked burials at three differing depths. The depths are .93m to 1.24m (depth one), 1.54m to 1.85m (depth two), and 2.17m to 2.48m (depth three). At depth one, 2644 potential burials were located. At depth two, 1355 potential burials were located. At depth three, 692 potential burials were located. Overlap between the same potential unmarked burial will occur at differing depths so the detected potential unmarked burials may be markedly less than the totals listed above. The second layer depicts six potential mass burial sites. The larger of these sites are located on the western side of the northern portion of the cemetery. During a 2008 summer school session students will use this site to shovel-test for evidence of mass burials. The GPR was synchronized to a Global Positioning System (GPS) capable of real-or post processing differential correction (DGPS). The DGPS collected exact locations while that could be tied to the image produced by the Ground Penetrating Radar (GPR). The GPS data was then differentially corrected to the beacon at Pensacola regional airport allowing for horizontal accuracy of under 0.5m for the vast majority of points collected within the cemetery. Therefore, the potential unmarked burials and the potential mass graves can be assumed to be within 50cm of their true horizontal location.

Supplemental GIS layers developed for this project include:

1) A point layer of botanical features of interest
2) A line layer of grave borders and other grave enclosures
3) A polygon layer delineating the cemetery
4) A polygon layer of the road that crosses the cemetery
5) A polygon layer of footpaths that traverse the cemetery
6) A polygon building footprint layer of buildings in the cemetery
7) A polygon layer depicting the area of African Love Grass
8) A polygon layer dividing the cemetery into 49 equal-area sections
9) A layer of colonial era roads and waterways around the cemetery

All results from SMC research are available for free to other researchers and the public through three differing GIS-powered interactive maps.

1) The entire GIS is available free of charge on DVD/CD utilizing GIS publishing software. The interested party is provided with a GIS data viewer and all the SMC cemetery data organized into logical layers. Users can interact with the database, turn on and off labels, create their own maps, and search all records for features of interest. This method of GIS publishing works on almost all desktop powered systems and is most suited to those who require access to all the information gleaned during the research into SMC.

2) All SMC findings are available via an interactive mapping website available at www.uwf.edu/gis/smc. This website has numerous unique features not found in other cultural resource applications. The website is available to anyone with internet access and a free web
browser such as Netscape, Firefox, or Internet Explorer. The website has a customized interface (Figure 7.2) that allows internet users to query the database by first name, last name, or any of the thirty plus attributes in the database. When a user queries the database via the web browser, all results that match the query are returned and a list provided for the user to select the record they wish to view. A link to the photograph of the gravesite is also returned. In the example in Figure 7.3 a query is run on ‘Gonzalez’ and all graves with that name are highlighted in blue on the map. A scroll bar appears at the bottom of the map with all the Gonzalez returns and the user can scroll through the list to find the Gonzalez they are trying to locate. When the user selects a grave marker that interests them, the website will zoom into the gravesite and provide additional information.

Other tools available on the website include an overview map to locate individual graves in the cemetery. Zoom in, zoom out, pan, zoom to full view, and zoom to active view are also available to users to investigate the cemetery spatially without querying for a specific grave-marker or symbol. Identify and query tools allow for non-spatial searches in a traditional query format. According to our research SMC internet interactive map is the first of its kind for a colonial cemetery. Many cemetery maps exist but few if any with the interactive functionality of SMC GIS. Another unique feature of this interactive maps is that is has been designed to allow the public without broadband access and without high-end or expensive computers to access the SMC data. This may be important to local schools in the area using the SMC website for course work and student research projects.

3) All data from the research for this project was coded into Keyhole Markup Language as is available for free viewing, download and querying in Google Earth. This publishing tool allows users without windows driven computers to access the full SMC datasets.
Figure 7.2. Website customized interface.
Figure 7.3. Query run on “Gonzalez”.
Chapter VIII. Locating Burials in St. Michael’s Cemetery Using Geophysical Techniques

by

Bryan S. Haley,

Aaron Fogle,

and

Jay K. Johnson

Introduction

A geophysical survey was conducted at Saint Michael’s Cemetery in downtown Pensacola, Florida in an effort to locate unmarked burials and confirm the location of marked burials. The primary technique was ground penetrating radar (GPR). The survey was conducted over the entire cemetery, except where it was not possible due to confined spaces. The size of the survey area and the number of obstacles presented new challenges to the way GPR is traditionally collected. In conjunction with this project, several hardware modifications were engineered and new software procedures were refined or developed. In addition, targeted electrical resistance and aerial thermal infrared survey was conducted to help reinforce the interpretation of the GPR data. A Geographic Information System was created to interpret and present the data.

Ground Penetrating Radar

Theoretical Introduction

Ground penetrating radar (GPR) operates in much the same way that radar is used to locate and track aircraft. That is, an electromagnetic wave is transmitted and the reflections generated by objects located in the transmission field are recorded. In both the air and in the ground, the strength of these reflections is determined by the amount of contrast between the target and the medium surrounding that target as well as the geometry created by the orientation of the surface of the target relative to the source of the antenna. Surfaces that are oriented at right angles to a line drawn from the antenna to the target are better reflectors than those targets with oblique or parallel orientations. The distance between the antenna and the target can be measured by recording the amount of time it takes for the reflection to return to the antenna and calculating the speed at which the energy travels.

There are of course, a number of differences between the radar we rely on whenever we travel by air and the radar that was used in surveying the subsurface of St. Michaels Cemetery. The differences have to do with the way in which the radar energy is generated, transmitted, reflected, and recorded in the soil. All of these factors require that a number of technical decisions be made by the operator in order to maximize the value of the resulting imagery. In
order that our results can be evaluated by other people planning to use GPR on a similar project and in order that they can profit from a review of our challenges and the solutions we reached to meet these challenges, it will be necessary to discuss those technical matters in some detail.

GPR operates by sending out an electromagnetic wave pulse into the ground that reflects off materials with contrasting electrical properties (Weymouth 1986: 371; Conyers and Goodman 1997: 23). The most important of these properties are the electrical conductivity and magnetic permeability of the materials (Conyers and Goodman 1997: 32). Relative dielectric permittivity (RDP), the ability of a material to store and pass a magnetic field, is the accepted property used to describe the materials. RDP, usually denoted by K, ranges from 1 for air to 81 for water and is expressed by \( K = \frac{c^2}{V^2} \), where \( c \) is the velocity of light and \( V \) is the velocity of the radar wave in the medium (Conyers and Goodman 1997: 33; Reynolds 1997: 689). For soils, the RDP ranges from 3 from the driest sand to 40 for saturated clay. The strength of the reflection is proportional to the difference in RDP of the two materials and relies on an abrupt change between the materials (Conyers and Goodman 1997: 34; Geophysical Survey Systems Inc. 1999: 36). However, a reflection may be generated from an RDP difference as small as 1 (Geophysical Survey Systems Inc. 1999: 31). Therefore, for example, since sandy soil and metal caskets have very a very different RDP and the boundary between casket and soil is abrupt, we would get a very strong reflection from a metal casket. In the same way, since the boundary of a shroud wrapped burial is likely to become indistinct after a few years in the ground and the RDP would be low, we would likely get a very week reflection from such a burial.

The travel time of the interaction, often expressed in nanoseconds (ns), is recorded as a matter of course in GPR surveys and this can be related to the depth of the target since the two quantities are directly proportional. However, the velocity in the medium must be determined in order to make this conversion (Conyers and Lucius 1996: 25). There are several methods available for determining the velocity of a soil (Conyers and Goodman 1997: 32; Geophysical Survey Systems Inc. 1999: 79). Because the electromagnetic field generated by a GPR system is cone shaped, extending before and behind the antenna, reflections will of a specific object will be recorded before and after the antenna passes over that object. Since the travel time for the signal decreases as the antenna approaches the object and decreases as it moves away from the object and the reflection is recorded at the point where the antennae is located at any one time, reflections are typically displayed as an inverted “V” or hyperbola. The faster the speed at which the signal travels in the soil, the flatter the tails of the hyperbola. This allows the speed/depth to be calculated using a technique known as geometric scaling in which a curve is fit to the properties of hyperbolic reflections in the data generated by strong reflectors (Geophysical Survey Systems Inc. 1999: 83).

GPR antennas are available in various center frequencies, usually between 100 MHz and 1500 MHz, which are related to the optimum depth of propagation and the resolution of the signal (Geophysical Survey Systems Inc. 1999: 51). In general, lower frequency antennas propagate energy to greater depths, but the vertical resolution also decreases (Geophysical Survey Systems Inc. 1999: 56). For example, low frequency antennas can penetrate as far as 50 meters in ideal circumstances. In contrast, a 1000 MHz antenna may only penetrate to 50 centimeters, but can resolve features to a thickness of a centimeter (Geophysical Survey
Antennas with frequencies between 250 MHz and 500 MHz are most often used in archaeological applications because this range achieves a balance between depth penetration and vertical resolution. For example, a 400 MHz antenna will record features to a depth of 4 meters in dry sand. For all frequencies of antenna, a cone of energy is sent out that is roughly 90 degrees from front to back and 60 degrees from side to side (Geophysical Survey Systems Inc. 1999: 45).

One limitation of GPR is that radar energy does not travel well through materials with high RDP values, such as clayey, wet, or saline soils (Reynolds 1997: 688). Such soils cause the signal to be attenuated at a shallow depth as a result of the dispersion and absorption of the energy (Conyers and Goodman 1997: 55). The best results are achieved in soils with low RDP values such as dry sand.

Archaeological features including pits, trenches, hearths, stone foundations, kilns, buried living surfaces, metal objects, voids, burials, tombs, tunnels, and caches have been effectively delineated with GPR (Conyers and Goodman 1997: 23, 197-200). In particular, at St. Michaels, metal caskets and concrete or brick vaults can produce very strong reflections caused by the strong contrast between these materials and the sandy soil of the cemetery. If air voids are present in a burial, a strong reflection can also be generated. Burials in wooden caskets are much more difficult to detect because the major possibility for a strong contrast in the RDP occurs at the bottom of the burial shaft, which will produce a reflection only if the shaft fill contrasts sufficiently with the undisturbed soil into which the shaft was dug.

There are several manufacturers of GPR equipment, including Geophysical Survey Systems Incorporated (GSSI). The University of Mississippi operates a GSSI SIR2000 system with 400 MHz and 300 MHz antennas. The SIR2000 system includes a control unit with 2.1 GB of storage and a battery pack that can be worn on a harness (Geophysical Survey Systems Inc. 1999: 5). Vertical profiles are displayed in real time on the screen. The position along transect lines are determined either by user added marks or a survey wheel that attaches to the antenna sled.

GPR surveys are most often performed using rectangular grids that are covered by transect lines in a zigzag pattern. The lines are usually spaced at a regular interval of .25 meter, .5 meter, or 1 meter. Data files are collected for each of these lines and these are named simply by a sequential number. Field notes must be taken that document the file number, the X coordinate, the starting Y coordinate, and the ending Y coordinate. Large, open spaces with flat terrain are best suited for GPR survey. Obstacles can be accommodated, but they result in “broken” lines that require two or more files.

Maximizing the potential of GPR in archaeological applications often requires unique processing and visualization techniques; these are more intensive than for other geophysical techniques used in archaeology. The most important phase is the construction of time slices, which are horizontal maps of radar reflection intensity that cover discrete depth ranges (Goodman et al. 1995: 85). More advanced visualizations can be produced by building three dimensional and isosurface renderings. A number of software packages are available for GPR...
data. GPR Slice, authored by Dean Goodman of the Geophysical Archaeometry Laboratory (GAL), contains the most advanced array of tools for archaeological applications.

**Detecting Burials with Ground Penetrating Radar**

Bruce Bevan (1991) has reported on the performance of different geophysical techniques on burial targets in a variety of historic cemeteries. Bevan achieves the greatest success with GPR, although some applications are noted for electromagnetic resistivity, conductivity, and magnetics. Bevan also outlines the settings in which burials can be detected; these include the presence of contrasting shaft fill, metal burial goods or casket, brick or stone vaulting, and air cavities. Bevan presents some positive results on low contrast 19th century burials where metal caskets are not present.

The University of Mississippi Center for Archaeological Research has reported on the effectiveness of geophysical techniques on a variety of cemeteries (Johnson and Haley 2005). The success of the surveys varies widely depending on soil and burial types. The clearest results (Haley and Johnson 2004) were achieved with GPR in sandy soils and metal caskets or vaults. Earthen and wooden casket burials produce more subtle anomalies, especially in soils with higher RDP values (Haley et al. 2002; Haley and Johnson 2005; Haley 2005).

**Field Methodology**

**GPR Survey with Global Positioning System**

The multitude of monuments, fences, copings, trees, and other surface objects at St. Michaels presented a new challenge to the collection of the GPR data. Recently, hardware and software advances have allowed Global Positioning System (GPS) to determine the position of GPR data.

Test data was collected using two differential GPS systems. The first of these was a Trimble 4700 with Trimble Reference Station 4800 base station, which was set to receive real time corrections from a base station at West Florida University. However, the reception was significantly limited by shadowing from downtown buildings, trees, monuments, and the operator.

The second system was a Trimble ProXR, which was set to record position data that were differentially corrected following the fieldwork. This system resulted in fewer dropped GPS positions compared to the real time corrected system and therefore it was chosen for the actual survey.

No commercial apparatus was available for the combination of the GPS and GPR hardware and, as a result, it was necessary to fabricate a custom bracket that screws onto the GPR antenna sled and contains attachment for the GPS antenna (Figure 8.1). The only drawback to this system is that the full length of the GPS antenna rod can destabilize the GPR antenna, causing decoupling of the GPR transmitter and receiver. Therefore, an antenna height
of less than two feet was required. Although this setup may have resulted in slightly more GPS shadowing, it was necessary to ensure adequate GPR data.

GPS positions were collected every second along with a range of information including time and accuracy. When collected in continuous mode, GPR data is collected at a fixed number of scans per second. Therefore, when the start of both the GPS and the GPR are synchronized, the position of any GPR scan can be determined.

Even in the areas with the best satellite reception, GPS readings were occasionally dropped due to inadequate reception. The GPR data, however, was continuous and thus mismatching would occur if positions were missing. To address this potential problem, the GPR scan number of each GPS position was calculated and placed in a spreadsheet.

An upper threshold of 30 minutes was allowed for each GPS and GPR file. There were two reasons for this approach. First, since GPR files are relatively large (approximately 10 kilobytes/second), smaller sized files would be more manageable by computers during processing. Second, if a catastrophic failure occurred with either technology, the amount of data lost would be minimized.

The cemetery was divided into 7 rows that were between 30 and 40 meters in length along the North – South axis. Row boundaries were placed to coincide with open areas. Transect lines were walked in North – South direction and roughly parallel to the orientation of the monuments, fences, and copings to allow the most efficient data collection. Flags were placed at the beginning and end of the rows. A target transect spacing of .5 meters was used. However, in practice it was difficult to maintain this spacing precisely. In fact, because we were using GPS to record the actual route of the transect, it was not necessary that the transects follow straight lines.
Angle Type GPR Survey

For several sections of the cemetery, the GPS guided GPR technique was not effective. The primary reason for this was that GPS reception was not adequate and the number of dropped position readings became too great. Primarily this is confined to the southeastern portion of the cemetery where the tree cover is relatively dense (see Appendix 8.A, Jamaica Crinum). The decision to rule out GPS guided survey in a given area was based on viewing the overlay of GPS points on the cemetery GIS. In several of these cases, a majority of GPS points were dropped.

Another method of positioning the GPR data was necessary in these areas. First, standard rectangular blocks were set up on an arbitrary grid. The orientation of the grid was chosen to best accommodate the orientation of the surface obstructions. In an effort to speed up the collection process a combination of flags and base lines were used instead of transect lines and base lines. That is, base lines were placed at the north and south end of each survey area and flags were used to provide a visual marker to guide walking of the line. If obstacles were present within any of the lines, a flag was placed and it was marked. Following data collection, the positions of the flags were recorded with a Leica TCR307 total station. In this way, the
actual locations of each of the line segments could be projected onto the arbitrary grid using a software routine available in GPR Slice. The locations of known monuments relative to the arbitrary grid were also shot in so the grid could be later referenced. This method was also used in confined areas, such as inside fences.

Ten discrete areas were surveyed using the angle method for a total of 8395 square meters of the total 31745 square meters enclosed by the cemetery fence. This alternative to the GPS positioning was nearly the same speed as the GPS guided survey and took less time to process.

**Florida Blanca Survey Area**

In addition to the GPR survey of the main portion of the cemetery, contained within the fenced area, we also conducted a survey of the area immediately to the east of the cemetery, across Florida Blanca Street in what is now a vacant lot. Although survey conditions were ideal, we were not able to determine whether earlier portions of the cemetery extended into this area because a public housing project had been built on the lot. Sewer and water lines along with foundations were quite evident but these features completely masked the deeper, more subtle reflections that might have been indicated early historic burials in the area.

**Laboratory Methods**

**Ground Penetrating Radar and Global Positioning System Data**

The GPS data were differentially corrected by Stuart Hamilton of the University of West Florida. Both University of West Florida and Pensacola base stations were evaluated and the latter chosen since it resulted in a greater accuracy (Start Hamilton, Personal Communication 2007). After the corrections, the resulting accuracy is 50 cm or better for 74% of the points and 100 cm or better for 96.2% of the points (Start Hamilton, Personal Communication 2007).

The PDOP (Positional Dilution of Precision) is automatically recorded for each GPS point, allowing the accuracy of each point to be evaluated. A PDOP threshold of 5 was chosen to determine the final GPS points and the remaining points were simply deleted. This resulted in a calculated horizontal precision of better than 1 meter, a threshold that Goodman et al. (2004) have suggested is sufficient for burials identification. Recall that the spacing of the transects was half a meter and the transects ran north to south while most of the burials were oriented east – west. Therefore, an adult burial would be crossed at least two times, providing multiple reflections in adjacent transects. Although probing was not conducted to test the accuracy of the GPR maps, the general correspondence between grave markers and detected burials is assuring. Also, early results from the GPR survey were used in locating the soil survey excavations detailed elsewhere in this report. The intent was to avoid burials in digging this pits. None were found in the areas where the GPR indicated that there would be no burials.

The resulting single data set was then split into 39 individual text files based on gaps in the time stamp and each was paired with the corresponding GPR file by assigning them the
The GPS data must be saved in a comma delimited text file with five columns: Northing, Easting, GPS Week, GPS Time, and Scan Number.

GPR Slice software was used to merge the GPR and GPS data; the process differs slightly from traditional data processing. A GPS type file must be specified when the info file is created and the number and names of files specified. Next, a link is established between the GPR and GPS files and the total number of readings for each is determined. If there are dropped readings, these can be interpolated using a routine on the GPS Map screen (Figure 8.2). Lastly, navigation is determined using the scan number column in each GPS file.

Once the GPS was prepared, the time slicing process commenced, resulting in a number of plan view maps presenting the GPR reflection intensity at a certain depth below surface. A small section of the cemetery was chosen and several different versions were processed to determine the best combination of number and thickness of the slices. Based on those results, the rest of the data was processed into 12 slices with a thickness of about 5 nanoseconds.

Using GPR Slice, a fit was performed on a number of hyperbolas found in the profile GPR data and a velocity estimate of 12.4 centimeters per nanosecond was calculated. Based on this estimate, each slice is about 30 centimeters thick.

Viewing properties for the time slice maps for each row were optimized using the extensive array of tools provided by GPR Slice. Many different color palettes can be used, color transforms can be customized, and the data range can be modified statistically or manually. For the Saint Michaels Cemetery data, a commonly used color palette was chosen consisting of red (strongest reflection), yellow, green, aqua, and blue (weakest reflections). The transform and data range for each slice was modified to allow for a consistent appearance throughout the slices.
Three of the slices were chosen for final analysis: slice 4 (93 – 124 cm), slice 6 (154 – 185 cm), and slice 8 (217 – 248 cm) (see Figure 8.2). The depth ranges of slices 4 and 6 sufficiently covered the expected depth of the targets of interest. Slices 1 and 2 were too shallow to be of use in delineating graves. Slices 3, 5, and 7 contained a large amount of anomaly duplication and they were not included as a time saving measure. Slice 8, although it is deeper than most burials, was included as a precaution. Conyers and Goodman (1997: 69) suggest looking deeper than expected to contend with inaccurate soil velocity estimates or variable overburden.

The time slice maps for each row were exported as a GeoJPEG type file from GPR Slice. The result includes an associated world file so that the raster data can be open in GIS software for further analysis.

Angle Type Survey Ground Penetrating Radar Data

GPR Slice software allows an angle type survey, which generate line coordinates for individual line segments, which are likely to be oriented at different angle to adjacent lines rather than being exactly parallel. Once the angle survey type is chosen and the transect line coordinates entered, the data is processed using traditional techniques. For Saint Michaels Cemetery, the data was processed using the arbitrary grid system that each was collected in. The time slice maps were produced using the same parameters as the GPS-guided grid with slices 4, 6, and 8 used for analysis.

Using the control points shot in and tied to markers in the cemetery, the arbitrary grid raster images were georeferenced to a Universal Transverse Mercator (UTM) Zone 16 projection using ERDAS Imagine raster GIS software produced by Leica Geosystems. A first order polynomial transformation was used, which required three reference points. The product was saved as an ERDAS Imagine .img file, which can be opened in ESRI’s ArcGIS software.

Geographic Information Systems

A GIS of Saint Michaels Cemetery was made available by West Florida University. All data was converted to a Universal Transverse Mercator (UTM) Zone 16 projection. Both types of GPR data (GPS and angle) were added to the GIS and a vector layer added for each of the three GPR depths (Figure 8.3).
An alignment problem was discovered at this point between the GPR and the existing GIS. When the GPR data was shifted approximately 3.5 meters north and .4 meters east, there was good agreement between some unambiguous burial anomalies and the grave markers in the GIS. Furthermore, this error appeared to be the same with the other GPS guided GPR files, although in some cases it was difficult to find markers to match with anomalies. Since this amount of error seemed too large to be related to GPS accuracy, the shifted data was used for the final analysis.

Polygons were added by hand for the GPR anomalies of appropriate amplitude (Figure 8.4). A total of 2420 polygons were created for layer 1 (GPR slice 4), 2384 polygons for layer 2 (GPR slice 6), and 1530 polygons for layer 3 (GPR slice 8). Next, the raw polygons in each of the layers were smoothed using a Bezier Interpolation algorithm in ArcToolbox.
After creating the polygon layers, a number of problems were apparent. First, objects on the surface such as copings and slabs can create anomalies that reverberate through the rest of the depth slices. Since GPR data was collected over obstructions a foot or less in height, this occurred many times. To address this issue, GPR slice 1 was included in the GIS and the GPR anomaly polygons were compared to the shallow GPR data. If a polygon was duplicated by the shallow GPR data, it was flagged in a column contained in the attribute table of the layers and deleted from the deeper slice.

Second, anomalies that are strong reflectors create multiple reflections that extend well below the actual target. A processing step called migration can remove this effect, but subtle anomalies can also be inadvertently removed. Therefore, migration was not performed on the St. Michael’s data. To address this issue, each of the three GPR anomaly layers was examined.

Figure 8.4: Polygons added to the GIS identifying anomalies in GPR slice 4 / depth 1.
in order to identify duplicates. If anomalies overlapped by more than 50%, they were considered duplicates and the deeper anomaly was deleted. Polygons overlapping by less than 50% were interpreted as individual burials. It is possible that stacked burials could have been removed during this process. However, the only method for delineating these stacked burials is to examine them individually in the raw profile data, which would require an enormous amount of time for a data set of this size.

In addition, a number of other targets unrelated to burials, such as iron concretions, can cause GPR reflections. These anomalies are generally smaller in size than burials. Unfortunately, the inconsistent data density of GPS guided GPR data can also lead to burial anomalies that are smaller in size than the target. To address this issue, a polygon area field was added to the attribute table using ArcToolbox and polygons smaller than .5 m² were flagged in another column in the attribute table. The small polygons were treated differently than normal polygons. If a small polygon overlapped another polygon of any depth, the larger anomaly was given priority and the small polygon deleted. If a small anomaly does not overlap another anomaly, it was left in the layer.

Lastly, many anomalies were visible in the GPR data that were too large to be individual burials. There are at least three reasons that this might occur. First, a large slab or crypt might cover several individual burials. The GPR data may or may not delineate individual burials at some other depth. Second, since the GPR energy propagates as a cone that gets larger with depth, the ability of the technique to resolve small objects decreases. Several burials that are close to each other might thus appear as a single large anomaly. Finally, one large pit might house many burials, such as might be expected for a mass grave. The individual burials would probably not be discernible. Large anomalies were flagged using another layer attribute if the polygon area was greater than 3 m². Since a typical single burial is 2 m², this threshold is the smallest that might yield multiple burials. The following set of rules was used to handle the large polygons. If a large polygon is overlapped and better defined by a number of individual polygons, then the large polygon was deleted. If however the individual polygons do not fully cover the large one, the large one was split and the empty area becomes a new polygon. A large anomaly that did not overlap any other anomaly was left in place.

Data Analysis Using GPR Slice

As part of this project, additional tools were added to GPR Slice to further aid in burial identification. One of the most important of these is the Split Screen tool (Figure 8.5). GPR profile data contains detail that is lost in the time slice map creation process. Comparing the types of data, especially for large GPS guided data sets, can be a very difficult process. The Split Screen allows the time slice maps to be viewed, the user to click a point on an anomaly, and the profile data to be displayed showing that same position.
The Split Screen tool was used to further investigate the polygons flagged as being related to surface anomalies in the GIS. Each of these anomalies was examined and the corresponding GPR profile displayed. If the anomaly in the raw GPR profile was continuous from the surface, the anomaly was deleted in the GIS. In some cases, distinct deeper anomalies were visible despite the surface visibility and the anomaly was not deleted. An edited example set of polygons is shown in Figure 8.6.
Results

The final GPR interpretation includes 2094 anomalies for depth 1 (.93m to 1.24m), 1336 anomalies for depth 2 (1.54m to 1.85m), and 685 anomalies for depth 3 (2.17m to 2.48m) (Appendix 8. A, Key to Depths). These are shown in nine figures in Appendix 8.B and are included in the accompanying GIS. The number of polygons, however, is probably quite different than the number of burials indicted in the GPR data since some anomalies may represent multiple burials. To address this issue, a population figure was determined for each depth using the criteria discussed in the laboratory methods. Figures 8.7, 8.8, and 8.9 show an estimate of the number of individuals using the preexisting St. Michael’s Cemetery grid system.
Figure 8.7: Population estimate for GPR depth 1.
Figure 8.8: Population estimate for GPR depth 2.
One example of the results and one of the least ambiguous of the GPR results is the area around the Daniel R. Sullivan monument, the largest in the cemetery. The Sullivan monument is surrounded by a rectangular-shaped grassy area that is enclosed by a fence that measures about 9 meters East-West and 13 meters North-South. In the center stands a pedestal monument about 30 feet tall dedicated to Sullivan, who was buried in 1884. To the east of the monument are head and foot stones, presumably marking the burial location. A sidewalk surrounds the grassy area on all four sides. Trees are located in the northwest, northeast, and southeast corners. In the southwest corner, a depression most likely marks the location where another tree stood. The entire grassy area is elevated two to three feet about the surrounding ground level by fill.
The area was surveyed using the angle method with a target transect spacing of 1 meter. The GPR profile data, even when viewed live in the field, contains a clear anomaly in the transect collected across the known grave location (Figure 8.10). The signature is actually the combination of several anomalies; this suggests a complex target possibly made up of a vault, a metal casket, and other objects. The depth to the most distinct portion of this anomaly is approximately .7 meters. Also visible in this profile and indeed in all of the profiles from this area, is a distinct layer at about 2.5 meters probably related to some well-defined soil change.

The time slice results for this area are shown in Figure 8.11. The blank area in the center is caused by the monument. A number of high amplitude anomalies are visible in the data as red, yellow, green, and aqua (in decreasing intensity). The anomalies in the deepest of the four slices are dominated by the well-defined soil change apparent in the GPR profile. Anomalies related to burials are confined to slices 3, 4, and 5, which cover depths from .6 to 1.5 meters. An overlay containing anomalies from these slices is shown in Figure 8.12 and a likely interpretation is offered. The most exciting result is an anomaly located at a similar depth and orientation as the known burial and with a size of about 1 by 2 meters; this evidence all suggests a previously unknown burial is located in this area.

Three dimensional models of the Sullivan plot were constructed from the time slice data. Figure 8.13 isolates the data at a depth of .7 meters, which best shows the two burials. Because burials are three dimensional targets and because these are so clear, an isosurface rendering can be used to best visualize these (Figure 8.14).

![Figure 8.10: GPR profile showing the Daniel R. Sullivan burial, visible in the center of data as a black and white patterning beginning at about .7 meters. Depths are estimated based on a hyperbola fit procedure.](image)
Figure 8.11: GPR Slices for the Sullivan survey area

Figure 8.12: An overlay of slices 3, 4, and 5 covering depths from about .6 to 1.5 meters with an interpretation.
Figure 8.13: A three dimensional visualization of the GPR data at a depth of .7 meters. The burials are visible as red patterns, indicating a strong GPR reflection. The perspective is looking to the northeast.

Figure 8.14: An isosurface rendering of the GPR data for the Sullivan survey area. The burials are the largest two anomalies. The perspective is looking to the northeast.
Electrical Resistivity Tomography

Theoretical Introduction

Electrical resistivity instruments measure how readily current flows through the soil. The goal of a resistivity survey in archaeological research is to map the distribution of subsurface differences in resistivity by taking readings from the surface (Loke 2000: 1). Most often, the resistivity distribution is closely related to the amount of moisture contained in the subsurface material (Weymouth 1986: 319, Clark 1996: 27). Differences in relative moisture are a function of grain size for soil and porosity for rocks. Clayey soils will usually have lower resistivity values than coarser grained soils because they retain more moisture after a rain. Rocks will usually have even higher resistivity values than sands because they are more moisture resistant than most soils, although this depends on the porosity of the rock (Clark 1996: 27). Relative salinity also affects electrical current flow by lowering the resistivity of the soil or material (Loke 2000: 4). The unit of measure for resistivity is the Ohm-m, which ranges from 5 for soils with high salinity to 10,000 for some sandy or gravelly soils (Bevan 1998: 8).

Electrical resistivity instruments operate by introducing a known quantity of current (I) into the soil through an electrode. The resultant voltage (V) is measured at potential electrodes (Loke 2000: 1). Using Ohm’s Law, or \( V = I \times R \), the resistance (R) can be easily calculated. From the measured resistance values (R), an estimate of the electrical resistivity (\( \rho_a \)) can be calculated if needed by \( \rho_a = k \times R \), where k is a geometric factor (Loke 2000: 1). The conversion takes into consideration the geometry of the array type and removes its effect (Geoscan Research 1996b: H-1). Because the calculated value is a measurement of the resistance over a volume of soil and only an estimate of the actual resistivity at a point in the ground, this is termed apparent resistivity. The advantage of calculating apparent resistivity is that values can be compared in a standardized way (Clark 1996: 27).

One characteristic of resistivity that is beneficial for archaeological survey is the depth of the anomaly can be determined as a function of electrode configuration (Weymouth 1986: 326). In simple terms, the separation of the electrodes is directly proportional to the depth of maximum sensitivity.

There are two different types of survey are normally performed. Electrical profiling, or constant separation traversing (CST), surveys measure the resistance value using a fixed probe separation along the horizontal plane of the ground (Reynolds 1997: 446). Therefore, a plan map is created that represents resistance anomalies at a single, fixed ground depth. Because targets can be visible as anomalies in plan view resistance imagery, it is not essential to convert the readings to apparent resistivity.

For the second type of resistivity survey, vertical electrical sounding (VES), probe separation is varied in order to determine how resistivity changes with depth (Reynolds 1997: 441). VES requires the conversion of resistance to resistivity. A number of VES soundings may be performed to allow the construction of a two dimensional vertical profile called a
pseudosection. Furthermore, advances in both software and hardware over the past 20 years have allowed resistivity variation to be determined in three dimensions (Loke 2000: 3).

In order to create the most accurate model of ground targets, inversion is usually performed on the data. This step is necessary because the same data set can be produced by a number of ground models (Loke 2000: 20). Inversion software allows the model to be refined based on a number of input assumptions (Loke 2000: 20). Two dimensional and three dimensional visualization software can then be used to display and analyze the data.

A typical resistance system is composed of electrodes, a battery, a meter, and a data logger. In theory, a measurement of the ground resistance can be performed with only a current and a potential electrode. However, a two electrode arrangement is impossible due to the contact resistance that is found around current electrodes (Aitken 1961: 61; Bevan 1998: 12). Therefore, electrical resistance instruments use a minimum of four electrodes that are designed to penetrate the ground enough to allow the current to propagate from the current probes and be sampled by potential probes.

The four electrodes may be arranged in many different configurations in order to perform a survey. A survey of possible configurations is given by Loke (2000) and is beyond the scope of this report. In general, however, certain methods are more suited to determining vertical or horizontal changes in ground resistivity.

In their most basic form, electrical resistivity instruments are simple and the least expensive of any geophysical instrument. (Bevan 1998) has demonstrated that a system composed of a standard multimeter, batteries, four metal electrodes, and some cables from an electronics store can be used to obtain high quality data. The disadvantage of this system is that it is very slow. More modern systems use multiple probes and elaborate switches to log many readings very quickly and store them electronically.

Electrical resistivity surveys can be easier to perform and give acceptable results in a wider range of sites than many other geophysical survey techniques (Bevan 1998: 7). Although extended periods of rain or drought may adversely affect resistivity surveys, the instrument is not subject to interference by metal debris, overhead power lines, and nearby cars as are magnetic and electromagnetic instruments. Resistivity has been used to delineate ditches, buried walls, foundations, tombs, voids, compacted floors, humus zones, daub concentrations, mound stratigraphy, and shell deposits (Aitken 1961:71; Weymouth 1986: 321; Geoscan Research 1996b: 6-8; Thompson et al. 2002).

Two electrical resistivity systems were used at Saint Michael’s Cemetery. One of these, a Geoscan RM-15 owned by the University of Mississippi Center for Archaeological Research, is designed specifically for archaeological applications and is primarily used in a CST configuration. However, a switching control mechanism called a multiplexor allows the collection of six readings at each station, enabling limited VES survey. It was used to collect trial data in the first phase of the project. Geoplot 3.0 by Geoscan was used for data processing and Res2DInv freeware produced by Geotomo Software was used for inversion.
The second instrument used was a Sting R1 Earth Resistivity Meter manufactured by Advanced Geosciences, Inc. (AGI) that is owned by the University of Arkansas. The system allows up to 56 probes to be used to create two dimensional and three dimensional data sets of electrical resistivity. EarthImager 2D and 3D was used to process and invert the data. Surfer 8 and Voxler, both produced by Golden Software, were used for display and visualization.

Resistivity Survey

Four different areas of the cemetery were selected for geophysical investigation using electrical resistivity (Figure 8.15). This resulted in seven two-dimensional surveys and one three-dimensional survey. All of the two-dimensional surveys utilized a dipole-dipole array with 0.5 meter spacing between probes. The array type was chosen because of its increased sensitivity to vertical changes. Probe separation was kept small to increase lateral sensitivity. Topographic data were collected using a total station for later locational correction of the resistivity surveys.
Area A was directly east of the Daniel Sullivan monument. Five two-dimensional south-to-north transects were collected using 28 probes and 0.5 meters between adjacent transects. Area B was located on a south-to-north pathway between the north road and the north boundary of the cemetery. One transect was collected using 56 probes. The 28 probe Area D transect started inside the northeast gate and extended past the storage building along the north road of the cemetery.

Area C was where the dipole-dipole, three-dimensional survey was performed. It was located in an area clear of markers in the south-central section of the cemetery. 48 probes were set up in a rectangle with equal spacing along rows and columns. Eight columns with one meter probe spacing and six rows with two meter probe spacing were used. Using a grid of probes as opposed to a line allows for resistivity to be recorded in both an X and Y direction during the same survey.

**Laboratory Methods**

Data processing was performed using various software programs. EarthImager 2D and 3D (AGI) were used for preprocessing and processing of the raw resistivity data. First, the raw data were downloaded from the Sting R1 control unit. Before processing, it was necessary to change the values for the location of the probes from the arbitrary numbers used by the instrument to the local coordinate system. Where applicable a terrain model was created to correct for elevation changes within a survey transect. Then an inversion was run on these data and the processed data were exported as text data and imported into Surfer 8 and Voxler (Golden Software) to create presentation quality graphics.

**Results**

**Area A**

All five of the two-dimensional transects from this area are very similar (Figure 8.16). A high resistivity layer at approximately one meter of depth is cut by a low resistivity layer in the middle. This low resistivity section corresponds to the area where Daniel Sullivan is buried. The high resistivity layer could be related to material that was brought in to raise the elevation of the area immediately surrounding the monument within the fenced in area. There are also low resistivity areas at the surface at either end of the five surveys. This could be in response to the adjacent cement sidewalk and additional runoff associated with it. However, the low resistivity anomaly on the south end is more significant and may be associated with a previously unknown grave identified in the GPR.

The Area A transects were located adjacent to one another to allow them to be combined into a three-dimensional data set. The data volume created in this process (Figure 8.17) provides a representation of the resistivity data in more of a real world fashion than the individual two-dimensional transects. The Sullivan grave anomaly is now quite clear as well as the more significant low anomaly, which may be associated with the previously unknown grave in the southern portion of the monument area (blue anomalies).
Figure 8.16: Area A resistivity transects results.
Area B

The Area B transect (Figure 8.18) was located at 1006.5 meters east. Within the first meter below surface, there are numerous low resistivity anomalies. As the Sullivan grave appears as a low resistivity anomaly these may represent unmarked graves. The two low resistivity anomalies located at ca. 976.5 and 980 north are the most likely to be graves. The long low resistivity anomaly between 983 and 987 north could be a row of graves or could be ponded water above the high resistivity anomaly. This high resistivity layer is discontinuous and is separated by a lower resistivity area. This layer and the layer immediately below appear undulating and may represent a previous land surface (high resistivity) and the current water table (deepest low resistivity layer).
Area C

Area C was set up in an area devoid of markers yet was surrounded by known graves. Figure 8.19 displays these data in plan view. Figure 8.20 is an isosurface image of the same data displayed obliquely. Interestingly, the most significant anomaly can be seen in the eastern portion of the survey area and has high resistivity (orange). This may represent natural conditions as in other locations within the cemetery with high resistivity. It could also represent a different kind of burial feature than the other burials associated with low resistivity anomalies. If this anomaly is related to human burial, it may be one large crypt or two individual graves oriented east-west.

On the southern edge and centered at 1042.5 East is another high resistivity anomaly. This may be the edge of an anomaly similar to the one mapped to the north however being on the edge of the survey area, it is difficult to evaluate with confidence.

In the northwest corner of the survey area is the one significant low resistivity anomaly. It is unclear what this anomaly represents, but it seems similar to the anomaly associated with the known grave in Area A. It is difficult to assess the low resistivity anomaly accurately due to its location at the edge of the survey area.
Figure 8.19: Plan view of Area C.

Figure 8.20: Oblique view of Area C.
Area D

The Area D transect (Figure 8.21) was located at North 965 meters. A layer of low resistivity was mapped at the surface. This could be associated with the materials used to construct the road or could be a recent layer of deposition. Below this is a layer of high resistivity. This layer of high resistivity could be a natural layer of varying continuity, owing to the variability in high resistivity between 965 and 980 East.

There could be a cultural explanation as well. Compared to the current land surface these high resistivity anomalies are too deep to be graves. However, if the upper low resistivity layer is depositional in nature (natural or anthropogenic) then there would be a living surface at the lower interface of this surface layer. If so, then the high resistivity anomalies are at a much more acceptable depth to be considered as human burials.

As in many of the other two-dimensional transects, the higher resistivity layer is cut by a lower resistivity area. One explanation is that this is related to underground water flow.

Thermal Infrared

Theoretical Introduction

Archaeological features, including burials, may be delineated with thermal prospecting if the physical properties of the feature differ enough to cause a perceivable contrast in temperature. The thermal behavior of a body is determined by several properties, including thermal conductivity (k), volumetric specific heat (Cv), and the thermal diffusivity (Γ) (Perisset and Tabbagh 1981: 170). These are used in the calculation of thermal inertia (P), which is a more convenient property to explain the thermal behavior of subsurface archaeological targets. Thermal inertia is inversely proportional to the response of the ground to thermal radiation. In an archaeological setting, this is largely determined by soil moisture and particle size. For example, an archaeological feature that collects soil moisture will have a higher thermal inertia than the surrounding soil matrix. Thus, it would heat and
cool relatively slow, causing it to show less temperature fluctuation through the diurnal cycle (Figure 8.22).

In order to discover archaeological features, the diurnal heating cycle must therefore be considered. In the morning, as the sun heats the ground, a subsurface feature may be detected as a positive or negative anomaly. For example, a buried pit feature that traps moisture will result in a negative anomaly in the morning. This results because moisture effectively increases the thermal inertia of the pit feature. In the evening, this situation would be reversed since the thermal gradient would be from the ground towards the atmosphere.

Some research (Perisset and Tabbagh 1981) has been conducted in detecting archaeological features using long term thermal changes, but generally measurements are taken

![Figure 8.22: Diurnal variation in temperatures of soils and rocks compared to water (Lillesand and Kiefer 1994)](image)

instantaneously using a camera system positioned on an aerial platform. This allows a large amount of area to be quickly covered, assuming the spatial resolution of the sensor is adequate to resolve the target.

For the St. Michael’s Cemetery project, an Agema 570 thermal infrared camera manufactured by Flir Systems Incorporated was used. The Agema looks much like a standard video camera, but is a precision digital thermal radiometer capable of measuring differences of temperature to .2 degrees Celsius (FLIR Systems 1996: 8-1). The camera is sensitive to radiation with wavelengths of 7.5 mm to 13 μm, covering the upper region of the
thermal infrared portion of the electromagnetic spectrum. A cutoff at 7.5 mm avoids atmospheric interference below this range. The camera has a 24 by 18 degree lens and produces a digital image composed of 320 by 240 pixels (FLIR Systems 1996: 8-1). This equates to a field of view of 42 by 32 meters and a spatial resolution of about 13 centimeters at 100 meters altitude (FLIR Systems 1996: 8-3).

A 26 foot helium blimp was used to carry the thermal infrared sensor (Figure 8.23). The blimp is flown at a maximum altitude of about 100 meters. A custom made gimble mount is used to maintain a vertical view. The blimp was tethered by three ropes to the ground and walked in a zigzag pattern around the cemetery until the entire cemetery was covered. A wireless video transmitter is used to send continuous video to the ground, where it is viewed and recorded on a Canon ZR60 digital video camera. Individual scenes were later extracted from the video.

Results

The thermal infrared survey results did not contain useful information about the location of burials. The primary problem is the extreme temperature range exhibited by the various surface features in contrast with the ground itself (Figure 8.24). Trees and shadows produced by monuments produced cool signatures that dominated the thermal range of most of the scenes. Burials, if they were visible thermally, would produce relatively subtle targets. Since the thermal infrared camera has a finite radiometric resolution (8 bit), large variation in temperature within a scene can limit the ability to distinguish these subtle differences. This is further complicated by the particular controls of the Agema 570, which force an automatic histogram calibration at a fixed time interval. There is no manual adjustment for histogram calibration. The result is that the open ground in the cemetery exhibits the same maximum 8 bit value (255).
Discussion

Overall, the GPR performed very well. The data, as suggested from the trial data (see Appendix 8.C), is very clear due to the ideal sandy soils found in the cemetery. Even where the stratigraphy was complex, such as with the fill on the south side, possible burials were delineated.

Measuring the position of the GPR data with the GPS proved to have advantages and disadvantages. The primary advantage was that we did not need to set up conventional
survey lines and transects could meander around obstacles. Merging the GPS and GPR data was a simple process in GPR Slice.

GPS data was not always available, however, due to dropped readings. Where the drop out was too extreme, such as under the large oaks in the southern third of the cemetery, the data could simply not be used. In other areas, downtown buildings, tall monuments, and the operators caused significant drop out, although the data could still be used. The performance of the GPS as measured in the accuracy results are somewhat misleading since they do not account for these dropped readings. Even where readings were not dropped, the anomaly location and shape were potentially impacted. That is, the cumulative effect of a relatively small variation in GPR accuracy in the reading on two adjacent lines could change the oblong, East-West image of a grave to something much different and more difficult to interpret. Another problems is determining where transects have been walked. With no ropes and the ability to meander, the operator is forced to rely on memory and sample density may therefore be variable.

The use of angled GPR survey proved to be a major advance. It was nearly as fast as using the GPS, but several of the problems were alleviated. It was more accurate and it was easier to determine which areas that been surveyed since they were straight lines. It does require the use of a total station to tie in grid corners and fractional lines start and finish positions. Therefore, unlike the GPS based method, survey time is a function of the number of surface obstructions and fractional lines.

Based on the distribution of markers and the GPR anomalies, it is likely that some burials are not visible with the GPR. These might be very ephemeral burials, such as earthen ones or those in deteriorated wooden caskets. Such targets are low contrast, even in the favorable soils at the cemetery, and may be beyond the limits of the GPR instrumentation.

Electrical resistivity tomography was also quite successful. The sandy soil, favorable for the GPR technique, is not ideal for resistivity since ground moisture is a necessary ingredient for current flow. Nevertheless, resistivity readings were obtained without issues.

A comparison of the GPR and electrical resistivity tomography data indicates a fairly close correspondence. For example, Figure 8.25 shows the GPR results for the portion of the Sullivan plot that was covered in Area A of the resistivity survey (Fig. 8.17). The Sullivan burial is clearly displayed in both images. The GPR image has the advantage of showing a buried, roughly horizontal zone, which was not evident in the resistivity image. This zone, which was detected throughout the Sullivan plot, might represent a buried land surface.

Likewise, a comparison of Area C in the resistivity data (Figs. 8.19, 8.20) with the GPR results for the same area (Fig. 8.26) shows a general correspondence. That is, there is a large shallow feature near the center of the area that dips to the east. In the resistivity, this is shown as a continuous mass while the GPR breaks it into several smaller masses filling about the same area. Both techniques detected a deeper, oblong mass that is intersected by the south boundary of the survey. In the GPR, it is obvious that this is a burial.
Although GPR and resistivity tomography yielded comparable results in the St. Michaels project, GPR seems to have shown more detail. The biggest drawback to the electrical resistivity tomography method is it is slow compared to GPR. For example, it took almost half a day to gather the resistivity data used in creating the image of Area C.

The thermal infrared survey was not very successful at St. Michael’s primarily due to the extremes in thermal variation caused by the many trees and monuments found there. In other archaeological applications (Haley et al. 2004), the ground surface was devoid of obstructions and the relatively subtle targets of interest were discernible. Thermal infrared might be successful in delineating unmarked burials in areas mostly free of markers and vegetation.

As with any remote sensing survey of archaeological sites, incorporating some form of ground truth is best. This is often a challenge with burials due to the issues surrounding human remains. In this case, however, the wealth of documentation and the possibility of excavation offer the potential to enhance the survey results presented here in the future.

Figure 8.25: Area A, three-dimensional volume of GPR data.
Figure 8.26: Area C, three-dimensional volume of GPR data.
Chapter IX. St. Michael’s Soil Survey

by:

Johan Liebens

Objectives

To fully appreciate the history of St. Michael’s Cemetery and its hidden graves this project must put the cultural landscape of the cemetery in its natural context. Topography is a basic foundation of any cultural or natural landscape and at the cemetery undoubtedly underwent many anthropogenic changes. Soils are also an integral part of our natural environment and may have been equally strongly affected at St. Michael’s. The objective of this chapter is, therefore, to examine the topography and soils at St. Michael’s Cemetery with the goal of contributing to a more complete understanding of the natural environment of the cemetery and the human impact upon it.

Specifically, this part of the project will:

• Generate a detailed topographic map of the cemetery.
• Systematically describe the soils at the cemetery.
• Assess the anthropogenic disturbance of the surface of the soils.
• Map the thickness of the disturbed layers and the topography of the original surface.
• Evaluate the relative age of the disturbance of the surface of the soils.

Methods

Existing scientific literature on soils in the Pensacola area is scarce. The most authoritative source is the recent Soil Survey of Escambia County (Williams 2004). The survey report was perused for descriptions of the soils in the St. Michael’s Cemetery area. In August and September of 2006 six trenches 6x3 wide were manually dug to describe and sample representative soils at the cemetery. The location of the trenches was selected so as to avoid disturbed locations and have a spread in a north south direction, which is the predominant direction of topographic slope. The selection of suitable sites for the trenches was greatly facilitated by preliminary findings from the GPR survey (see chapter VIII) that identified areas where unmarked or unidentified graves were not present. Additionally, field observations such as local depressions or knolls were used to avoid potentially disturbed sites. Soil horizons in the trenches were described and sampled in accordance with USDA guidelines (Soil Survey Division Staff 1993) and bulk density samples were taken according to procedure 1B1 of (Burt 2004). Trench ID’s started with T3 to be consistent with the coding of archaeological features at the cemetery. To complement the information from the trenches, soils were described in 26 auger holes that were manually drilled with a 3” diameter bucket auger in fall 2006 and spring 2007. The auger holes were located at presumably undisturbed locations in parts of the cemetery without a trench. Additionally, small, shallow soil pits about 0.5 m in each dimension were dug to just below the original topsoil at 77 seemingly undisturbed random locations throughout the cemetery. The thickness and color of all layers in these pits was recorded and, thickness allowing, samples were collected from the top, middle and bottom of each organic-rich layer in the profiles.
In the laboratory, samples from the trenches were analyzed for particle size distribution with the pipette method (procedure 3A of Burt 2004) and for organic matter content with the loss-on-ignition method (LOI) (procedure 5A of Burt 2004). For the samples from the shallow pits the organic matter content was determined with both the loss-on-ignition method on lab duplicate samples and the modified Walkley-Black method (procedure 6A1 of Soil Survey Laboratory Staff 1992). The pH for these samples was measured in a 1:1 water suspension (procedure 4C1 of Burt 2004). The Oxidizable Carbon Ratio (OCR) age was calculated for the samples from the shallow pits using methods explained in Frink (Frink 1992, Frink 1994, Frink 1995).

A topographic survey of the cemetery was carried out with a total station using a spacing of no more than 30 ft (10 m) between survey points. At the beginning and end of each day two control points were surveyed to evaluate the day-to-day consistency of the measurements and the agreement with the existing GIS of St. Michael’s Cemetery (http://www.uwf.edu/gis/smc/index.cfm). The measurements were tied into the NAVD88 vertical datum by surveying a nearby tidal benchmark. The survey data were imported into a GIS and converted to a surface map using Kriging and a cell size of 5 m. Kriging was selected over an inverse distance weighted method for the surface interpolation after comparison of the RMSE (root mean square error) that resulted from both methods. A map of the depth to the original surface was also interpolated, based on field observations in the small soil pits, with Kriging using the same parameter settings as those used for the topographic surface map.

Results and Interpretation

Ancillary Surveys

A total of 637 points were surveyed with the total station. A visual evaluation of the location of the control points in the GIS indicated that their coordinates were consistent and matched the existing GIS maps of the cemetery. The topographic map resulting from the Kriging-based interpolation shows that the northeast corner of the cemetery is highest (Figure 9.1). The highest surveyed elevation in that area is 19.55 ft above the NAVD88 datum. The surface descends gradually in a straight-line slope towards the southwest corner of the cemetery. The topography is generally very smooth, which is consistent with the marine origin of the underlaying sediments. In the southeast section of the cemetery, just south of the southernmost road, a more complex topography consisting of small knolls and depressions is present (see Figure 9.1). These local knolls and depressions may be the result of human activity or of natural uprooting of large trees. The lowest measured elevation in the southwest is 7.35 ft above datum, making the total relief difference for the cemetery 12.20 ft. The slope gradient is between 2 and 4.5 in the undulating southeast section but generally remains below 2 in the rest of the cemetery.
Figure 9.1: Topography of St. Michael’s Cemetery based on total station survey. NAVD88 vertical datum.
The preliminary GPR survey found that few areas of the cemetery have strong and reliable evidence for the absence of unmarked graves. Several small areas that were free of unmarked graves were discovered, however, and a total of six trenches were completely excavated in those areas (Figure 9.2). One additional trench, trench number 6, was started but had to be abandoned because water pipes were encountered at shallow depth and our objective was to avoid obviously disturbed sites. From historical sources (Koch 1896) it was known that undisturbed sites were not present in the low-lying southwest section of the cemetery. The section originally was a swampy area that was used as a refuse dump and gradually filled in. However, the area was of interest because it was expected to have different soil characteristics than most of the cemetery based on its topographical position and information from the soil survey. Therefore, we excavated one trench in the low lying area (trench T5) to gather any information possible and one just north of it (trench T4) at a somewhat higher but undisturbed location (see Figure 9.2). The depth to which the soil trenches could safely be excavated was between 3.61 ft and 5.90 ft (Table 9.1).

According to the soil survey report (Williams 2004) the soils at St. Michael’s Cemetery belong to the Foxworth series, with the exception of those in the low laying southern part. The series is formally described as very deep, sandy, and moderately well drained. From December to April the water table is generally between 3.50 ft and 6 ft deep. The Foxworth series typically has a 6 inch thick A horizon (topsoil) over several light yellowish brown C horizons (subsoil) that extent to more than 6.50 ft deep and represent the parent material of the soils. Soils in the south and southeast part of the cemetery belong to the Hurricane series and are very deep and sandy (Williams 2004). However, they are formally described as being somewhat poorly drained and having a groundwater table that is 1.50 ft to 3.50 ft deep from December to April in most years. The somewhat poor drainage of these sandy soils is the result of their low position in the landscape. The Hurricane series typically has a 5 inch thick A horizon over several leached E horizons. Below the E horizons, starting at about 5 ft depth, B horizons with accumulation of organic matter can be observed in this series.
Soil Profile Development

The soils in the trenches excavated for the current study have a poorly developed profile with little differentiation between the horizons (Table 9.1). A B horizon, or zone of accumulation that typically attests to a somewhat greater soil development, was only observed in the trenches in the low laying area in the south (trenches T3, T4, and T5). The
three highest trenches (trenches T7, T8, and T9) have a profile with A (topsoil) and C (subsoil) horizons only, suggesting minimal soil development (see Table 9.1, Figure 9.3). The lower trenches have an A-E-B-C profile, indicating that some movement of materials from the E to the B horizon has taken place. The development of the B horizons is minimal, however, as indicated by their color, texture, and structure. Trench T5, in the lowest landscape position, has the best developed B horizon. The B horizon has a dark brown color characteristic of horizons with accumulation of organic matter and has a clay content that is slightly higher than the overlaying E horizon (Table 2) which suggests that some accumulation of clay has taken place. The general lack of development of the soils may be due to the geologically relatively young age of the parent material but is also the result of the very high sand content of the soils. The sand in the area is extremely quartz rich (Williams 2004) and contains few mineral constituents conducive to soil development. The difference in profile development between the topographically higher and lower profiles is due to the position of the groundwater table. In the higher topographic positions the groundwater table is so deep that in these sandy soils infiltrating water moves through the profile swiftly without producing soil horizons. At the lower elevations the shallow groundwater table slows down infiltrating water, and potentially stops it at certain times of the year. This leads to increased deposition in the B horizon of substances being transported by the infiltrating water and thus to increased soil formation. Observation in the field of a soft soggy bottom at 3.28 ft depth in trench T4 and standing water at 4.27 ft depth in an auger hole in the bottom of that trench are consistent with a shallow groundwater table. Conversely, the bottoms of trenches at higher elevations, i.e. T7 and T8 at 3.83 ft depth and of trench T9 at 6.17 ft depth, were completely dry and solid. The grayish brown color of the deepest horizon in trenches T3 and T4 as compared to the more brown color of the deepest horizons in trenches T7, T8, and T9 (see Table 9.1) also indicates that the groundwater table is shallower at the lower elevations, and hence is more likely to affect soil development.

The decreasing trend of soil development from higher to lower elevations is in agreement with soil survey report data (Williams, 2004) but the soil in trench T5 appears less developed than the Hurricane Series mapped by the soil survey in the south section of the cemetery. This may be because we could not excavate deep enough in a safe manner to observe deeper and more developed B horizons or because the soil is not a typical representation of the series because it is situated at the edge of the zone mapped as Hurricane Series. The soil survey report maps the southeast part of the cemetery as Hurricane Series but this is in contradiction with the topographic map of the current study which shows that the southeast part is between 3 ft and 5 ft higher than the southwest corner. Observations in auger holes also indicate that soils in the southeast section do not belong to the Hurricane Series but are more similar to the Foxworth series. The discrepancy between the current study and the soil survey report (Williams, 2004) can be explained by the broad scale at which the soil survey was necessarily made.
All horizons in the trenches are very sandy (see Table 9.2). Laboratory analysis show that the minimum sand content for any of the horizons is 88.7 %, the maximum is 96.0%. Within the sand range of particle sizes, the medium sand fraction (0.25 mm - 0.50 mm) dominates (see Table 9.2). Clay content is very low and ranges from 0.3 % to 3.8 %. All horizons have a sand texture, according to the USDA soil texture classification system (Soil Survey Division Staff, 1993).
### Trench T3

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<td>g, w</td>
<td>w, f, gr</td>
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Table 9.1: Description of soil profiles in trenches.

1: b indicates a buried horizon which is an horizon that was covered by newer material after it initially formed.
2: / indicates a transitional horizon in which distinct parts have recognizable properties of the horizons indicated by the capital letters.
3: two capital letters designate a transitional horizon dominated by properties of one horizon but having subordinate properties of another.
4: number indicates presence of more than one horizon of the same type.
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Table 9.2: Particle size analysis [%] and bulk density [g/cm³] of samples from trenches.
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Table 9.2: Particle size analysis [%] and bulk density [g/cm³] of samples from trenches.
* n/a: Bulk density is not available for some horizons because the limited thickness or mixed nature of the horizon prevented collection of bulk density core samples.
Visible Disturbance in Soil Profiles in Trenches

In all trenches material that was added or disturbed by humans was found to overlay the horizons of the original natural soils. The disturbed material was recognizable in the soil profiles as a horizon couplet consisting of a thin medium gray organic rich horizon on top of a yellowish brown organic poor layer that covered a better developed, and presumably original, A horizon. The thin organic horizon at the surface represents renewed soil formation in the surficial material, and thus is a new A horizon, whereas the yellowish brown horizon is thought to represent the original state of the new or disturbed material, making it a C horizon (see Table 9.1). Given the minimal development of the new A horizon the material must have been added or disturbed very recently in a pedological sense. The thinnest recent cover material was observed in trench T3 where a 1” thick A horizon and 1” thick C horizon overlay the A horizon of the original soil (see Table 9.1). Similar recent A and C horizons have a combined thickness of 5 inches and 7 inches in trenches T4 and T8 respectively. Trench T7, located on the side of the northern road at the cemetery, has three finely stratified and dark colored layers with a combined thickness of 9.5” on top of the original surface (Figure 9.4). The three layers and their stratification are parallel to the current surface and truncate the original A horizon. These layers may result from repeated improvements to the road. Trench T5, in the low lying south part of the cemetery, has two anthropogenic A horizons on top of an 18 inch thick anthropogenic layer that consists almost exclusively of household refuse containing glass bottles and ceramics, clearly indicating that the two A horizons are recent cover material. The refuse layer reaches a depth of 27” and rests on what seems to be the original A horizon.

These observations suggest that at locations where the soil has not been completely disturbed by internment activities, such as at the sites for the trenches, the soils have been altered by addition or mixing of surface materials. The only exception seems to be trench T9. The top of the wall of trench T9 that was described (south wall) is not covered by recent material (see Table 9.1). The soil at this site was covered with pavers. It is possible that recent cover materials were removed when the pavers were placed, or that no material was added to the top of the soil because of the presence of the pavers. Two of the other walls (east and west walls) of trench T9 have 20” of fill material at the top of their profiles. This fill is characterized by a mix of gray organic matter rich material and yellowish-brown organic poor material. This shows that some disturbance of the soils in the vicinity of trench T9 has taken place. The midsection of the profiles in the SW and SE corners of trench T3, which were not described, also contained fill material consisting of a mix of gray material rich in organic matter and yellowish-brown material. It is interesting to note that these two corners of trench T3 were just outside the irregularly shaped area marked by the GPR survey as being undisturbed. The wall of trench T3 that was described did not show evidence for major disturbance and was within the area cleared by the GPR survey.
Figure 9.4: North wall of trench T7 showing three added layers at surface. Dark brown horizon just below third peg from top down is interpreted as lower part of original A horizon.
Figure 9.5: Location of trenches (T), small soil pits (SM), and auger holes (A).
Surficial Disturbance of Soils

To further investigate if and where the surface of the soils at the cemetery has been altered by the addition of new material, as suggested by the profiles in the trenches, 77 small pits were dug to a depth at which the soil became homogeneous and yellowish-brown in color (Figure 9.5). The horizon at that depth was interpreted, based on observations in the trenches, to be an undisturbed E or C horizon and to not be of anthropogenic origin.

Field observations showed that in most of the small soil pits the undisturbed E or C horizon was overlain by a fairly homogeneous gray horizon the bottom of which gradually changed into the E or C horizon. This gray horizon was interpreted to be the original A horizon. This horizon was sometimes absent, indicating that it had been removed by natural erosion or human activities. At some sites, the original A horizon reached the surface, indicating that little or no disturbance of the soil had taken place at that site. This original A horizon, or in its absence the undisturbed E or C horizon itself, was overlain by relatively thin heterogeneous horizons that were either gray or orange brown in color or were a mix of materials of various colors. These heterogeneous horizons had abrupt boundaries between them and with the underlying horizon (original A or undisturbed E or C horizon). These heterogeneous horizons were interpreted as fill material that was added to the surface of the soil.

In total six different types of profile were observed above the undisturbed E or C horizon (Figure 9.6). Four of the profile types (profile type 1 - 4) included an original A horizon. One or two distinct layers were found to cover the original A horizon (profile type 3 and 4). In the other profile types the original A was not present and the original undisturbed E or C horizon was overlain directly by a layer that had completely (profile type 5) or partially (profile type 6) developed into a new A horizon.

The profile type could be established for 75 of the small pits, the six trenches, and 15 of the auger sites, for a total of 95 sites. Results show that at 55 of these 95 sites material was added to the surface of the soil (profile types 2 - 6) (see Table 9.3). This added material may result from excavations for nearby graves or for erecting fences, coping, or grave markers. This relatively large number of sites with added and disturbed surface materials shows that many soils have been disturbed at St. Michael’s Cemetery, even at places where there are no obvious signs for the presence of interments, as is the case for the sites used in this study. At 16 of the 55 sites the original A horizon had been removed, probably by human action but possibly by natural erosion, before the new materials were added (profile types 5 and 6). This indicates that these soils underwent the most severe disturbance. Many of the soils were disturbed only once, as indicated by the single disturbed layer at the surface of all but six of the 55 sites (see Figure 9.6). At 40 of the 95 sites the profile was seemingly undisturbed and the original A horizon reached the surface (profile type 1). Obviously, removal or addition of small amounts of material may not have been discernable in the A horizon. The original A horizons at the surface are considerably thicker than A horizons in the added material (see Table 9.3, 8.92” vs. 4.85” on average). This can be explained by a lack of sufficient time for the formation of a thick A horizon in the added material and is consistent with the interpretation of the material as being recently added.
Figure 9.6: Schematic representation of soil profile types observed at St. Michael’s Cemetery. Capital letters designate soil horizons, numbers indicate different layers. 1 represents original parent material of soils, 2 and 3 represent disturbed and added material. 

indicates that the 1A horizon was removed prior to addition of layer 2.
A map of the distribution of the profile types shows that profile type 1 is absent from the southwest and south-central sections of the cemetery (Figure 9.7). This indicates that the original surface of the soil is covered by disturbed materials throughout this area. This observation is consistent with findings about the topography of the area (see section 3.5 below). In the rest of the cemetery the various profile types do not show any spatial trend, indicating that disturbance of the surface of the soils and addition of new materials did not occur systematically but rather at isolated locations at various times. This is consistent with an origin associated with local excavations for interment and maintenance.

Reconstruction of Original Topography

To reconstruct the topography of the cemetery at the time it was established we mapped the depth to the top of the original A horizon and subtracted that depth from the current elevation. The depth map is based on the soil profiles in which the original A horizon was identifiable (profile types 1 to 4), 79 sites in total (see Table 9.3, see Figure 9.6). The depth map (Figure 9.8) shows that in much of the cemetery the original A horizon is overlain by less than 2 inches (< 5 cm) of disturbed and added material. In the southwest and south-central section of the cemetery, however, the original surface is interpolated to be under 1 to 3 ft of fill materials. This greater depth in the south section is consistent with historical information that the south section of the cemetery was originally swamp-like but was filled in (Koch 1896). It is also consistent with the presence of an anthropogenic refuse layer observed in trench T5 and the absence of profile type 1 in the area, as discussed in the previous section. In some of the auger holes in the south section of the cemetery the original surface, or any other original undisturbed soil horizon, could not be reached because of the large amount of household refuse in the fill material. It is possible, therefore, that in the south section of the cemetery the original surface is locally more than 3 feet deep.

Comparison of the maps of the topography of the original surface (Figure 9.9) and current surface (see Figure 9.1) shows that the general topography and elevation have changed little since the establishment of the cemetery. The major change has occurred in the southwest and south-central parts of the cemetery where the original elevation was lower and slopes steeper. The lowest original elevation, based on the Kriging interpolation of the field observations, was 4.59 feet (1.4 m) above datum, the lowest interpolated current elevation is 7.55 feet (2.3 m). The complex pattern of small knolls and depressions that occurs just south of the southernmost road is also visible on the map of the original topography, indicating that the pattern is not the result of human cut and fill operations. It is possible that it results in part from the settling of material at unmarked gravesites but the topography may originally have been pockmarked due to uprooting of trees. Uprooting of trees would not be unexpected in the sandy soils and storm prone climate at St. Michael’s Cemetery.
Figure 9.7: Spatial distribution of soil profile types. See figure 9.6 for description of profile types.
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Table 9.3: Depth and thickness of current and original A horizons [cm].

§ 0: 1A is at surface (profile type 1); -: 1A is not present (profile type 5 and 6). See Figure 8.6 for explanation of nomenclature of horizons.

* The 1A horizon could not be determined with certainty in some auger holes.
Figure 9.8: Interpolated depth to original surface, as marked by top of original A horizon (1A horizon in Figure 9.6).
Figure 9.9: Topography of original surface, as marked by top of original A horizon (1A horizon in Figure 9.6).
One of the objectives of the study was to determine a timeframe for the disturbance of
the soils at the cemetery. Given that most of the disturbance of the soils at the cemetery is
associated with interment and other human activities during the last two centuries, reliable
absolute age dating techniques are not available. Radiocarbon techniques, for instance, have
good precision only about 250 years ago and beyond and would most likely provide
unreliable ages. In the current study we applied a relatively new age dating method that
employs a ratio of two different types of organic carbon and has the potential to yield the
absolute mean residence time of organic carbon in soils (Frink, 1992; Frink, 1994; Frink,
1995). The method is based on the principle that different analytical techniques measure
different types of organic matter and that these different types have different decomposition
rates. The Walkley Black method, for instance, measures the amount of readily oxidizable
carbon in organic matter whereas the LOI method measures almost all of the carbon present
in a soil including the carbon present in resistant forms of organic matter. The ratio of the
readily oxidizable carbon to the total carbon (OCR) is, therefore, related to the degree of
decomposition of organic matter and, all other factors being equal, is a proxy for the time the
sample has been decomposing. However, in nature not all factors are constant and Frink
(Frink, 1994; Frink, 1995) used a multiple linear regression to determine the quantitative
relationships between the OCR, time, and other factors that affect organic matter
decomposition. A high correlation was found between the age dates obtained with this OCR
regression and the radiocarbon method (Frink, 1994). After its initial establishment in the
early 1990’s the OCR method has been applied successfully by other researchers to date
archaeological features (Dubois, 2003; Gunn et al., 2002; Josephs, 2002; Keith, 1998) but it
has also been criticized as lacking a sound physical basis (Killick et al., 1999). Regardless of
this criticism, the OCR method is based on a statistical regression analysis and should not be
used to quantitatively predict ages outside the range of the original input data for the
climatological, pedological and biological regression parameters. Given that the method is
still in its scientific infancy, we have applied the OCR method in this study as a relative age
dating tool. Even though the method generates numerical output we interpret the values only
in relative terms. As is the case for the C14 method, the OCR method can not provide a true
age date for the formation of the soil or any particular horizon but only the mean residence
time of organic matter in the soil.

The OCR age was determined for three samples above the original subsurface (E or C
horizon) in the shallow pits. One sample was taken from the top of the surface horizon, one
just above the top of the original subsurface, and one in between. Results for the variables
required for calculating the OCR age show that the total LOI organic matter content is
relatively low on average (2.0 %), and that it ranges from 0.5 % to 7.2 % (Table 9.4). This
low average is consistent with the sand texture of the soils and the warm and wet climate that
facilitates decomposition of organic matter and leaching of the derived substances. The pH
of the samples is slightly acidic (6.2 on average) and ranges between 4.4 and 8.0. A slightly
acidic pH is also consistent with the sand texture and warm and wet climate. The climate
variables used to calculate the OCR age are, obviously, constant for all samples and are
based on observations at the nearby Pensacola Regional Airport (temp = 80.6 °F, precip =
157 cm). Units are as required by the method. A code of 5 was entered for the texture of the
soils as stipulated by the method for soils with sand texture. The value for the constant in the
formula for the OCR age (14.4888) is from Frink (1994; 1995).
The OCR age increases with depth in each profile. This trend is as expected and can be explained by the incorporation of recent organic matter into the surface of the soil while older more decomposed organic matter gradually is mixed deeper into the soil profile. The trend also indicates that at the sampling sites there was no major recent turnover of the top of the profile which would have brought old organic matter to the surface. However, given that the depth of the sample is one of the variables used to calculate the OCR date, this method may not be ideal to identify such turnover.

To assess the age of the last disturbance of the soils we examined the OCR age of the topmost sample from the surface horizon in each profile (Table 9.5). At two sites (SM-49 and SM-72) the surface horizon was too thin to be sampled and these profiles were not included in this assessment. The OCR ages for the surface horizons range from 163 to 833 and have an average of 426. As argued above, it is prudent not to interpret these ages as calendar years but the results indicate that these surface horizons are young, in a pedological sense. The mean OCR age for the surface of soils with an unaltered upper profile (profile type 1) is 441, for soils with an altered top (all other profile types) it is 406. Even though these two OCR ages are similar, and may be within the resolution of the method, they display the proper trend. The original A horizons at the surface should have an older age because organic matter has been accumulating in them for a longer time than in the surface horizons in the disturbed added material.

The OCR age of the surface horizons is spatially variable (Figure 9.10), indicating that the disturbances of the soils are due to local activities and not to any systematic work at the cemetery. This corroborates a similar contention that was made based on the distribution of the profile types of the disturbed soils. A map generated with a kriging-based interpolation of the calculated OCR ages (see Figure 9.10) shows that in general the youngest surfaces are present in the west of the cemetery, indicating that the most recent disturbances of the surface predominate in those areas. The oldest surfaces are present in the south-central and north-central sections of the cemetery. The interpolated OCR age of the surfaces in the southwest and south-central parts of the cemetery are very different, suggesting that although the marshes in that area may have been filled in at approximately the same time at the end of the XIX century (Koch 1896), the newly created fill surface must have been disturbed or added to at various times in various places.

An interpolated map of the year of death inscribed on grave markers (Figure 9.11) differs considerably from the OCR age map (see Figure 9.10). The year-of-death map shows a distinct pattern with the oldest graves in the east-central section of the cemetery. Slightly younger graves surround the nucleus of old graves in more-or-less concentric zones but with a secondary spot of old graves just south of the priests’ hill. The youngest graves occur
mostly in small areas around the periphery of the current cemetery and in a large homogeneous area in the south. The discrepancy between the maps indicates that the disturbances and additions to the surface of the soils are not mainly due to local excavations for interments. Therefore, the most likely source of the added material are excavations for fences, coping, utilities, and other maintenance and possibly intentional transport of soil to fill in local depressions. The uniformity of the large homogeneous area of relatively recent graves in the south (see Figure 9.11) indicates that few older graves are present in that area. This supports the notion that the south section of the cemetery was filled in within a limited period of time.
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Table 9.5: OCR dating parameters and results for surface horizon in small soil pits.
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Table 9.5: OCR dating parameters and results for surface horizon in small soil pits (continued).
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Table 9.5: OCR dating parameters and results for surface horizon in small soil pits (continued).
Figure 9.10: Calculated (circles) and interpolated OCR age for surface horizon.
Figure 9.11: Interpolated map of year of death inscribed on grave markers. Years in legend are average year-of-death value for a particular map pixel and do not represent actual inscriptions.
Summary and Conclusions

Soils at St. Michael’s Cemetery are poorly developed in a pedological sense. This is mainly due to the sandy texture of the parent material, locally high topographic position, and high rainfall, which together favor leaching over soil development. In the low lying south section of the cemetery soil development is somewhat more advanced than elsewhere because of the presence of a shallower groundwater table. Findings of the current study suggest that these somewhat more developed soils may not be as extensive as presented in the soil survey report, most likely because of scale limitations of the soil survey.

Many of the soils examined in the current study have surficial horizons that have been anthropogenically altered, mainly through addition of one or two relatively thin surface layers. In some soils the original surface horizon was removed, by human or natural action, before addition of the new surficial layers. The surface alterations do not show a spatial trend, indicating that they are the result of isolated rather than systematic activities.

The original topography of the cemetery was similar to that of the present day with the highest areas in the northeast and a gradual and gentle slope towards the southwest. The largest difference between the current and original topography was observed in the southwest where the original elevation was at least 3 feet lower than the present day one. In that southwest section soils show clear evidence of various phases of anthropogenic soil built up and disturbance. These observations are consistent with historical sources that show that a marshy area in the southwest of the cemetery was filled in at the end of the XIX century.

Relative age dating suggests that the age of the surface of the soils is highly variable, both spatially and temporally. This is consistent with the lack of a spatial trend in the type and presence of surface alterations, and corroborates the contention that the surface of the soils at St. Michael’s Cemetery has been altered at various places at various times. Disagreement between spatial patterns of the age of the soil surface and the age of graves suggests that the surface of the soils is not strongly influenced by excavations for local graves. Most likely, soil additions and disturbances are mainly the result of local construction and maintenance of fences, coping, and utilities.