May 2019

Visitor Impact at Historic Sites: An Assessment of the Influence of Usage, Interpretation, and Management on Material Degradation

Laurel Lynne Bartlett
Clemson University, bartleb@clemson.edu

Follow this and additional works at: https://tigerprints.clemson.edu/all_dissertations

Recommended Citation
https://tigerprints.clemson.edu/all_dissertations/2381

This Dissertation is brought to you for free and open access by the Dissertations at TigerPrints. It has been accepted for inclusion in All Dissertations by an authorized administrator of TigerPrints. For more information, please contact kokeefe@clemson.edu.
VISITOR IMPACT AT HISTORIC SITES:
AN ASSESSMENT OF THE INFLUENCE OF USAGE, INTERPRETATION, AND MANAGEMENT
ON MATERIAL DEGRADATION

A Dissertation
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Planning, Design, and the Built Environment

by
Laurel Lynne Bartlett
May 2019

Accepted by:
Dr. Carter L. Hudgins, Committee Chair
Dr. Elizabeth Baldwin
Dr. Matthew Brownlee
Dr. Matthew Powers
ABSTRACT

Protection of cultural resources and sustainable visitation have been significant issues in the management of historic sites since the early nineteenth-century when site managers at Mount Vernon discovered damages to architectural materials from relic hunters. As tourism and the number of historic sites grew in the twentieth century, professional architectural conservators also took note of physical damage due to increased tourism. However, the impacts themselves are often a confluence of external factors, such as individual visitor behavior and the interpretation and management strategies that provide access.

Thus, with the goal of sustainable visitation, the present problem is to understand the correlation between visitor use and subsequent material damage and methods that afford a better understanding of spatial distribution patterns while also keeping visitation sustainable. Comprehensive understanding of the interconnection of damage and site usage affords better site accessibility and damage mitigation without restricting access, while from a historic resource perspective also balancing the retention of significance and integrity with visitation.

One potential method for a better understanding of visitor use and spatial relationships to physical damage is GPS Visitor Tracking (GVT). Derived primarily from studies designed to assess visitor use at national parks and outdoor areas (Hallo et al., 2005 and 2012; D'Antonio et al. 2010; D'Antonio and Monz, 2010; Beeco, et al., 2014;
and Taczanowska, 2014) various approaches to the technology have application with understanding visitor use at historic sites as well. Using Thomas Jefferson’s Monticello as a case study, this research uses GPS systems, heat mapping, and conditions assessments to help understand patterns of visitor use and material damage. This research explores how visitors behave in a space and how patterns of density and congestion correlation with frequency and type of material damage.

Geographic behavioral analysis offers insight into the human factors that influence material degradation. The creation of a processed-based framework for visitor impact assessment developed from this research works to assist historic sites in enhancing plans for sustainable visitation and the protection of historic materials. As use continues to change at historic sites this research will help preservation professionals and planners understand the human factor characteristics of visitor impact, identify issues that could increase the risk of visitor impact, and recommend improvements that may reduce those risks ultimately leading to better preservation planning and management.
DEDICATION

Dedicated to my mother for inspiring me to be a strong woman and a kind human. To my father for his support and teaching me the value of a cup of coffee. Finally, to my grandmother, Harriet Bell, for being the inspiration for my education.
ACKNOWLEDGEMENTS

This dissertation would not have been possible without the guidance and help of several individuals who in one way or another extended their gracious assistance and contributed to the completion of this research. First, I offer my sincerest thanks to my committee members. Matthew Brownlee for his generosity and dedication to expanding my technical knowledge of visitor studies, Elizabeth Baldwin for instilling in me a passion for National Parks and qualitative research, and Matthew Powers for always encouraging me to think about my research from a different angle.

It is with immense gratitude that I acknowledge the support and guidance of my long-time mentor and committee chair, Dr. Carter L. Hudgins, who continually and convincingly conveyed a spirit of adventure and excitement regarding research and scholarship. I am indebted to him for his enthusiasm, grace, humor, and for being the single greatest “threat” to historic resources.

I would like to express my deepest gratitude to those at Monticello and the Thomas Jefferson Foundation who were not only essential to this research but whose assistance and support of this research was truly remarkable and inspiring. My deepest gratitude to the Thomas Jefferson Foundation and its President Ms. Leslie Greene Bowman for allowing me to bring this research to Monticello. Additionally, I am indebted to Mr. Gardiner Hallock, Mr. Steven Geis, Ms. Lucy Midlafort for all their time in coordinating and assisting with this research. Lastly, I am very appreciative of all the
wonderful staff and volunteers at Monticello and the Thomas Jefferson Foundation, including Caitlin B., Caitlin H., Dave, Jim, Malia, and Tabitha.

In addition to the staff at Monticello, the gracious assistance of several key individuals contributed to the success of this dissertation: Mr. William Hiott at the Calhoun House; Amalia Leifeste Samant, Anna Treado Overby, and Brian Peterson for their technical assistance and guidance; and to Shayla Shreves at the ACHP for her interest and promotion of this study.

A very special thank you to Daniel Arthur, Katy Harris, Emelyn Kendrick, Pamela Kendrick, Wendy Madill, Julia Tew, and Amy Elizabeth Uebel for all their graciousness and support throughout this dissertation adventure. Most importantly, I am indebted to my cohort who continue to amaze me with their accomplishments, intellect, and camaraderie.

Lastly, I give the sincerest appreciation to all the visitors to Monticello and participants of this study. None of this research would have been possible without their kindness, humor, and willingness to help a stranger in the name of research.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TITLE PAGE</td>
<td>i</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>ii</td>
</tr>
<tr>
<td>DEDICATION</td>
<td>iv</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>x</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xi</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Description of the Research Problem</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Purpose of the Research and Objectives</td>
<td>3</td>
</tr>
<tr>
<td>1.3 Significance of the Study</td>
<td>5</td>
</tr>
<tr>
<td>1.4 Primary Research Questions</td>
<td>6</td>
</tr>
<tr>
<td>1.5 Definition of Terms</td>
<td>7</td>
</tr>
<tr>
<td>2. THEORETICAL FOUNDATIONS AND LITERATURE REVIEW</td>
<td>8</td>
</tr>
<tr>
<td>2.1 Introduction</td>
<td>8</td>
</tr>
<tr>
<td>2.2 Historic Preservation Theory and Practice</td>
<td>13</td>
</tr>
<tr>
<td>2.2.1 Theoretical Foundations</td>
<td>13</td>
</tr>
<tr>
<td>2.2.2 Contemporary Historic Preservation and Pragmatic Policy</td>
<td>18</td>
</tr>
<tr>
<td>Implementation</td>
<td></td>
</tr>
<tr>
<td>2.2.3 Significance, Integrity, and Authenticity of Historic Sites</td>
<td>23</td>
</tr>
<tr>
<td>2.3 Visitor Impact and Materials Conservation Literature</td>
<td>31</td>
</tr>
<tr>
<td>2.3.1 Conservation Theory and Approaches</td>
<td>31</td>
</tr>
<tr>
<td>2.3.2 Problem Recognition</td>
<td>34</td>
</tr>
<tr>
<td>2.3.3 Physical Effects of Visitation</td>
<td>36</td>
</tr>
<tr>
<td>2.3.4 Signs of Attrition</td>
<td>40</td>
</tr>
<tr>
<td>2.3.5 Biological and Environmental</td>
<td>45</td>
</tr>
<tr>
<td>2.3.6 Conflicts in Material Decay and Patina</td>
<td>48</td>
</tr>
</tbody>
</table>
### TABLE OF CONTENTS (Continued)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4 Visitor Impact in Historic Site Management and Interpretation</td>
<td>51</td>
</tr>
<tr>
<td>2.4.1 Historic Site Management Theories and Challenges</td>
<td>51</td>
</tr>
<tr>
<td>2.4.2 Proactive Management Approaches</td>
<td>53</td>
</tr>
<tr>
<td>2.4.3 Access and Carrying Capacity</td>
<td>56</td>
</tr>
<tr>
<td>2.4.4 Historic Site Interpretation Theories and Challenges</td>
<td>61</td>
</tr>
<tr>
<td>2.5 Conclusion</td>
<td>66</td>
</tr>
<tr>
<td>2.5.1 Lack of Comprehensive Approaches</td>
<td>66</td>
</tr>
<tr>
<td>2.5.2 Complexity of Ideals</td>
<td>67</td>
</tr>
<tr>
<td>2.4.3 Varied Regional Emphasis</td>
<td>68</td>
</tr>
<tr>
<td>3. RESEARCH DESIGN AND METHODS</td>
<td>69</td>
</tr>
<tr>
<td>3.1 Case Study Research Design</td>
<td>69</td>
</tr>
<tr>
<td>3.1.1 Introduction</td>
<td>70</td>
</tr>
<tr>
<td>3.1.2 Thomas Jefferson’s Monticello as a Case Study</td>
<td>74</td>
</tr>
<tr>
<td>3.1.3 Monticello Background and Current Conditions</td>
<td>76</td>
</tr>
<tr>
<td>3.1.4 Research Questions</td>
<td>77</td>
</tr>
<tr>
<td>3.1.5 Explanatory Propositions</td>
<td>78</td>
</tr>
<tr>
<td>3.1.6 Units of Analysis</td>
<td>79</td>
</tr>
<tr>
<td>3.2 Data Collection Strategy</td>
<td>79</td>
</tr>
<tr>
<td>3.2.1 Structure of Relationships</td>
<td>81</td>
</tr>
<tr>
<td>3.2.2 Concepts, Dimensions, Variables, and Measures</td>
<td>83</td>
</tr>
<tr>
<td>3.2.3 Evidence Collected</td>
<td>84</td>
</tr>
<tr>
<td>3.2.4 Data Collection Instruments</td>
<td>86</td>
</tr>
<tr>
<td>3.3 Phase I: Field Conditions Assessment, Archival Review, and Interviews</td>
<td>86</td>
</tr>
<tr>
<td>3.3.1 Field Conditions Assessment Protocol</td>
<td>89</td>
</tr>
<tr>
<td>3.3.2 Archival Data Collection</td>
<td>92</td>
</tr>
<tr>
<td>3.4 Key Staff Interviews</td>
<td>92</td>
</tr>
<tr>
<td>3.4.1 Identification of Key Staff</td>
<td>95</td>
</tr>
<tr>
<td>3.4.2 Interview Protocol</td>
<td>98</td>
</tr>
<tr>
<td>3.5 Phase 2: Observations, Survey, and Expert Review</td>
<td>99</td>
</tr>
<tr>
<td>3.5.1 GPS Visitor Tracking (GVT)</td>
<td>95</td>
</tr>
<tr>
<td>3.5.2 Direct Observations</td>
<td>98</td>
</tr>
<tr>
<td>3.5.3 Motion-Triggered Videography</td>
<td>99</td>
</tr>
<tr>
<td>3.5.4 Exit Survey</td>
<td>98</td>
</tr>
<tr>
<td>3.5.5 Expert Review</td>
<td>99</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS (Continued)

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.6</td>
<td>Data Analysis</td>
<td>99</td>
</tr>
<tr>
<td>3.7</td>
<td>Threats to Validity and Reliability</td>
<td>101</td>
</tr>
<tr>
<td>3.7.1</td>
<td>Construct Validity</td>
<td>101</td>
</tr>
<tr>
<td>3.7.2</td>
<td>Internal Validity</td>
<td>102</td>
</tr>
<tr>
<td>3.7.3</td>
<td>External Validity</td>
<td>102</td>
</tr>
<tr>
<td>3.7.4</td>
<td>Reliability</td>
<td>104</td>
</tr>
<tr>
<td>3.8</td>
<td>Pilot Study</td>
<td>104</td>
</tr>
<tr>
<td>3.8.1</td>
<td>Testing</td>
<td>104</td>
</tr>
<tr>
<td>3.8.2</td>
<td>Adjustments to Methodology</td>
<td>105</td>
</tr>
<tr>
<td>4.</td>
<td>RESEARCH FINDINGS PART I</td>
<td>107</td>
</tr>
<tr>
<td>4.1</td>
<td>Introduction</td>
<td>107</td>
</tr>
<tr>
<td>4.2</td>
<td>Monticello and Site Context</td>
<td>109</td>
</tr>
<tr>
<td>4.2.1</td>
<td>Monticello Brief Background</td>
<td>109</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Site Context and Visitor Access</td>
<td>112</td>
</tr>
<tr>
<td>4.3</td>
<td>Conditions Assessment</td>
<td>114</td>
</tr>
<tr>
<td>4.3.1</td>
<td>General Findings</td>
<td>114</td>
</tr>
<tr>
<td>4.3.2</td>
<td>Monticello Mansion</td>
<td>121</td>
</tr>
<tr>
<td>4.3.3</td>
<td>Pavilions and Outbuildings</td>
<td>128</td>
</tr>
<tr>
<td>4.3.4</td>
<td>Landscape and Grave</td>
<td>142</td>
</tr>
<tr>
<td>4.4</td>
<td>Interview Assessment</td>
<td>148</td>
</tr>
<tr>
<td>4.4.1</td>
<td>Introduction</td>
<td>148</td>
</tr>
<tr>
<td>4.4.2</td>
<td>Staff and Visitor Protocols</td>
<td>149</td>
</tr>
<tr>
<td>4.4.3</td>
<td>Damage and Repairs</td>
<td>152</td>
</tr>
<tr>
<td>4.4.4</td>
<td>Behaviors and Observations</td>
<td>153</td>
</tr>
<tr>
<td>4.5</td>
<td>Part I Conclusions</td>
<td>154</td>
</tr>
<tr>
<td>5.</td>
<td>RESEARCH FINDINGS PART II</td>
<td>155</td>
</tr>
<tr>
<td>5.1</td>
<td>Usage Assessment</td>
<td>155</td>
</tr>
<tr>
<td>5.1.1</td>
<td>Introduction and General Findings</td>
<td>155</td>
</tr>
<tr>
<td>5.2</td>
<td>GPS Visitor Tracking and Density Analysis</td>
<td>156</td>
</tr>
<tr>
<td>5.3</td>
<td>Exit Survey Analysis</td>
<td>167</td>
</tr>
<tr>
<td>5.4</td>
<td>Behavioral Heat Mapping and Observational Analysis</td>
<td>169</td>
</tr>
<tr>
<td>5.5</td>
<td>Expert Review</td>
<td>178</td>
</tr>
<tr>
<td>5.5</td>
<td>Part II Conclusions</td>
<td>178</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS (Continued)

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Conclusions</td>
<td>180</td>
</tr>
<tr>
<td>6.1 Discussion</td>
<td>180</td>
</tr>
<tr>
<td>6.2 Overall Research Findings</td>
<td>181</td>
</tr>
<tr>
<td>6.2.1 Research Finding 1 and Propositions</td>
<td>182</td>
</tr>
<tr>
<td>6.2.2 Research Finding 2 and Propositions</td>
<td>184</td>
</tr>
<tr>
<td>6.3 Recommendations</td>
<td>186</td>
</tr>
<tr>
<td>6.3.1 Recommendation 1</td>
<td>186</td>
</tr>
<tr>
<td>6.3.2 Recommendation 2</td>
<td>187</td>
</tr>
<tr>
<td>6.4 Implications</td>
<td>189</td>
</tr>
<tr>
<td>6.4.1 Historic Preservation</td>
<td>189</td>
</tr>
<tr>
<td>6.4.2 Historic Site Management and Interpretation</td>
<td>190</td>
</tr>
<tr>
<td>6.4.3 Visitor Use and Access</td>
<td>190</td>
</tr>
<tr>
<td>6.5 Limitations</td>
<td>191</td>
</tr>
<tr>
<td>6.6 Recommendations for Future Research</td>
<td>192</td>
</tr>
<tr>
<td>6.7 Conclusion</td>
<td>194</td>
</tr>
</tbody>
</table>

APPENDIX A: IRB APPROVAL: PROTOCOL IRB2018-177 ............................................. 195

APPENDIX B: EXIT SURVEY INSTRUMENT ................................................................. 196

REFERENCES ................................................................................................................. 208
## LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1. Matrix of visitor impact subtopics and methods</td>
<td>11</td>
</tr>
<tr>
<td>3.1. Site selection criteria</td>
<td>72</td>
</tr>
<tr>
<td>3.2. Dimensions, Variables, and Measurements</td>
<td>82</td>
</tr>
<tr>
<td>3.3. Field Conditions Assessment Guide</td>
<td>86</td>
</tr>
<tr>
<td>3.4. Key Staff and Visitor Interview Question Wording</td>
<td>91</td>
</tr>
<tr>
<td>3.5. Sample Survey Question Wording</td>
<td>98</td>
</tr>
<tr>
<td>4.1. Research Questions and Methods of Analysis</td>
<td>108</td>
</tr>
<tr>
<td>4.2. Visitor Impact Damage by Location</td>
<td>114</td>
</tr>
<tr>
<td>4.3. Visitor Impact Damage within the Monticello Mansion</td>
<td>122</td>
</tr>
<tr>
<td>4.4. Visitor Impact Damage Within the Outbuildings</td>
<td>129</td>
</tr>
<tr>
<td>5.1. Stratification of Sampling Dates for Distribution of GPS Trackers</td>
<td>159</td>
</tr>
<tr>
<td>5.2. Percentage of Visitors to Significant Areas of the Monticello Site</td>
<td>163</td>
</tr>
<tr>
<td>5.3. Average Time Spent in Specific Locations</td>
<td>165</td>
</tr>
<tr>
<td>5.4. Observed Counts of Impact-Inducing Behavior</td>
<td>171</td>
</tr>
<tr>
<td>6.1. Research Questions and Methods of Analysis</td>
<td>181</td>
</tr>
</tbody>
</table>
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Example of worn finishes and dirt and oil build-up</td>
<td>7</td>
</tr>
<tr>
<td>2.1</td>
<td>Fields of study influencing visitor impact</td>
<td>9</td>
</tr>
<tr>
<td>2.2</td>
<td>Helen, GA, an early nineteenth-century logging town rebranded in the 1970s as German-themed Alpine village</td>
<td>28</td>
</tr>
<tr>
<td>2.3</td>
<td>Nineteenth-century graffiti from traveling comedians. Avon Opera House, Avon, NY</td>
<td>39</td>
</tr>
<tr>
<td>2.4</td>
<td>Example of staircase structural reinforcing</td>
<td>41</td>
</tr>
<tr>
<td>2.5</td>
<td>Dirt and oil build-up on stone surfaces at the Biltmore, Asheville, NC</td>
<td>42</td>
</tr>
<tr>
<td>2.6</td>
<td>Museum display showing the impact of dirt and oil build-up on collections</td>
<td>43</td>
</tr>
<tr>
<td>2.7</td>
<td>Ruinous decay from external factors and not visitor impact at Tanglewood Mansion, Pendleton, SC</td>
<td>50</td>
</tr>
<tr>
<td>2.8</td>
<td>Example of warning signs and visitor control measures. Alcázar of Seville, Spain and Volusia County, Fla</td>
<td>54</td>
</tr>
<tr>
<td>3.1</td>
<td>Identified case study locations based on the site selection criteria</td>
<td>73</td>
</tr>
<tr>
<td>3.2</td>
<td>View of the west façade of Monticello</td>
<td>75</td>
</tr>
<tr>
<td>3.3</td>
<td>Examples of visitor impact related damages</td>
<td>87</td>
</tr>
<tr>
<td>3.4</td>
<td>Intercept location at Monticello Visitor’s Center</td>
<td>93</td>
</tr>
<tr>
<td>3.5</td>
<td>Canmore GT-740FL unit marked with identifiers</td>
<td>94</td>
</tr>
<tr>
<td>3.6</td>
<td>Motion camera locations</td>
<td>97</td>
</tr>
</tbody>
</table>
3.7. Floorplan overlays showing visitor path and identified Damages and density map of damage-induced behavior ................ 106

4.1. West façade of Monticello ................................................................. 109

4.2. View looking north toward Monticello from the South Pavilion area ca. 1914-1918. ..................................................... 111

4.3. Monticello Mountaintop Public Map for Visitors ......................... 113

4.4. Monticello Conditions Assessment of Damages (all locations) .................. 115

4.5. Example of biological material build up along the wall surface and architrave in the basement of Monticello .................. 116

4.6. Geographic Dispersal Pattern of Identified Visitor Impact ................ 118

4.7. Locations of Superficial Visitor Damage .............................................. 120

4.8. Locations of Minor Visitor Damage .................................................... 120

4.9. Locations of Moderate Visitor Damage .............................................. 120

4.10. Example of minor damage along the architrave in the mansion .............. 117

4.11 Breakdown of visitor impact among locations .................................... 122

4.12 Abraded surface and missing paint in the dome room ......................... 123

4.13 Visitor path along the first floor of Monticello .................................... 124

4.14 Visitor impact damages identified within the first floor of Monticello .... 125

4.15 Example of worn floor finishes ........................................................... 126

4.16 Examples of visitor impact within the mansion .................................... 127

4.17 View of the South Pavilion in 2018, looking northwest ......................... 131

4.18 View of the South Pavilion in 1905 .................................................... 131
4.19. View of damage within the south pavilion ...................................................... 133
4.20. Superficial impact from dirt build-up on west wall, Hemmings Room in the South Pavilion ...................................................... 134
4.21. View of the north pavilion, looking west ........................................................ 135
4.22. Views of damage within the north pavilion and north passage ...................... 136
4.23. View of the stable (left) and view of wear to the stable door architrave ...... 137
4.24. Hemmings’ cabin/servants’ house (left) and storehouse for iron ................. 138
4.25. View of the textile shop along Mulberry Row, facing southwest ................. 139
4.26. Views of visitor damage within the textile shop ............................................. 140
4.27. The garden pavilion, facing south ................................................................. 141
4.28. Examples of build-up and scraping in the garden pavilion ......................... 141
4.29. Landscape erosion near the Textile Shop, wear along the edge of the pathway, and visitors sitting on objects ................................................................. 142
4.30. View of Mulberry Row, facing west .............................................................. 143
4.31. Abrasions to tree roots along Mulberry Row and erosion to landscape ....... 144
4.32. Visitors cutting across the South Pavilion yard toward Mulberry Row ......... 145
4.33. Examples of signage at Monticello ................................................................. 146
4.34. View of the vegetable garden, facing southwest .......................................... 147
5.1. Methods and Research in Spatial Tracking Design ........................................ 157
5.2. Example of GPS tracker recording error ....................................................... 160
5.3. Map of the Monticello site showing all GPS tracks combined ..................... 161
5.4. Monticello visitor use density.................................................................164

5.5. Image overlay of density patterns and observed visitor impact locations at Monticello .................................................................166

5.6. Map of camera placements with cone of view shaded in gray ...............169

5.7. Data analysis with TimeLapse2 software...............................................170

5.8. Video captures showing leaning in the South Square and touching the architraves in the North Octagon .................................................173

5.9. Heat map showing locations of observed visitor damage-inducing behaviors within the camera placement areas ...................................174

5.10. Heat map showing locations of visitor damage inducing behaviors in relation to the visitor path .........................................................175

5.11. Video capture of visitor touching architrave in the North Octagon ..........176

5.12. Combined map of visitor impact-inducing behaviors, tour pathway, and observed visitor impact damages ...........................................177

6.1. Monticello Mountaintop Public Map for Visitors with Promoted Sites .......185

6.2. Delamination near visitor benches .........................................................186

6.3. Visitor warning sign, Alcázar of Seville, Spain .........................................187

6.1. Monticello Mountaintop Public Map for Visitors with Promoted Sites .......185
CHAPTER ONE
INTRODUCTION

1.1. Description of the Research Problem

Protection of cultural resources and sustainable visitation have been significant issues in the management of historic sites since the early nineteenth century. In the 1860s, site managers at Mount Vernon discovered damages to architectural materials from visitors and relic hunters. Civil War soldiers, visiting Mount Vernon as a war-time respite, left physical marks commemorating their visit on the walls of the mansion and its outbuildings. Though largely non-malicious, cumulative effects of direct contact with architectural materials, whether through accidental or incidental means, lead to material deterioration and aesthetic surface-level damage. As tourism and the number of historic sites grew in the twentieth century, professional architectural conservators also took note of physical damage due to increased tourism. This damage includes dirt and oil build-up on wall surfaces, abrasions, and wearing of finishes. Over-visitation also results in increased vibrations from foot traffic, increased weight and force loads on internal structures, and microclimatic conditions due to temperature and humidity increases. Furthermore, physical damage also occurs to landscape features such as vegetation and pathways that connect to secondary structures.

However, the impacts themselves are often a confluence of external factors, such as individual visitor behavior and the interpretation and management strategies
that provide access. For example, promoted areas or those with greater accessibility can potentially lead to variations in the type, as well as the location and intensity, of physical damage. As heritage tourism grows many historic sites also face continued demands for access from multiple actors, including site managers, donors, the public, and researchers.

Without continued visitation, most historic sites would not be sustainable. Visitation provides both a tangible and intangible public benefit. A direct connection with the past. Preservationists cannot overlook the economic benefit of visitation either. Visitation revenue provides for many of the necessary maintenance activities as well as educational programs at historic sites. Unfortunately, popularity does, as historian David Lowenthal noted, “speed the past’s destruction” (Lowenthal 1985, 397). Historic site preservation presents an interesting paradox; public access meant to encourage protection inevitably introduces the threat of visitor-driven material degradation. Historians have romanticized ruins as places of fascination and discovery. However, ruinous decay and physical damage in most historic house museums have negative connotations that reflect overuse and neglect (Douglas-Jones, et al. 2016). Material transformation can occur through environmental factors and inherent flaws within the materials themselves. However, it is the human factor that presents the greatest challenge. Preservationists must carefully balance retaining both the significance and integrity of a historic site while remaining sustainable and accessible.
In a contemporary context, intentional damage from relic hunters and vandals is minimal compared to compounding, and often unintentional, damage created by routine visitation. Increased education and stricter security measures aid in limiting would-be vandals, but numerous materials conservation studies illustrate that sustained and measurable material impacts of routine visitation continue, regardless (Feilden 1982; Chitty and Baker 1999; Getty 2007). Historic homes once used for residential purposes now see upwards of half of a million annual visitors. Each leaving their physical mark on the site. However, research shows that physical damage is also present at sites with as few as several thousand annual visitors.

The existence and continued preservation of historic sites rely on retaining their historical significance and integrity. While the most efficient solution to minimizing physical damage would be to limit access, Lowenthal warns that restricted access alters the interpretation and character of historic sites (Lowenthal 1985, 398). Thus, with the goal of sustainable visitation, the present problem is to understand the correlation between factors that influence visitor use and subsequent material damage. Comprehensive understanding of the interconnection of damage and site usage affords better site accessibility and damage mitigation without restricting access.

1.2 Purpose of the Research and Objectives

Historic preservation and built environment studies are evolving fields. Recent focus expands to include more vernacular resources with a greater interpretation of
historic significance (Hoagland 1998; Starn 2002). Growing attention to once overlooked historic narratives and the introduction of new uses for historic sites may lead to changes in visitation patterns that affect material damage. The purpose of this research is to understand the relationship between material degradation and visitor interaction with historic sites.

In Andrew Sayer’s treatise on social research titled, *Method in Social Science: A Realist Approach*, Sayer, proposes the philosophy that the social world functions around and within social structures. Understanding these structures and their interdependent relationship is pivotal to completing fully-developed social research design (Sayer 1984). In a similar fashion, established social structures affect the management of visitor impact and the historic environment. These structures guide the causes and effects of human interaction with the built environment. This research seeks to understand how those constraints act as threats to historic sites. Specifically, how visitor use, based on degrees of interpretation and access, correlates with material damage.

Managing cultural resources is a continuous process. Assessing resources in a systematic way assists with understanding the mitigating factors and multi-causal mechanisms of material degradation. The primary goal of the research is to develop a process-based framework for the holistic assessment of visitor-induced material degradation. Based on the theoretical underpinnings of preservation, conservation, interpretation, and human behavior, this framework also assesses the impact of site usage, interpretation, and management. The research seeks to define visitor impact,
identify areas of physical degradation, develop a common set of standards to gauge visitor impact, develop a core set of objectives for site management, and illustrate the implementation of the standards and objectives via a case study. The research more narrowly focuses on identifying vulnerable areas and understanding the site-specific limits of acceptable change.

1.3 Significance of the Study

Prevailing literature indicates there is a lack of holistic research on visitor impact at historic sites. Additionally, many historic sites address material damage reactively rather than proactively. A need exists to first understand how visitors use historic sites, specifically what areas they frequent and how they behave in different types of spaces. There is also a need to identify how management decisions affect accessibility and how site interpretation (tour type and messaging) affects behavior and use. As uses continue to change at historic sites this research will help preservation professionals and planners understand the influence visitors have on materials and cultural resources. This research may ultimately lead to better preservation planning and site management. Most importantly, this research will lead to a more in-depth understanding of sustainable visitation to protect historic materials and minimize damage. As such, a case study to examine the relationship between visitors and historic sites allows for assessment of this phenomenon in its real-world context.
1.4 Primary Research Questions

The research questions for the proposed case study guide the overall research methodology and are based on the research purpose and objectives. The main goal of this research is to look holistically at a historic site and examine the multi-causal factors that contribute to visitor impact and material degradation. Fully-developed research also constitutes an understanding and implementation of accepted preservation and conservation standards and guidelines. Furthermore, levels of intervention and the degree of visitor impact are context-dependent and vary between historic sites. The historical associations and significance of a historic site affect the judgment of the severity of material damage. They also affect solutions for mitigation. In extracting from the above-mentioned qualifications, this research proposes to answer two primary questions.

1) How does visitor-induced material damage correlate with the patterns of use and access of individual visitors at a historic site?

2) How, or to what degree, do management and interpretation strategies affect the actions of individual visitors as it relates to material degradation?
1.5 Definition of Terms

There are two distinct forms of visitor impact, direct and indirect impacts. Direct impacts are physical damages attributed to the direct interaction between visitors and the historic fabric, both architectural and environmental. These include incidental and intentional damages, such as dirt and oil build-up on finished surfaces, wear and tear, abrasions, dust and dirt infiltration, temperature and humidity increases, loads and forces exerted on structures, wearing of landscape vegetation and pathways, and vandalism, graffiti, or the physical removal of historic material (Figure 1.1). This research does not address damage to museum collections. These items, such as artifacts or curatorial installations, are not physically part of the construction of a structure or landscape. Conversely, indirect impacts are not physically resultant of visitor interactions. These impacts develop out of secondhand responses to historic site management to accommodate visitors. These include adjustments to accommodate visitors such as the installation of an HVAC system and compliance with the Americans with Disabilities Act.

Figure 1.1 Example of worn finishes and dirt and oil build-up.
2.1 Introduction

A century and a half ago, Mount Vernon superintendents issued fines to visitors for writing their names on the walls of Washington’s home. A generation ago, historic sites allowed visitors to smoke inside many locations. Today, site management and curatorial efforts aim to minimize impact for site preservation and sustainable visitation.

This review is a comprehensive gathering of the theoretical foundations and recent methodological developments in the study of visitor-induced material degradation that support the research design. Most importantly, it highlights the growing field of visitor impact studies at historic sites. Specifically, those relating to conservation, material degradation, and maintenance of historic resources. While there are larger socio-cultural and economic issues of visitor impact that arise due to increases in tourism, this review focuses on aspects specifically related to material degradation, site management, and interpretation.

Research from a variety of fields emphasizes the interdisciplinary nature of the visitor impact problem and the multiple factors that influence mitigation. It also highlights fragmentation among disciplines. Illustrating a lack of holistic understanding and adding to the notion that there is no singular theory of visitor impact. Visitor impact research methods and theories emerge from various contemporary approaches. These include natural science-based methods such as petrography and seismographic analysis.
of peak particle velocity. As well as more traditional methods of survey and interviews to understand phenomenological aspects of material degradation. Figure 2.1 presents a diagrammatic representation of the fields of influence permeating visitor impact studies in the last century.

![Figure 2.1 Fields of Study Influencing Visitor Impact](image)

Historic preservation theory provides general principles and themes that guide the professional practice of historic preservation. Theories, such as preservation and restoration, guide the management and conservation postures at historic sites. Themes relate to authenticity both of materials and of interpretation, maintaining material integrity, and establishing site significance. These core concepts of significance,
integrity, and authenticity serve as theoretical foundations for the field of historic preservation and as pragmatic guiding principles for the treatment of the built environment. Theories, however, remain impressionable as the scope of significant resources expands and the influence of interdisciplinary studies continues. Heritage professionals charged with defining and establishing objects worthy of preservation continue to navigate through societal and political factors as well as the increasing technology and understanding of the built environment that has permeated the preservation discussion.

In terms of the practical application of visitor impact theories, three broad subtopics or typologies, each of which encompasses various micro-categories, include material conservation, site management and use, and site interpretation. Typologies, micro-categories, and associated methods of research found in Table 2.1 highlight the interdisciplinary nature of the research field. They also emphasize the methodological growth of quantitative and qualitative approaches to understanding visitor-induced material degradation.

There are theoretical and methodological similarities and differences between historic and contemporary approaches. Current research highlights new uses for technology in the study of visitor impact and an increase in understanding relationships between materials conservation and visitor interaction. Each of these methods stands on their own merits, but collectively, they represent continued research into more proactive approaches to sustainable heritage management.
<table>
<thead>
<tr>
<th>Subtopic</th>
<th>Micro-Categories</th>
<th>Methods</th>
</tr>
</thead>
</table>
| Material Degradation and Conservation | ❖ Environmental Changes  
❖ Architectural Damage  
❖ Human Actions  
❖ Structural Loads and Forces | ❖ Material Loss Measurements  
❖ Material Change  
❖ Documentation  
❖ Material Transference Analysis |
| Site Management and Use          | ❖ Authenticity and Integrity  
❖ Site Design  
❖ Sustainable Tourism  
❖ Site Use | ❖ GPS Visitor Tracking  
❖ Carrying Capacity  
❖ Timed-Entry  
❖ Visitor Use Surveys |
| Site Interpretation             | ❖ Museum Studies  
❖ Ruinous Decay Value  
❖ Visitor Experiences and Values | ❖ Visitor Experience Surveys  
❖ Interviews  
❖ Participant Observations |

Conservation theories and practices influence restoration and maintenance and highlight the importance of standards of care, including the concept of reversibility. Additionally, conservation theory aids in understanding material characteristics, as well as the type and degree of damage. Research related to visitor-induced material damage reflects this but varies by material and impact factor. Generally, conservation research pertaining to visitor impact falls into one of four categories: environmental changes, architectural damage, human actions, and structural loads and forces. Methods used to assess conservation-related impacts draw from a positivist approach from natural science studies and are based on the scientific method of inquiry.

Three primary methods for assessing conservation impacts are material loss measurements, material change documentation, and material transference analysis. Material loss measurements focus on erosion or abrasion of materials, wear and tear...
patterns, and structural loading. Material change documentation examines material qualities and factors that influence the physical transformation of materials. In these instances, physical changes in the materials are largely related to environmental changes and biological influences. Primarily these transformations exist in subterranean environments or locations that are prone to fluctuations in temperature and humidity. Lastly, a common method for analyzing conservation impacts is material transference analysis. Material transference is the transfer of one material to another. These types of transference include dirt and oil build up on wall surfaces, dust and dirt infiltration, and vandalism and graffiti.

Historic site management includes the management of the built environment as well as the historic natural environment. Historic site management and interpretation include values-based approaches to management, historical memory, and the growth of heritage tourism. As it pertains to visitor impact, management generally centers around maintaining the safety and security of a site, minimizing damage for site sustainability, and maintaining visitor experience. Overuse is one of the primary factors in visitor-induced damage and as such, conflicts arise in site management when principles of heritage management come up against sustainable visitation.

Literature related to historic site management and interpretation also draws from several aspects of environmental psychology. These principles suggest that socially constructed environments can influence the way visitors interact with space (Tilden 1957; Falk and Dierking 1992; and Bitgood 2006). Specifically, how designed
interpretation influences emotional and psychical connections (Tilden 1957). Human
behavior research perhaps more fully aids at understanding theories for how visitors
interact with a site and the built environment. Theories from environmental psychology
suggest that surroundings can influence how visitors behave in a space and help to
explain why some depreciative behavior may occur (Kaplan et. Al. 1998).

2.2 Historic Preservation Theory and Practice

2.2.1 Theoretical Foundations

The plausible theoretical, philosophical, and cultural foundations of modern
historic preservation theory generally center between two schools of thought
preservation and restoration. Preservation, which seeks to preserve or maintain a
historic form and materials, is often in direct conflict with restoration, which intends to
restore or return a historic site to a previous period. These foundations of the American
preservation model and its theoretical approaches originated in the early nineteenth-
century dialogue between French architectural theorist Eugène Emmanuel Viollet-le-
Duc and his Victorian contemporary, English architect, and critic John Ruskin. Although
the content of Viollet-Le-Duc and Ruskin’s discussion focuses largely on the
philosophical debate between preservation and restoration approaches in the
management of historic resources, their attitudes reflect an underlying reliance on the
significance of values that historic resources embody.

Editor Thomas Hearn’s interpretation of Viollet in “Viollet-Le-Duc: A Visionary
among the Gargoyles” and “Defining the Nature of Restoration,” in The Architectural Theory of Viollet-le-Duc: Readings and Commentary (1990) illustrates the complexity of Viollet’s theory. Viollet’s main argument on restoration suggested not preserving a building as its builders designed it but restoring it to a Gothic architectural style for structural and aesthetic purposes. Although mentioned nearly four centuries prior by Italian architect Leon Battista Alberti in On the Art of Building in Ten Books (reprinted 1988), restoration during the mid-nineteenth century was still a new concept with undefined rules. Viollet viewed restoration as a practical approach and argued that restoration was likely to, “reestablish a building in a complete condition that may have never existed” (Hearn 1990, 6).

Viollet’s theories, as well as his physical restorations, called for the removal of layers of architectural fabric and decorative elements. By doing so, John Ruskin argued, this presented a false sense of history by not only editing portions of a structure’s architectural design but by also introducing a history and period which did not previously exist for the structure (Ruskin 1849). However, choices for restoration were not based on superficial opinion but rather on a practical approach to building

---

1 While some of Alberti’s attempts at restoration share similarities with modern approaches, his principles and thoughts on restoration are specific to the context of his lifetime. In the modern context of the built environment restoration means to return a building or structure to a time in which it once existed. While Alberti drew from historical precedents he did not attempt to restore a building to a previous period but rather he designed for the future. For further discussion see, Leon Battista Alberti, On the Art of Building in Ten Books, Joseph Rykwert, Neil Leach, and Robert Tavernor, Trans. (Cambridge, MA: The MIT Press, 1988), xiii and Mário Júlio Teixeira Krüger, Comentários à arte edificatória de Leon Battista Alberti, (New York: Columbia University Press, 2014), 71.
construction. The features of gothic architecture served a functional purpose and promoted future uses. Gothic architecture was a “rational approach to building rather than of aesthetic or iconographical considerations” (Hearn 1990, 8).

Controversy accompanied Viollet's restoration work based on what appeared to be arbitrary decisions. However, Viollet based his decisions on the function of internal structures rather than ornamentation or historical form. He respected historical integrity in so much that it gave contextual guidance, but he did not seek to retain it. He argued that, “decorative features should not be recarved because it is impossible to reproduce their authentic character” and that “an old building should not be made like new but should retain the signs of wear and tear” (Hearn 1990, 15). Viollet-le-Duc's notion is that buildings are not immutable objects. Though not a direct implementation of Viollet’s theory, contemporary preservation planners advocate that usefulness of historic structures aids them from becoming isolated monuments and ultimately destroyed (Semes, 2009). As it relates to modern preservation approaches, Viollet’s theories present some conflict when addressing visitor impact at historic sites as historic sites are often isolated monuments. However, his theories also illicit additional considerations such as material authenticity and changing uses at historic sites.

Viollet-le-Duc’s Victorian contemporary, English architect, and critic John Ruskin, in his writing, *The Seven Lamps of Architecture* (1849), contended that restoration produces an inauthentic history and that “restoration is the most total destruction a building can suffer” (Ruskin 1849, 179). Ruskin contended that a restored building would no longer
represent the spirit, intent, and history of the previous builder. Restoration would embody another builder or time and would be a false representation of the original. While not promoting one absolute truth, Ruskin suggested a more relativistic view in that there are multiple historic values and truths that restoration would edit. The role of architecture, Ruskin argues, is to remember and the historical significance of buildings should be even more evident in public structures than ordinary buildings (Ruskin 1849, 164;168).

In *The Stones of Venice* (1850), Ruskin’s opinions on Gothic architecture illustrate a key point in the difference between restoration and preservation. While Ruskin, supported Gothic architecture and its forms, he did not view it in the same way as Viollet. Viollet valued it for its internal structures and functions, whereas Ruskin valued the external forms and historical elements. Ruskin argued that, “the demand for perfection is a sign of misunderstanding” and that “there are no rules to great architecture” (Ruskin 1850, 187). Again, this relativistic view allows for equally valid periods within the historical life of a structure. It also proposes that the destruction of any one of those is dangerous.

Both Viollet’s and Ruskin’s views represent the extreme ends of the preservation spectrum. Preservationist Steven Semes, in highlighting the ambiguity of modern preservation doctrine, argues that “applying the hands-off approach indiscriminately [as Ruskin proposed] would impose a death sentence on all but the most durable construction” (Semes 2009, 130). However, as historian John Sprinkle acknowledges in
Crafting Preservation Criteria: The National Register of Historic Places and American Historic Preservation (2014), both Viollet and Ruskin, “failed to provide a theoretical foundation for deciding what properties were worthy of preservation” (Sprinkle 2014, 2).

While Ruskin was a proponent of an extremely hands-off approach to preservation, he, like Alberti, advocated for preventative maintenance and care for structures to prevent the need for restoration. He proposed to, “take of buildings and let the weathering come honestly” (Ruskin 1849, 181). Modern solutions to this debate come from a confluence of mitigating factors, but it is, as Alberti suggested, important to understand the context of a building, its design, and the intentions of its builders to determine the correct approach to its ultimate preservation (Rykwert ed. 1988).

Fellow English theorist William Morris echoed this sentiment in his writing of the Manifesto (1877). Morris wrote the Manifesto for England’s Society for the Protection of Ancient Monuments written partly to counter restorations spurred on by Viollet and in response to ongoing European restorations in the late-nineteenth century. Morris also believed that the nineteenth century had no defined architecture style of its own which played a part in the growing interest in restoring the ancient monuments (Morris 1887). Morris suggested that conservators should care for monuments and he advocated for continual maintenance and the establishment of conservation standards. Morris’ writings represent the first practical iterations of this debate marking the beginning of the conservation dialogue and technical postures at historic sites.
While neither Viollet, Ruskin, or Morris dictate specific guidelines for visitor impact management, their theories and approaches to preservation and restoration laid the groundwork for twentieth-century principles that, in part, dictate the management of historic sites and monuments. The difference in approaches influenced the development and professionalization of the preservation field as well as the construction of various charters and laws drafted to manage the historic built environment. These formal and informal precedents represent a paradigm shift from the theoretical to the practical and directly influence the way preservation managers and professionals address historic sites, their maintenance, and access by visitors.

2.2.2 Contemporary Historic Preservation and Pragmatic Policy Implementation

While Viollet and Ruskin reflect mid-twentieth century European sentiments, these ideas weave into the fabric of American preservation as well. Early American pursuits at preservation reflected buildings and places indicative of American values, patriotism, and those that reflected the “historical and cultural foundations of the nation” (Morton, 1987). Following the near deification of George Washington upon his death in 1799 and on the heels of the Marquis de Lafayette’s ceremonial tour of the United States in 1824 through 1825, Lafayette suggested the preservation and memorialization of buildings and places that represented the history and significance of the American Revolution, such as Independence Hall, Yorktown, and Bunker Hill (Bluestone, 2011). In a young nation without ties to a history of its own, this associated
The cultural ideal of American patriotism and the search for a national identity in the mid-nineteenth century is noteworthy as a starting point of modern preservation. However, the official and unofficial early-twentieth century precedents related to the management, interpretation, and use of historic sites highlight the omnipresent, if rarely mentioned, notion of visitor impact. Preservation theory and the establishment of a professional practice guides the designation of historic sites and the development of standards for their management. A contemporary context muddles Ruskin and Viollet’s debate as the management of historic sites draws from additional ideas of significance, integrity, authenticity, memory, and memorialization. In the twentieth century, a series of laws and acts laid the groundwork for both subjective debates of these notions and attempted to create objective frameworks for assessing historic sites.

The Antiquities Act of 1906 gave the President of the United States the authority to designate landmarks, structures, and other historic sites located on government land as national monuments. It further prohibited the destruction or desecration of historic sites or objects of antiquity (Antiquities Act 1906). Since the mid-nineteenth century, individual States and non-profit organizations recognized historic structures worthy of preservation, such as Hasbrouck House and Mount Vernon, but the Act of 1906
represented the first law that put specific acts of preservation under presidential authority (Murtagh 1988, 53). Though largely used for the conservation and preservation of historic natural environments and archaeological sites. Historic structures including, the Castillo de San Marcos and Fort McHenry round out the varied list of resources under the Act’s purview. Much of the contemporary debate surrounding the Antiquities Act center on land usage and private property rights (Squillace 2003, 502). Although the Act does not mention visitor impact outright, it is clear through its prohibitions that the management and mitigation of damage from relic hunters were necessary, thus setting forth a Federal precedent for historic site protection and management in the United States.

The passage of the 1935 Historic Sites Act officially made preservation part of the national policy. The 1935 Act authorized the Secretary of the Interior to survey and inventory sites “which possess exceptional value as commemorating or illustrating the history of the United States,” which led to the creation of both the National Historic Landmarks (NHL) program and the Historic American Buildings Survey (HABS) (Historic Sites Act 1935). Part of President Roosevelt’s New Deal programs designed to put Americans back to work, the Historic Sites Act expanded the scope for identifying historic sites, however, critics of the Act site its failure to provide minimal guidance for doing so (Sprinkle 2014).

Perceived threats to historic and cultural resources from post-WWII development and suburbanization spurred on the formation of the National Trust for
Historic Preservation in 1949 (Stipe 2003, 9). The Trust, a non-governmental organization, fulfilled the missing nationwide preservation advocacy role and served to expand the scope of resources included as historic sites. It also addressed national preservation needs and formal coordination of private and public preservation efforts that the National Park Service was unable to handle (Morton 1997, 165).

Like the influences of the industrial revolution in spurring on Viollet and Ruskin’s debate, suburbanization and growth in the post-World War II era promulgated increased attention to the loss of historic resources in the wake of mass development. Additionally, increased international attention to preservation, advocacy efforts, and the growth of popular history influenced the passage of the 1966 National Historic Preservation Act (NHPA). The NHPA expanded the role of historic preservation and changed the formal practice of preservation.

The 1966 Act initiated government policies which, formally and informally, influence the management of historic sites and revolve around significance, integrity, and authenticity. It also created State Historic Preservation offices and expanded the National Register of Historic Places (NRHP), which serves as a repository of sites deemed significant in history or prehistory. Arguably the most legally binding implementation, Section 106 of the act, required any federal undertaking to take into consideration its impact on historic resources that are eligible or included in the National Register of Historic Places (NHPA 1966, Amended 1992). Furthermore, the Act relieved
administrative pressure on the NPS to manage the increasing number of historic sites by incorporating state and local coordination (Sprinkle 2014, 28).

This also led to the establishment of more formal and objective criteria for National Register eligibility. Preservation historian, Charles Hosmer in *Presence of the Past* (1965), offered “Criteria for Selecting Buildings Worthy of Preservation” which included both historic and architectural values of sites (Hosmer 1965, 260). Hosmer’s criteria offerings predate the official criteria of the NPS, but official criteria reflect many of his sentiments. However, the formal criteria created an additional dimension. Historic sites were no longer only representations of idyllic patriotism and American history, but they represented the expanding importance of state and local history and broader patterns of regional development.

The criteria also represent a paradigm shift with a greater focus on authenticity rather than significance. A historic site may be significant, but according to the criteria, if the site lacks integrity or the ability to express its significance, it is not eligible for official listing (NPS 1997, 44). However, the association of a site to its historic context is largely subjective and contextual, illustrating the complexity of an increasing scope of preservation-worthy sites. (Stipe 2003, 12). While the criteria help to establish Federal guidelines for managing historic resources, they also informally direct non-federally involved preservation efforts and have become establish a more formalized preservation ethos or doctrine rather than just practical implementation.
2.2.3 Significance, Integrity, and Authenticity of Historic Sites

The 1906 Antiquities Act, the restoration and reconstruction of Colonial Williamsburg in Virginia beginning in the 1920s, and the 1935 Historic Sites Act aided in the expansion and refinement of significance determinations. However, they still presented major issues in terms of formalized criteria. In the context of historic preservation, the concept of significance reflects the meaning or importance assigned to historic resources including buildings, structures, sites, landscapes, and objects. Societal and political factors influence the determination of significance and reflect a complex, sliding scale of values. American historic preservation has taken on significance as a charge for defining and establishing objects worthy of preservation. Contemporary approaches are also reflective of a broadening focus from individual monuments to larger expanses of both the built and natural environment with a widening scope of individual and cultural narratives (Morton, 1987). With an increasing volume of historic resources, practitioners and scholars continue to wrestle with defining significance, especially when dealing with concepts of authenticity and integrity of historic resources.

Attempts to apply objective criteria to this subjective pattern of thought, including criteria reflected in the goals of the National Register for Historic Places, reflect pragmatic and academic outlooks in the latter half of the twentieth century aimed at further defining significance. However, these approaches illustrate the complexity of an imperfect process in applying preservation theory and subjective notions in the treatment of historic resources bound in an objective matrix. Additionally,
the current debate surrounding the significance of historic resources is twofold. First, resources reflect a significance for what they represent in their time of importance or construction, and, second, the significance of resources reflects their meaning viewed with contemporary values (Semes, 2009:159). Lastly, approaches to historic resources are multi-layered. Charters and laws designed to assist with the management of the historic built environment reflect the expanding and changing role of significance and the far-reaching impacts of the concepts of authenticity and integrity in the professional application of standards of treatment. These formal and informal precedents represent a paradigm shift from the theoretical to the practical and directly influence the way preservation managers and professionals address the preservation of historic resources.

The criteria for listing in the National Register attempt to create an objective matrix for analysis, but they also highlight the inherent complexity of applying objective criteria to a subjective field of study. The NRHP criteria state that “decisions concerning the significance, historic integrity, documentation, and treatment of properties can be made reliably only when the resource is evaluated within its historic context” (NPS 1997, 1). The National Park Service manages the NRHP and relies on four categories of significance based on association with A) important events or activities have made a significant contribution to the broad patterns of our history, B) significant persons, C) distinctive characteristics of a type, period, or method of construction, or D) information important in prehistory or history (NPS, 1995: 3). What the NRHP criteria reveal is that significance can be both subjective and contextual.
In the changing narrative surrounding significance and historic and cultural objects worthy of preservation, the NRHP criteria reveal that significance can be both subjective and contextual. Critics argue that despite the creation of seemingly objective criteria, the association of a site to its historic context remains largely subjective and situational, illustrating the complexity of managing an increasing scope of preservation-worthy sites (Stipe 2003, 12). Additionally, critics also argue that significance reflects the motivations of those in power. Although primarily relating to attitudes towards significance prior to the creation of the NRHP, the theoretical and historical sentiments still reflect the inherent flexibility of the National Register criteria for evaluating significance. Historians Daniel Walkowitz and Lisa Maya Knauer (2004) and historian Francoise Choay (2001) note that difficulties arise in determining significance depending on who is in power or in charge of the decision-making process. Walkowitz and Knauer (2004) and Choay (2001) both recognize that the formation of objects, such as historic monuments is based on external economic, political, and social factors and that the prevailing ideas and values of those in political power perpetuate the memorialization that occurs in public space.

More pragmatic, contemporary critics argue that significance varies within the timeline of a structure or site and that it has multiple layers. Preservationist and professor Alison Hoagland argues that there are three periods of the significance of a historic site as it relates to the National Register: its construction, its designation as a historically significant property, and the period after its designation (Hoagland,
Hoagland contends that preservationists sometimes use significance determinations based on the individual priorities, ignoring various periods of significance, and in doing so the criteria are less reflective of “objective, measurable standards” (Hoagland, 1998:118). Additionally, the notion that historical value can reflect multiple iterations in a site’s history and that it is not specific to any one era presents issues with applying objective or universal ideas of authenticity (Starn 2002). This approach presents complexities in applications of significance applied in direct professional practice. While it works well on a larger academic or even philosophical reflection, in practical application, such as through Section 106 it complicates the process which only seeks to address the significance of a historic resource during its designation as a historically significant property.

Significance, integrity, and authenticity form the basis for preservation theory, but they are also emblematic of conflicts and contradictions with the preservation field, specifically regarding treatments of historic resources. In addition to providing guidelines to evaluate historic significance, the NRHP criteria state that historic sites also need to retain their integrity. Integrity is the cornerstone for the valuation and treatment of historic resources. For while a resource may have significant historical associations, if it lacks integrity, it cannot properly express that significance (NPS 1997, 45). The NRHP criteria echo this sentiment and, in addition to providing guidelines to evaluate historic significance, define seven aspects of integrity: location, design, setting, materials, workmanship, feeling, and association (NPS, 1995:45). Historic resources do
not necessarily need to retain all seven of these aspects and some aspects may only apply to certain resources. The qualities of integrity, for example, of a Frank Lloyd Wright-designed building would be different than those for a battlefield. Although these guidelines pertain to specific criteria for listing in the National Register of Historic Places, they also informally guide the practice of management of historic resources as well.

Integrity relates not only to the intensity of physical damage at historic sites but also in terms of how the damage affects the significance of the sites. Specifically, in the cases of materials, feeling, and association. The more intense the damage the more likely it is to affect the integrity of a site. The NR specifies that “a property must retain the key exterior materials dating from its period of historic significance” (NPS 1997, 45). Surface damages such as the build-up of dirt and oils on architectural surfaces, dust deposits, abrasions of floorboards, and wear on painted surfaces, though not directly affecting the structural stability of historic houses, are nonetheless hazards to retaining the integrity of a site.

However, integrity can be subjective and situational. Historian John Sprinkle (2012) suggests that “the rarer a site is, the more liberal the interpretation of integrity might be” and that integrity needs to be “judged in a relative context” (Sprinkle, 2012: 57-61). For example, Old Main on Knox College in Illinois was the site of one of a series of historic debates between Lincoln Abraham Lincoln and Stephen Douglas. The debate took place on the steps of Old Main and the exterior setting of the building is more significant to the associations of the debate than the interior. As such, interior renovations, including
the removal of original flooring or the replacement of windows, while they may affect the material integrity of the building, they do not affect the integrity of location of the debate event which is the primary significance of the site. The criteria also represent a paradigm shift in preservation theory with a greater focus on authenticity rather than significance (Figure 2.2). The retention of integrity is important for establishing what Sprinkle notes as authenticity and the difference between history and heritage or “what happened” versus “what people feel happened” (Sprinkle 2014,48).

Outside of the U.S., the International Council on Monuments and Sites’ (ICOMOS) “Venice Charter” (1964) reflected growing international attention to authenticity. The Venice Charter represented the first international effort of accepted standards of conservation practice and principals of preservation. The Charter likely served as an impetus for the 1966 NHPA. The main argument contended that historic monuments and sites are common heritage and that is important to safeguard their authenticity and integrity for future generations (ICOMOS 1964). The Venice Charter valued preservation over restoration and promoted interpreting all valid historical contributions of a site or monument. Thirty years prior, the Athens Conference of 1931

Figure 2.2 Helen, GA, an early nineteenth-century logging town rebranded in the 1970s as German-themed Alpine village.
centered on restoration practices of historic sites. It also laid the groundwork for the Venice Charter and the ultimate establishment of ICOMOS as professional cultural heritage organization in 1965 (Glendinning 2013, 401).

Following the Venice Charter and the 1966 NHPA, preservationists W. Brown Morton and Gary Hume crafted the “Secretary of the Interior’s Standards for Rehabilitation” in 1976. The Secretary’s Standards, codified in the U.S. Federal Register, take four approaches to historic preservation: preservation, rehabilitation, restoration, and reconstruction. The Secretary of the Interior issued the standards as preliminary guidance for US Department of Housing and Urban Development (HUD) projects. The Secretary of the Interior also issued the Standards, as suggested by Morton (1987), partly in response to inappropriate alterations to historic properties that occurred with the establishment of a Federal rehabilitation tax credit program (Morton 1987). The Standards, in a somewhat Ruskonian manner, advocated that a property retain its historic purpose, its historic character, and that any restoration work should avoid giving a false sense of historical development. Guidelines issued by the NPS for the treatment of historic properties assisted in applying the Standards. Reviewed and revised through the 1980s and 1990s, the guidelines indicated a continued discourse on preservation practices and reflected changing goals and motivations within the field.

Historical value crosses multiple periods and is not specific to any one era. This presents issues with objective or universal ideas of site authenticity (Starn 2002). Within preservation theory, the psychological role of historical memory explains why historic
preservation professionals highly-covet authenticity. Historians David Lowenthal in *The Past is a Foreign Country* (1985), W. Brown Morton in “What Do We Preserve and Why?” (1987), and Daniel Bluestone in *Buildings, Landscapes, and Memory: Case Studies in Historic Preservation* (2011) promulgated this idea. Lowenthal argued that contact with material evidence of the past enriches our view of it, but that nostalgia and personal values, beliefs, and the application of contemporary values onto a previous time skew our view of the past (Lowenthal 1985). He contended that “preservation has deepened our knowledge of the past but damped our creative use of it (Lowenthal 1985, xvii).” As the field of preservation grew so did the popularity of historic sites and tangible connections to the past. As such, Lowenthal contended the past is more valued for its relics and that our interpretations of them limit their understanding. Bluestone (2011) made a similar argument that the tangible connection to the past is what gives it power. The way people interpret the past reflects the views of those in the present time and imparts a social and political value on the past.

The National Register Criteria, the Secretary of the Interior’s Standards, and the continually evolving concepts of significance and authenticity illustrate the importance of damage prevention at historic sites. They also highlight the dichotomy embedded in the discussion of values-based approaches to patina and damage at historic sites. These literary sources that interpret the application of historical significance, although not focused on visitor-induced damage, give insight into values associated with historic sites. Assigned historical value to individual buildings, architectural features, and
materials can affect the perception of visitor-induced damage to relics. Therefore, it appears that any measurement of damage severity is first a reflection of the significance of the site and second of the intensity of the damage.

2.3 Visitor Impact and Materials Conservation Literature

2.3.1 Conservation Theory and Approaches

Conservation theory and its methods guide approaches to the study and management of visitor impact at historic sites. They also assist with understanding the significance of the impact. Conservation theories draw from similar ideas of authenticity and integrity that are fundamental to preservation theory. Architectural conservation, both in practice and in theory, is a complexity of approaches. Retention of original materials, minimal intervention, and reversibility are the foundations of conservation theory and ethics. Twentieth-century approaches draw direct parallels from the Athens Conference and the Venice Charters. Due to a growing fear that attention to conservation would be superficial and damaging to authenticity, the conservation practice took on reversibility as central to its ethics in the mid-twentieth century (Glendinning 2013, 400-401).

Most conservation manuals and scientific approaches to materials conservation are based on practice rather than substantial theoretical background (Muñoz Viñas 2005,2). Bernard Feilden, a former head of ICOMOS, published one of the first comprehensive guides to architectural conservation, Conservation of Historic Buildings,
in 1982. Field argued that the purpose of architectural conservation is to prolong the life of the built environment and maximize its current and future uses (Feilden 1982, x).

Feilden’s approach, like Ruskin and Morris, advocated for preventative conservation to prevent damage or decay before it occurs. Conservation principles are based on similar ideas of significance, authenticity, and integrity seen in the National Register valuation process. Additionally, conservation ethics dictate prioritizing values, documenting the structure before acting, preserving historical evidence, and making sure intervention is minimal or reversible (Feilden 1982, vii). Feilden suggested a comprehensive approach to the management and care of the built environment that accounts for understanding both man-made and intrinsic and extrinsic causes of decay. He warned that “unless the causes of decay of cultural property are properly analyzed and the effects of each harmful agent to some extent quantified, there is a danger that the wrong priorities will be applied to protective measures” (Feilden 1982, 157). Conservators argue that non-reversible interventions are superficial and affect a site’s authenticity (Munoz-Vinas 2005).

Theoretical conflicts with conservation ethics, specifically the idea of reversibility, come from a more post-modernist approach. Conservators need different types of approaches to treat different types of material problems (Muñoz Viñas 2005, 2). Similar approaches to different objects are either routine maintenance or conservation (Muñoz Viñas 2005, 28). The idea of reversibility represents a decline of truth and objectivity when it comes to conservation. Conserving an object at a moment
in time cannot make it more authentic than it is in its current state (Muñoz Viñas 2005, 93). However, this paradox does not exist when one understands that subjective valuations guide conservation postures and that there is no one correct approach (Muñoz Viñas 2005, 104). This contemporary thought is more a post-modernist approach to conservation in which there are multiple truths. It represents an evolving approach to conservation muddled with ambiguity. Muñoz Viñas’s main theoretical point is that “conservation increases a building’s functionality or values at the cost of decreasing others” (Muñoz Viñas 2005, 181). Approaches to managing the built environment can and should be flexible.

Like the Secretary’s Standards and the methods promoted by Feilden, conservation manuals for historic structures and prevailing conservation management literature focus on the retention of original materials and reversibility of preservation methods. Most manuals published in the 1990s and 2000s primarily focused on damages to collections and briefly mentioned wear caused by visitors (Applebaum 1991). England’s National Trust, however, follows similar conservation ethics and ideas of authenticity in historic interpretation to include using period-appropriate materials and retaining historic context (National Trust 2006, 36).

Conservation theory and practice illustrate the influence that visitor impact, including cosmetic damage, has on the authenticity and interpretation of historic sites. When addressing cosmetic issues conservators must account for the significance of the original owner, standards of display, etiquette, and propriety (Fitch 1972, 314). Places
like Mount Vernon, Monticello, and Windsor Castle represent elite households which would have been well-maintained. Abrasions, surface dirt, debris, and other physical markings on finished surfaces degrade the intended appearance of the structures. Likewise, oil build-up and staining may not lead to physical deterioration, but it does affect the appearance of a site (Honeyborne 1990, 231). Additionally, surface-level or cosmetic damages such as staining from tobacco by-products, though not as common today, may conceal architectural features and make other issues such as cracking or loose plaster difficult to identify.

2.3.2 Problem Recognition

Historic site visitation in the United States steadily increased since the mid-nineteenth century. The Post-WWII economic boom made tourism a major industry. A growing sense of patriotism, active promotion by the heritage tourism industry in the 1960s, the passage of the 1966 National Historic Preservation Act in the United States, and the British Tourism Act of 1969 were all partly responsible for an increase in mass visitation to historic sites around the world. The British Tourism Act, while it did not directly promote historic site visitation, allocated public funds for the development of hotels and infrastructure to promote tourism (Tourism Act 1969). Archaeologist Henry Cleere noted that the increase in tourism and visitation at “sites such as Stonehenge and the Athenium Acropolis began to put the monuments themselves in jeopardy from
sheer physical attrition” (Cleere 2012, 3). Though Cleere spoke in relation to archaeological sites, the built environment also experienced physical attrition.

Conservators also took note of physical damage due to increased tourism. ICOMOS passed the Cultural Tourism Charter in 1976 as an effort to encourage responsible management amid growing concern over the increase in tourism (ICOMOS 1976). The charter emphasized maintaining the accessibility of heritage sites but also promoted active management to maintain the integrity of sites and sustainable visitation. The Charter attempted to rectify the growing divide between conservators and those responsible for the preservation of the built environment with the promoters of tourism (Brooks 2001). It further defined responsibilities for all parties and recognized the interdependent relationship between conservation, interpretation, and management. A lack of understanding of site significance and poorly planned interpretation led to the degradation of the physical materials and their authenticity but also to larger socio-cultural effects (Brooks 2001).

Additionally, the danger posed by heritage tourists influenced the growth of professional conservation in the 1980s. The growth of the conservation practice reflects growing concern about authenticity retention at historic sites. English conservator Jane Fawcett argued that the influx of tourists at cathedrals led to increased damage to ledger stones, paving stones, and furnishings (Fawcett 1987). Proposed solutions included installing protective panels and restricting accessibility (Fawcett 1987). However, the study focused on identifying the problem areas and instituting mitigation strategies
rather than understanding the multi-causal factors of the degradation.

Additionally, the 1989 conference on *Tourist Wear and Tear on Monuments and Sites* held by ICOMOS UK and English Heritage drew global attention to the consequences of visitor impact at historic sites, including Canterbury Cathedral, St. George’s Chapel, and Westminster Abbey (ICOMOS 1989). The research focused on measuring material degradation, noting that most damages were resultant of overuse and the way visitors moved through the site. Research showed that site management and interpretation conflict with conservation. Conservators argued the importance of preemptively addressing visitor-induced damage because simply replacing damaged materials damaged did not lessen the documentary and aesthetic loss of original materials (Marsh 1989, 3).

2.3.3 Physical Effects of Visitation

Prevailing studies on visitor impact vary in scope. Some focus on a single material, others aim at developing mitigation efforts, and few quantify damage as part of a holistic study. However, research indicates that visitors do have measurable and sustained physical impacts on historic structures and materials. Some types of impacts are controllable and others, such as biological and structural impacts, threaten the preservation of the structure and limit its interpretation and use.

As previously mentioned, visitor-induced material degradation takes two distinct forms, direct and indirect impacts. Direct impacts are physical damages attributed to the
direct interaction between visitors and the architectural fabric. These include wear and
tear, abrasions, vandalism, biological impacts, and micro-climatic changes. Direct
impacts also occur as the result of unanticipated and uncontrollable events including
illness, spills, and falls. Conversely, indirect impacts develop out of secondhand
responses to historic site management. These include adjustments to accommodate
visitors such as, but not limited to, the installation of heating and cooling systems and
compliance with the Americans with Disabilities Act. Impacts to historic landscapes and
pathways include erosion and alteration of materials. These impacts generally relate to
patterns of circulation and connection between secondary structures. Visitor impact on
environmentally sensitive, natural, or terrestrial areas, such as National Parks, as well as
noise pollution, economic, or socio-cultural impacts, and intangible cultural heritage are
not part of this current study.

Current research reflects the complex and changing attitudes towards physical
damage. For example, graffiti and vandalism are the most visible forms of intentional
visitor impact, but their historical significance is debatable. Site managers and
preservationists generally view it as a negative aspect of visitation. Although cosmetic
damage does not directly affect the structural stability of historic sites, it is nonetheless
important. The appearance of a historic structure and the quality of a visitor’s
experience are interrelated (Fitch 1972, 314). Cosmetic damage, such as graffiti, affects
the display and experience of a historic site by not allowing it to properly represent its
historic context and significance. Viewed as a reality and an unsanctioned consequence of opening historic sites to the public, history views early examples of graffiti differently.

Paleolithic cave paintings in Lascaux, France illustrate some of the earliest known examples of “graffiti” (Henry 1941 and Dupont et.al. 2007). Historians revere graffiti at Pompeii, entombed by the eruption of Mount Vesuvius in 79 A.D., for its ecclesiastical connotations rather than as vandalism or as a negative physical impact (Moorman 2015). Medieval and Renaissance graffiti also persists in private residences, churches, and other public spaces throughout England (Fleming 2001, 29). However, graffiti, like that seen at Pompeii, partially represents the transition between pictorial expression and linguistic expression (Reisner 1971, 31). Historical graffiti within structures served a purpose different from contemporary ideas of vandalism. Medieval and Renaissance churches and private residences sanctioned, if not encouraged, graffiti as an important part of records; sometimes even reserving portions of church fabric for markings (Fleming 1997, 3). The commonness of surviving sixteenth and seventeenth-century graffiti illustrates its everyday use. The abundance of graffiti is also emblematic of growing literacy and the scarcity of resources during these time periods and less as a physical intrusion upon a historic structure (Fleming 2001, 50). The expense of paper made it an item reserved for more elite classes, while structural inscriptions were available to anyone who entered a building (Figure 2.3).
Not until the mid-nineteenth century did graffiti become associated as a negative activity. During this time, scarcity of resources was no longer cause for graffiti and as historian Juliet Fleming notes graffiti, “implied the operation of unauthorized activity whose results decorate and articulate our own public spaces” (Fleming 2001, 40). This transition marked changing attitudes towards graffiti that currently continue. Fleming stated it is a “paradox that has continued to haunt the term; dictating, for example, our own distinction between graffiti which culpably obscures the past and graffiti as a potent record of the past” (Fleming 2001, 40).

In contemporary iteration, vandalism and graffiti are constant threats to historic sites and artifacts exposed to the public (Fitch 1976, 328). Fitch also suggests that neglect of maintenance and preventative measures play a role in contributing to damage, as graffiti begets more graffiti (Fitch 1976, 328). Although Fitch drew attention to modern issues with graffiti, the only solution proposed was to limit visitors at historic sites. The recommended solution to graffiti relates to guiding principles of management and less to methods of remediation (Chitty and Baker 1999).

Whether addressing graffiti from a management standpoint, a remedial effort, or in relation to preventative measures, many sources within the built environment view it...
in much the same way, as a negative consequence of public access. However, as a contrasting view, and although limited in literature, preservationists sometimes view graffiti positively when taken within the context of the historical record where it coincides with a period of significance at a historic site or aids in understanding the development of a site (Feilden 1982, 22). In many cases, conservators cover historically significant graffiti with a consolidant to ensure its preservation. One likely explanation for the lack of literature related to graffiti viewed as a historic element is because sites and preservation managers do not want to promote or encourage it. The point at which graffiti becomes historically significant appears to be only when tied to an important historical period or a person of significance.

2.3.4 Signs of Attrition

In addition to intentional damage, wear and tear or physical attrition of historic materials is a consequence of public access. Mentioned by Viollet, Ruskin, and even Alberti, physical wear is a factor of use that site managers and conservators cannot completely prevent. However, when historic sites change use from often private residences to public spaces, the use of the space and the volume of persons using it increases leading to more physical damage. Examples of which are limitless.

Primary damages include worn finishes, loss of paint or wall surface material, erosion of wooden and ceramic materials, and increases in structural issues as evidenced by work needed to reinforce framing at many historic sites (Figure 2.4).
Research methods reveal a variety of approaches. These range from observational methods, conditions assessments, and archival research. Research is primarily material or damage-specific and limited on holistic assessments of multiple damage types. Much of the research on indirect physical damages relates to object conservation. However, studies show that physical damage does occur to the building envelope because of accommodations made for both visitor comfort and artifact preservation (Rose 1994).

Figure 2.4. Example of staircase structural reinforcing.
Although limited in scholarly literature references, and most noted in internal conditions assessments and reports, nearly every popular historic structure in the United States is subject to visitor wear and tear damage (Figure 2.5). Physical attrition at Philadelphia’s Independence Hall necessitated the installation of steel members to structurally reinforce the second floor of the structure (Connally 1972, 341). The painted surfaces and finishes at Mount Vernon bear the scars of attrition from one million annual visitors. Additionally, many historic sites make modifications to historic materials to comply with visitor access requirements such as the Americans with Disabilities Act. Modifications to allow wheelchair access at Monticello, for instance, leads to damage along doorways and architraves. Within most historic sites, damage concentrates along the visitor path. However, associating measurable damage to visitors proves difficult without a known starting point for the damage and a baseline for comparison (see Figure 2.6) (i.e. replacement materials or previous repairs). Recent research by the J. Paul Getty Trust in 2007

Figure 2.5 Dirt and oil build-up on stone surfaces at the Biltmore, Asheville, NC.
focused on quantifiable visitor-induced material degradation at a house museum in Amsterdam (J. Paul Getty 2007). The study included documenting and measuring material loss to stair treads, micro-climactic conditions, and a collections assessment.

Researchers noted that abrasions occurred on the original seventeen-century stair treads themselves, but also on the rise portion where feet hit before reaching the next step. The stairs lost a total of 11-13mm of their original thickness of 31mm (J. Paul Getty 2007). Based on calculations from attendance they concurred that replacement treads lost 0.4 mm per tread caused by a total visitation number of 800,000 visitors over a twenty-year period (J. Paul Getty 2007). While the type of material is likely a variable in the rate of wear, it still represents a significant and measurable loss of material due specifically to visitation. Comparatively, at Mount Vernon, replacement wooden thresholds along the multiple entry doors lost 1-2mm within only one year based on an average of 1,000,000 annual visitors (Bartlett 2013). Additionally, researchers in Amsterdam noted that wear also occurs in areas where travel is unstable.

Figure 2.6. Museum display showing the impact of dirt and oil build-up on collections.
causing visitors to hold other surfaces such as the wall or balustrades leading to paint loss and the buildup of dirt and oil (J. Paul Getty 2007). Similar impacts are also present at Mount Vernon where visitors hold on to wall surfaces while traveling along the staircase from the second floor to the first.

Recent studies at Pompeii show the material repercussions of problematic visitor behavior and mismanagement at a historic site. Researcher Alia Wallace in “Presenting Pompeii: Steps Towards Reconciling Conservation and Tourism at an Ancient Site” (2012) analyzed visitor impact at Pompeii combined with a qualitative assessment of visitor experience. She examined and mapped visitor movements to study their impacts and how they moved through the site. Using methods of observation, GPS tracking, and recording linger-time, Wallace tracked visitors throughout the excavated city of Pompeii (Wallace 2012:119). Visitors touched exposed frescos and wall surfaces and often sat, stood, or leaned against walls. Visitors noted that they liked touching the ruins for the sense of connection, even though they knew site visitation guidelines prohibited it (Wallace 2012, 125). Wallace noted that as an active archaeological site, Pompeii will always have some level of decay; however, “most of the decay from visitors comes from overcrowding and poor communication, both factors that can be addressed with appropriate management” (Wallace 2012, 133). Wallace’s research is notable for correlating specific consequences of management directives or lack thereof. However, in comparison to other conservations studies, it does not include an in-depth
conservation analysis correlating use with the degree of material damage and physical impact.

2.3.5 Biological and Environmental

In addition to physical damage from direct contact, biological and micro-climatic conditions arising from the introduction of visitors lead to environmental changes and damages to historic materials. Conservation scientists found the formation of bacteria and increases in temperature and humidity have serious implications for the integrity of historic sites. In larger more expansive areas, the changes in conditions occur predominately in the areas accessed by visitors (Sanchez-Moral, et. Al. 2005).

In several cases, visitor-induced physical damage threatened historic materials forcing the interpretation of the site to change or, in the case of the caves at Lascaux, stop entirely. Discovered by accident in 1940, the Paleolithic cave paintings at Lascaux in the southwest of France illustrate how visitors to a historic location led to alteration and loss of material. Site managers carved pathways within the caves to accommodate visitors and improve access. Visitors to the site introduced a biological fungus that eroded and deteriorated the cave paintings. To prevent further loss, site managers restricted visitation to the caves. Professionals blocked off sections and installed barriers (Henry 1941 and Dupont et.al. 2007). In this instance, the severity of the damage is more immediate than at most sites because it threatens a total loss of material.
Likewise, conservators recorded similar instances of visitor-induced deterioration present within Roman catacombs. In 2004, scientists first noted micro-climatic changes within the atmosphere and correlated those changes to material degradation within the catacombs. Researchers noted both immediate and long-term changes in relative humidity, gas concentration, and temperature because of the external influence of visitors (Sanchez-Moral, et. Al. 2004, 183). The totality of these increases affected the amount of surface condensation which led to material decay (Sanchez-Moral, et. Al. 2005, 260).

Like Lascaux, the formation of biofilms from artificial illumination and humidity occurred primarily in areas that tourists accessed, including the entrance and in areas with artificial light. Scientists observed chemical dissolution and pitting along with “aesthetic damage...due to biofilm coverage over frescos and paintings” (Sanchez-Moral, et. Al. 2005, 267). Conservators commonly find these types of biological damages in subterranean environments. However, additional studies show temperature and humidity fluctuations in cathedrals and historic structures as well. Conservators often treat these damages by implementing biocide removal and dehumidification measures (R. Douglas-Jones, et al. 2016, 827).

Environmental issues such as dust and dirt intrusion affect historic sites as well as interior collections. Dust and dirt carried into historic sites by visitors is not only a visual barrier to the experience of a site but may also have long-term effects on materials if not properly addressed. Conservators Helen Lloyd, Peter Brimblecome, and
Kathy Lithgow argue that “dust can cause physical damage or chemical alteration to materials [and] the process of removing dust can cause further damage, either through frequent abrasion or from aggressive cleaning techniques” (Lloyd et al. 2007, 135-136). Dust also presents a management challenge for historic sites in terms of managing routine housekeeping and increased costs for maintenance. Generally, the cost is minimal for larger sites with greater visitation numbers, but for smaller historic houses and sites with fewer visitors, the costs increase substantially (Lloyd et al. 2007, 141).

There are benefits and drawbacks to these methods for documenting conservation damages from visitors. In terms of sample size, generally these methods are bound by a case study location and while they may include multiple samples of damage, they generally are not enough to draw statistical conclusions related to material damage. However, they do assist with developing testing methods and protocols such as the development of films, coatings, and surface treatments to arrest erosion and abrasions (Blau, 2007). Regarding data collection and analysis, data collection is based primarily on conditions assessments and direct observations, relying on traditional methods of field data collection and scientific methods. Analysis of artifacts (i.e. building materials and landscapes) is often specific to certain materials such as brick, stone, wood, plaster, etc.

Additionally, similar threats to external validity challenge each of these methods. Due to the contextual nature of sites and small samples sizes results are not usually generalizable (i.e. one rate of wear does not transfer to another site). However, patterns
of damage are transferable to similar environments. Causes of damage often relate back to materials conservation theories that underpin the study of material degradation and relate to material construction, inherent flaws in materials, and material quality. Generally, conservation research is not holistic in that does not address all factors of visitor influence within a site or all damage to materials, and it traditionally focuses on one material per study. Lastly, there could be issues with instrumentation which could affect the internal validity of the research designs, but generally, methods of collection are based on established standards of procedures within the scientific community such as the American Society for Testing and Materials (ASTM). The primary benefit of these approaches is the conservation theories and practices that result from these studies that influence the practical management of material damage, restoration, and maintenance.

2.3.6 Conflicts in Material Decay and Patina

Material damage also introduces additional problems and considerations for historic site management. Physical damage is more than a nuisance or a consequence of public access. It affects the interpretation and experience of the site as well. The relationship between the appearance of a historic structure directly affects the quality of a visitor’s experience (Fitch 1972, 314). When a historic house is a representative of elite architecture, an upper-class citizen, or even a revered public space, cosmetic and
physical damage affects the experience and interpretation of a historic site (Fitch 1972, 314). The observable damage alters the historic view and display of the site.

Various architectural theorists and conservators stress the aesthetic value and sense of historicism that can come from decay and ruins (Lowenthal 1985, Wells 2009, and Douglas-Jones et al, 2016). Lowenthal (1985) argues that age and patina add to the appearance of antiquity, can be a useful source of information about the past, and are pleasing to viewers or visitors (Lowenthal 1985, 154-157). Furthermore, author Jeremy Wells in his dissertation titled, “Attachment to the Physical Age of Urban Residential Neighborhoods: A Comparative Case Study of Historic Charleston and I'On" (2009), makes a further distinction about types of patina. Wells argues that patina of historic materials is, “good’ decay as opposed to ‘bad’ decay” (Wells 2009, 52). Meaning that material age and deterioration can sometimes evoke feelings of a connection to the past, rather than negating the value of a site. However, Wells’ assessment of decay is based on variations in material decay because of natural deterioration, environmental decay, or damage from neglect rather than visitor-induced damage.
Cultural heritage professionals, Rachel Douglas-Jones, John J. Hughes, Sian Jones, and Thomas Yarrow in their article entitled, “Science, Value and Material Decay in the Conservation of Historic Environments” (2016), like Lowenthal and Wells, stress the aesthetic value and sense of historicism that can come from decay and ruins (Figure 2.7). However, they argue that this value does not extend to visitor-induced damage and suggest that there is a “complex range of cultural values and qualities associated with material transformation” (Douglas-Jones, et al. 2016, 823). Additionally, visitors and conservators view patina negatively when it is the result of visitor-induced damage. For instance, conservator Helen Lloyd argues that the patina generated on objects or surfaces from dust gives the appearance of neglect and reduces aesthetic value (Lloyd et al. 2007, 135). The degree to which patina and physical damage affect visitors’ views and experiences of a historic site come from multiple values and qualities of the deterioration which are complex, situational, and contextual. Douglas-Jones et al. argue that there is no formula to discern between
positively valued forms of decay and those that are undesirable (Douglas-Jones, et al. 216, 823).

2.4 Visitor Impact in Historic Site Management and Interpretation

2.4.1 Historic Site Management Theories and Challenges

Females primarily dominated the management and interpretation of many mid-nineteenth century American house museums. Museum managers did not focus on interpreting the site with the level of historic authenticity as seen today. Management decisions reflected more Victorian domesticity and churchlike atmospheres that promoted home life as an answer to public matters and conflicts (West 1999, 1). Ideas of pastoral imagery served to promote tourism and visitation at venerated shrines such as Mount Vernon and the White House (West 1999 and Marx 1964). Several management problems resulting from these fanciful interpretations and unregulated access included vandalism and damage from physical attrition (West 1999, 3). Calls for changes and formal directives in management protocols and interpretation resulting from this time underpin contemporary site management in the United States.

Large-scale historic sites in the United States such as Monticello, Colonial Williamsburg, and Fort Sumter receive more than 500,000 annual visitors, while sixty-percent of American House Museums entertain less than 10,000 (Coats 1990, 26-28). However, sites with minimal visitation are also susceptible to material damage. As visitation to historic sites continues, site managers struggle with balancing conservation
and interpretation. The greatest challenge to ensuring the longevity of sites is balancing between access and minimizing impact (Shakely 1999, 79; Allfrey 1999, 120). General historic preservation theories focus on safeguarding the authenticity and significance of the built environment. As such, traditionally, conservation has taken priority over presentation and interpretation in site management (Wallace 2016).

Historic site management, as it relates to visitor-induced material damage, generally comes from three areas of management: management of the historic built environment, management of the natural environment, and management of the built environment from a city and regional scale. They all generally emphasize similar principles and ethics for management that include safety and security of the historic site, environmental quality, visitor experience, and sustainability and commercial viability of the site (Glasson 1995, 2-3). Several basic operations that historic site managers are responsible for include site design, interpretation/presentation, visitor management, staff management, buildings management, addressing risks and crises, managing capacity, and visitor satisfaction (Millar 1999, 24). However, with all the factors involved in management, there still exists a conflict in balancing site conservation and preservation with interpretation and visitor experience (Shakely 1999, 79).

Several authors also note one of the key challenges in achieving sustainable heritage management results from conflicting priorities and values between tourism and heritage management. Though often spoken of as interrelated, tourism managers
and historic site or heritage managers have different stakeholders, ideologies, and objectives. For examples, site managers view historic sites for their significance and value and primarily prefer conservation over interpretation, while tourism managers or promoters view them as wealth and activity-generating resources (McKercher and du Cros 2002, 13).

2.4.2 Proactive Management Approaches

Visitor impact management is a growing field. While large international sites, such as the Valley of the Kings in Egypt, limit access to prevent material damage, many smaller scale sites are moving away from outright restrictions and taking more proactive approaches to management. This represents a slight theoretical shift in the debate between conservation and access. Alternative planning and visitor education are keys to balancing access and damage control and have proven successful at multiple historic sites (Chitty and Baker 1999). Suggestions include putting ancillary facilities such as restrooms, gift shops, and admission centers outside of the primary structure. Thus, reducing interior damage and the need for modification (Allfrey 1999, 121).

Many sites also offer alternative experiences to disperse visitors and reduce large concentrations within the primary structure or site. For example, at Mount Vernon, an education center, museum, pioneer farm, and varied tours provide alternative experiences, disperse visitors, and reduce the concentration in the primary structure. Similarly, Hadrian’s Wall, a World Heritage Site known for being the
northwest frontier of the Roman Empire, faced erosion and collapse from excessive visitation (Young 1999, 41). Unstaffed areas with uncontrolled access faced the greatest damage. One source of mitigation spreads visitors more widely throughout the site and along the wall primarily through education and visitor tour direction that highlights and encourages other areas of visitation (Young 1999, 46).

![Figure 2.8 Example of warning signs and visitor control measures. Alcázar of Seville, Spain (left) and Volusia County, Fla (right).](image)

Primarily, researchers agree that most impacts are controllable with proper management (Shakley 2001, Wallace 2016, and Chitty and Baker 1999). As a professor of Cultural Resource Management, Myra Shakely notes, “theft, vandalism, and graffiti are all types of physical impacts that are deliberate and to a certain degree predictable” (Figure 2.8) (Shakley 2001, 44). Material damages from physical attrition resultant of poorly-control visitation require more creative solutions and further understanding. However, there is still conflict within site management from the conservation
standpoint. Conservator Sherry Butcher Younghans highlights the disparity between site management and technical training which adds to the mismanagement of physical impacts. She argues that managers of house museums and historic sites generally lack the technical knowledge and training to properly conduct conservation and preservation work and that preservation guides only assist in maintenance rather than in conservation and prevention (Butcher Younghans 1996).  

In some instances, site managers associate damages such as vandalism with over-visitation, but some suggest that a lack of guards or visible interpreters is the main cause for the damage (Drdacky, et. Al. 2005, 14). Management is often the key component in controlling physical damage and limiting impact. Conservators involved with the Pro-active management of the Impact of Cultural Tourism upon Urban Resources and Economies (PICTURE) project financed by the European Commission Sixth Framework Programme of Research, argue that limiting visitors, demarketing (i.e. reducing marketing efforts that promote historic sites to tourists), using guide-led tours to control movement, and keeping visitors at a distance from historic materials are the only ways to mitigate risks (Drdacky, et. Al. 2005, 18). Similarly, proactive management solutions implemented for damage mitigation at Notre Dame Cathedral included requiring reservations, varying tour types, and imposing preferential tariffs. This

2 Additional historic site management literature, while primarily focused on collections rather than architectural conservation, by preservation professionals Nicola Ashurst (1994), Melissa M. Heaver (2004), and Jane Merritt and Julie A. Reilly (2010) also suggests that many house museums and site managers, while aware of visitor-induced material damage, lack the physical design within the structures to accommodate large numbers of visitors.
resulted in improved conditions and more even dispersion of visitors throughout the year instead of at peak visitation times (Jean-Marc Boyer 2000, 168).

2.4.3 Access and Carrying Capacity

Visitor impact and management literature reveal that limiting impacts directly correlates to the management decisions at historic sites. Resources that continue in their historic function also present conflicting issues. This includes structures such as churches and cathedrals which have a continuing and evolving use. David Baker suggests that “visitor management has to reflect the level of demand to see the building, the quality and vulnerability of what is there, and the resources that are available” (Chitty and Baker 1999, 107). Management is more complicated in these instances since various stakeholders play a role in the site. Consequently, management decisions need to be proportional and representative of the site’s uses and resources.

Perspectives from environmental and ecological management standards and practices also recognize the impact of visitors to natural areas and the need for defined management goals and an understanding of use patterns. The Visitor Use Management Council, an interagency comprised of the Bureau of Land Management, the U.S. Forest Service, the National Oceanic and Atmospheric Administration, the National Park Service, the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service, promotes an interdisciplinary understanding of policies and procedures that guide visitor use management on Federally managed lands (IVUMF, 2018). Guidelines
encouraged by the Council promote the understanding of required conditions to manage visitor use, the development of criteria to determine desired conditions, and the development of strategies to track changes related to use over time (IVUMF, 2018). Though not employed within the field of historic preservation and the management of historic sites, specifically, the theories of sustainability and site monitoring to minimize damage have been. Supporters of these objective frameworks suggest they can assist with managing sustainability in requiring the construction of indicators and thresholds to monitor change and in the creation of objectives to determine acceptable levels of change (Manning, et al., 2011:25).

In addition to conflicts in use and access, ideas of carrying capacity present similar management dilemmas related to balancing access with conservation. As Shakely (2001) notes, “visitor management problems [which include physical deterioration of historic materials] increase in direct relationship to visitor numbers” (Shakely 2001, 74). However, calculating the maximum number of visitors to a site is a controversial process. Applied more recently to historic cities and individual sites, theories of carrying capacity and limits of acceptable change draw from natural environment management and wildlife management studies (Glasson 1995, 44).

The underlying theory first proposed by Geoffrey Wall and Alister Mathieson defines carrying capacity as, “the maximum number of people who can use a site without an unacceptable alteration in the physical environment [and] without an unacceptable decline in the quality of experience gained by visitors (Wall and Mathieson
The carrying capacity of a site is a function of several factors, including the number of resources and visitors, levels of tolerance, visitor use, and behavior, and site design and management (Glasson 1995, 45). If site managers determine the optimum number of visitors for a site, they can devise a management plan to maintain appropriate access levels. Contemporary research at Machu Pichu notes that congestion occurs at the most popular and promoted areas and further suggests that carrying capacity is dependent on factors such as weather and time of day and needs to continually monitored and reassessed (Comer et. Al. 2016).

Once site managers determine optimum carrying capacity, they can either limit and control visitation levels or find ways to expand the capacity (either through varied tours or alternative experiences) (Shakely 2001, 66). For example, at Sissinghurst Castle Gardens in Kent, site managers implemented a structure for timed entry based on carrying capacity calculations. Although related to impacts on the natural environment rather than architectural damage, it did show that site managers decreased physical damage by implementing successful alternative solutions (Benfield 2001). Regarding structural damage, researchers noted that measuring physical impacts is possible and necessary for assessing the sustainable capacity of historic structures (Lloyd and Mullany 1994, 132). While immediate visitor-induced structural impacts are minimal in comparison with other types of physical damage, conservators Helen Lloyd and Tim Mullany note that “the cumulative effects of multiple load cycles can contribute to structural fatigue” (Lloyd and Mullany 1994, 135-136). Calculating the sustainable
number of visitors can potentially reduce or prevent long-term effects on the structural integrity of historic sites.

However, in the management of historic resources, indicators and threshold standards that come from analysis patterns such as carrying capacity and spatial density can prove to be an issue in their application. Several factors involved in determining carrying capacity, for example, include the number of resources and visitors at a site, the types of visitor use and behavior, and site design and management (Glasson, 1995: 45). Ideally, if site managers determine the optimum number of visitors for a site, they can maintain appropriate access levels to reduce risk and overcrowding. However, critics argue that multiple contextual factors, such as weather and time of day, influence calculations, which complicates the application of carrying capacity limits (Comer et. al., 2016). Lastly, setting strict capacity limits can encourage a focus on physical amenity and visitor satisfaction rather than maintaining the historically significant qualities of a site (Glasson, 1995: 45). This can promote certain areas of a site at the exclusion of others which could underrepresent other historic narratives that are part of a site’s interpretation.

Additionally, critics of the applicability of carrying capacity measures argue that multiple contextual factors influence calculations, which illustrates the complexity in applying strict measures of carrying capacity to a historic site. Research shows there is a point at which visitors no longer feel comfortable in a space (Wall and Mathieson 2006) because of this, conflicts arise when applying carrying capacity to sacred sites due to
variances in physical and psychological carrying capacity – or the point at which visitors no longer feel comfortable in a location (Shakley 2001, 66). Additionally, in setting capacity limits, Glasson (1995) argues that site managers have “tended to focus on the relationship between physical amenity and user satisfaction – excluding economic, social, and political dimensions” (Glasson 1995, 45).

Within the United States, guidelines created by the National Park Service highlight the issues with resource protection and maintaining visitor experience. The Visitor Experience and Resource Protection Framework, (1993), created by NPS addresses carrying capacity and limits of acceptable change (National Park Service 1993). The framework consists of nine elements related to the management of sites including developing interpretive themes and assessing visitor use. The framework also stresses developing indicators to determine when park uses crosses set thresholds or quantitative variables of minimally acceptable use, such as the number of visitors on a trail (National Park Service 1993, 58).

General management plans for NPS park sites trend toward management by zones, rather than comprehensive management (Hof and Lime 1997, 30). By transitioning to zone-based management, VERP framework allows for more manageable and applicable thresholds for different areas. A critique of the VERP framework is that few NPS units applied it due to difficulties in compliance making its effectiveness debatable (Hof and Lime 1997, 32). Additionally, the nine elements of the VERP framework do not address the underlying causes of visitor-induced material damage.
and fail to make a strong management connection beyond natural resources with historic resources. VERP framework seeks to identify historic structures under NPS purview but does not provide ways to measure or value the severity of physical damage within the structures associated with visitor activity.

2.4.4 Historic Site Interpretation Theories and Challenges

Interpretation plays an important role in helping to manage and protect resources including both the natural and the historic built environment. Though interpretation promotes an understanding of the significance and history of a location, it also aids in a visitor’s relationship to a space and their emotional and physical connection to it (Tilden, 1957). Messaging and strategies that guide attitudes about a place can also influence behavioral patterns of visitors. Additionally, an important product of interpretation, as it relates to historic resource management, is in the ability of messaging to assist with limiting both intentional and incidental visitor impacts. In a study of multiple tours among protected lands in Australia, researchers noted that the most used type of messaging in all forms of interpretation were messages to encourage appropriate behavior (Armstrong and Weiler, 2002).

In the 1950s, writer Freeman Tilden created a concept of interpretation to improve visitor education and understanding at national parks and historic sites, part of which included attention to influencing the behavior of individuals. Freeman laid forth six principles of interpretation: 1) interpretation needs to relate to the physical
environment, 2) listing information is different from interpretation, 3) interpretation is an art, 4) the aim of interpretation is not to instruct but to provoke, 5) interpretation must present the whole story and not just a part, and 6) interpretation for children must be different than that for adults (Tilden, 1957 and 2008:18). A more contemporary approach to interpretation comes from author Sam Ham in “Interpretation: Making a Difference on Purpose” (2013). Ham (2013) offers a simplified version of Tilden’s principles and suggests that interpretation should strive to be “thematic, organized, relevant, and enjoyable to process (TORE) (Ham, 2013:3).

In contrast to Ham, Tilden put greater emphasis on the responsibility of interpretation in managing visitor behavior. While some parks and historic sites revered the visitor as sovereign (in that guides cannot tell visitors what to think about a site), Tilden suggested that interpretation should and does play a role in guiding visitors how to think about a space as well as how to interact with it (Tilden, 1957). Interpretation is responsible for relating expected norms of behavior in various contexts to visitors. Conversely, while Ham (2013) does concur that messaging can “promote proper or preferred behavior,” he suggests that messaging’s influence on behavior is less common as an outcome of interpretation due to the small subset of visitors who engage in depreciative behavior (Ham, 2013:3). However, Ham is generally referring to depreciative behavior in this argument and not the results of attrition that interpreters can minimize through messaging, such as leaning on walls or touching fragile surfaces.
Nevertheless, contemporary critics argue that quality interpretation and education lead to increased respect for historic resources (Leask and Yeoman, 1999). Researchers have shown that specific interpretation language and reference to visitor impact and/or normative behaviors within interpretation strategies results in lower counts depreciative behavior (Johnson and Swearingen, 1992). As a result, areas popularized or promoted by interpretation strategies, such as instruction from guides and signage, may lead to less material damage or less intentional damage. These strategies may influence the type and degree of material damage that occurs as well, such as differences between minor abrasions and heavily eroded pathways.

Interpretation also helps to disperse visitors and aids in reducing large concentrations of visitors in popular areas. Practical implementations of strategies at Hadrian’s Wall have illustrated as much, but studies related to the effectiveness of messaging in preventing visitor-induced material damage are relatively limited (Chitty and Baker, 1999 and Young 1999, 41).

However, scholars also point out the negative consequences of relying strictly on interpretation to promote sustainable heritage. Interpretation can lead to underrepresented areas and comprise the overall interpretation theme, it can lead to the promotion of elitist ideals, and can lead to the construction of false histories (Bramwell and Lane 1993; Leask and Yeoman 1999). Concentrating visitors in areas to reduce damage in others can affect visitor experience and lead to more intense damage (McGregor 1999, 204). Visitors may feel a sense of seclusion or security in uninterpreted
or less restricted areas leading to greater instances of intentional damage or wear. At Pompeii for example, researchers noted that although guide maps were available for most of the site, visitors limited their movements to a small portion of the site (Wallace 2012, 122). Doing so led to overcrowding and deterioration by neglect in certain areas, while other areas received little visitation (Wallace 2012, 122). Primary reasons for the disproportionate visitation were the promotion of specific areas by the interpreters and guidebooks combined with no methods for alternative tours (Wallace 2012, 125).

Access and tours at historic sites vary and depend on both the objectives of site managers and the approaches to interpretation. In terms of presentation and physical interpretation, Preservationist James Marston Fitch advocated for the docent system at historic sites. He stated that because of their education, their knowledge of the architectural significance of the building, and their personality, docents not only add to the experience of a site but also their presence helps control theft and vandalism (Fitch 1982, 343). A point also reiterated by Feilden (1982) and Wallace (2016) is that interpreters can control much of the damage through communication. Another form of interpretation is self-guided audio tours. These tours give visitors a chance to experience the site on their own. Additionally, self-guided audio tours control of the material presented and the consistency of content and message (Fitch 1982, 343).

Interpretation also puts visitors in the direct path and contact of tangible heritage and historic materials. Site experience is different for each individual and behavior and visitor expectations not only affect how visitors will interact with a site but
also affect site management (Falk and Dierking 1992, 25). This relativistic view of human behavior explains the unpredictability of visitor behavior. Visitors have various experiences, backgrounds, and values. As Falk and Dierking note, “some visitors are knowledgeable, some are curious, some learn best when they touch things – multiple factors make up the visitor’s personal context and influence their agenda” (Falk and Dierking 1992, 25).

Additionally, human behavioral patterns may still be observable in historic sites that have unrestricted or unguided or minimally guided access, such as forts and archaeological sites. Generally, visitors turn right upon entering a space (Melton 1935). Visitors also get “museum fatigue” meaning they tire as they visit, and they spend less time looking at exhibits (Gilman 1916). Additionally, Stephen Bitgood proposed the theory of the General Value Principle, which “predicts choice behaviors as a ratio of perceived experience divided by perceived costs” (Bitgood 2006). In a sense, a visitor will gauge the relative costs of their behavioral choices with the benefits it produces, such as access to restricted areas.

Visitor behavior concepts like these play an important role in the interpretation of a site and may allow for predictability of areas of physical damage. Additionally, they aid in understanding site use and access and how it may correlate with physical damage. Especially, if site managers determine that visitors tend to linger in one area or another. Regardless of the location or historic site, it is evident that interpretation is not only a significant aspect of historic site management, but it also plays a visible and immediate
role in limiting visitor-induced material damage at historic sites. Regardless of the location or historic site, it is evident that interpretation is not only a significant aspect of historic site management, but it also plays a visible and immediate role in limiting visitor-induced material damage at historic sites.

2.5 Conclusion

2.5.1 Lack of Comprehensive Approaches

Physical degradation of historic materials and landscapes is a consequence of direct contact by visitors. It is also the result of mitigating factors such as building materials, micro-climatic conditions, visitation patterns, site interpretation, management, usage, and planning. A review of multi-disciplinary studies that correlate site usage with physical damage reveals several things. Research on visitor-induced material damage is topically uneven. It is a fragmented research area that lacks comprehensive application and interdisciplinary understanding due to the separation of research among the disciplines. The literature reflects a need for a more integrated approach to mitigating the factors that influence visitor-induced material degradation.

Conservation studies consider physical damage but do not address all the factors that cause the damage. Preservation and conservation theories and ethics surrounding significance, authenticity, and integrity are highly subjective despite the application of objective criteria. This makes approaches to managing impact more complicated. Management and interpretation literature address visitor impact but do not address material damage itself. Additionally, there is limited research on how all these systems
currently work together. How is damage related to visitor use of the site? Are there areas that are more accessible than others that minimize damage? Certain areas may have a lot of use, but they may have minimal damage. Less visible areas might have more damage because of a sense of safety or seclusion that visitors may feel. Is the damage concentrated in specific areas at most sites and how extensive is the damage? Do use, management, and interpretation factors weigh heavier at one site than another? As the literature highlights, the missing link in sustainable tourism is the correlation between a comprehensive understanding of use and damage.

2.5.2 Complexity of Ideals

The literature highlights complexities in value assessment as well as competing priorities from various fields. Shifting theoretical paradigms and approaches that site managers and preservationists consider when addressing visitor-induced material damage make it even more complex. Contemporary preservation and conservation literature discuss architectural and historic significance and integrity. However, they lack a specific formula or matrix to measure or quantify physical damage and then assess its value based on its historic significance. This is likely due, in part, to the inherent subjectivity and contextual nature of significance at each historic site. Significance is based on a multitude of factors including larger social, cultural, and political values. Additionally, threats to material integrity and site interpretation may affect the significance of a historic site.
An understating of ways to measure severity is necessary because damage to sacrificial or non-historic materials, while it may be materially severe and cosmetically unattractive, may not be as significant to the interpretation or use of the site as less intense damage on original materials. As in the case of graffiti, the amount of time that elapsed from when the damage occurred aids in the determination of its significance. Additionally, its association with the writer or its larger meaning within the context of the historic site affects its significance. As such, decisions to mitigate graffiti while also preserving historically significant graffiti are largely value-based. Furthermore, measurable loss to replacement material, such as a threshold, may be materially severe but not significant compared with damage to original plaster.

2.5.3 Varied Regional Emphasis

Lastly, most sources related to conservation and visitor-induced physical damage come from European perspectives. Despite growing concern about visitor impact, the lack of American literature and conservation studies that address the correlation of material degradation with site usage is a significant gap within the study of the built environment. Visitor impact studies at large archaeological sites such as Pompeii and Machu Pichu or at sites with greater visitation such as the Palace of Versailles and Windsor Castle make up much of the research. There is a need for a study at smaller locations such as American historic sites and structures because as the literature reflects visitor impact occurs even at sites with low annual visitation.
CHAPTER THREE
RESEARCH DESIGN AND METHODS

3.1 Case Study Research Design

3.1.1 Introduction

There are multiple methodological approaches to research design. Each approach has its advantages and disadvantages. Each is contingent upon the subject of inquiry, the purpose of the research, and the variables of interest to the researcher. The purpose of a case study approach, according to Robert Yin is to, “investigate a contemporary phenomenon in-depth within its real-world context, especially when the boundaries between phenomenon and context may not be evident” (Yin 2009, 1). Visitor impact is a contemporary phenomenon. The boundary between visitor-induced material damage and the factors of influence, such as use, interpretation, and management, often overlap and are not well-defined. Additionally, a case study methodology is a preferred approach when the primary research questions derive from the “how” and “why” components of inquiry (Yin 2009, 3). As there is little external control over visitor and management behavior and visitor impact occurs in a contemporary context, a case study is most the most appropriate methodology for the research (Yin 2009, 3).

Strengths of case study design are the ability to focus on multiple variables and to understand the occurrence of events in a holistic manner (Yin 2009). The ability to generalize to larger populations is a limitation of case study design. However, case
studies draw strength from abstracting to general theoretical propositions and often strengthen or deny theoretical propositions (Yin 2009). As Yin suggests, a case study methodology, “copes with the distinctive situation where there will be many more variables of interest than data points, relies on multiple sources of evidence with triangulating data, and benefits from the prior development of theoretical propositions for data collection and analysis” (Yin 2009, 5).

This study is an embedded single-case study design. It represents a critical test of visitor-induced material damage related to access and interpretation. Different types and sources of data collected and used favor a case study design. Yin suggests the strength of a case study is its “ability to deal with a full variety of evidence (Yin 2009, 8). Understanding visitor impact requires a multi-faceted approach, including direct observation, field research, archival research, interviews, and surveys. Additionally, since the physical boundaries of a historic site bound the extent of visitor impact and given that visitor impact is largely contextual and situational, a case study is the most appropriate approach (Creswell 2007, 73).

3.1.2 Thomas Jefferson’s Monticello as a Case Study

The case study location, Monticello, is a unique case in terms of visitation level and potential damage. Monticello receives an average of 450,000 to 500,000 annual visitors per year, making it one of the most visited historic houses in the United States. While physical damage does occur in sites with as few as 30,000 annual visitors, the
predominance of material damage and availability of immediately measurable evidence are more prevalent in this location compared to others with less visitation. Had the research relied on a longitudinal study, rather than a cross-sectional design, to observe damages over time, a location with fewer visitors would have sufficed.

Additionally, a singular case study was necessary for this research due to the number of contextual considerations to account for, including differences in materials, interpretation strategy, environmental conditions, and site policies. Multiple variables influence material damage such as environmental conditions, methods of construction, type of construction, etc. Policy varies widely between sites, as does the number of visitors and the interpretation and management strategies (i.e. non-profit, for-profit, private, and public). Given the nature of the research, the time necessary for data collection, multiple sources of evidence, and various context-dependent elements, a single case study was the preferred approach. However, while a single case bounds the research, there were multiple historic structures within the case for site analysis. Lastly, there exists an architectural and archaeological precedent for single case study design for visitor impact research, including research conducted at Pompeii and Machu Pichu (Wallace 2016; Comer et. Al, 2016; J. Paul Getty Trust, 2000). Based on the stated considerations for the case study design, Table 3.1 lists the required criteria used for the case selection.
Table 3.1. Site Selection Criteria

<table>
<thead>
<tr>
<th>Site Considerations</th>
<th>Architectural Considerations</th>
<th>Visitation Considerations</th>
<th>Accessibility Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allows for visitor movement through a larger site and a landscape.</td>
<td>Contains the survival of most of the original construction materials.</td>
<td>The site receives visitation at or over 500,000 individuals per year.</td>
<td>The site has professional connections with the researcher.</td>
</tr>
<tr>
<td>A historic site in the United States not primarily interpreted as an archaeological site.</td>
<td>Contains both masonry and wood-framed structures and finishes.</td>
<td>The site offers the availability of both docent-led and self-guided tours.</td>
<td>The site is located within the geographic proximity of the southeast.</td>
</tr>
<tr>
<td>The site contains an intact primary residential structure and related outbuildings.</td>
<td>Contains exposed interior and exterior architectural finishes.</td>
<td>The site is open year-round (except for selected holidays).</td>
<td>The site is a preservation-minded location.</td>
</tr>
<tr>
<td>The site is self-contained (not within a historic district or urban core).</td>
<td>The site has previously-identified or a history of visitor-induced material damage.</td>
<td>The site has been in operation as a historic site for more than 50 years.</td>
<td>The site is managed as a museum rather than an attraction.</td>
</tr>
<tr>
<td>This site is an original site and not a reconstruction.</td>
<td>Most finishes have not undergone extensive renovation or restoration in last five years.</td>
<td>Controlled access site with designated entry and exit locations.</td>
<td></td>
</tr>
</tbody>
</table>
In applying the site selection criteria, several locations identified as possible case study locations included the Paul Revere House and sites located along the Freedom Trail in Boston, MA; Independence Hall in Philadelphia, PA; George Washington’s Mount Vernon in Mount Vernon, VA; Colonial Williamsburg in Williamsburg, VA; Thomas Jefferson’s Monticello in Charlottesville, VA; the Biltmore House in Asheville, NC; Fort Sumter in Charleston, SC; and the Castillo de San Marcos, in St. Augustine, FL, see Figure 3.1.

The criteria exclude the locations in both Boston and Philadelphia. These historic sites located within an urban core and lack an exterior landscape with pathways to secondary structures. Mount Vernon has recently undergone extensive restoration and renovation of the exterior and interior of the primary structure reducing or removing visitor impact that was previously present. Despite receiving close to 500,000 annual visitors, Colonial Williamsburg’s most frequented structures, the Governor’s Palace and the Capitol building, are reconstructions. Additionally, the site landscape and pathways provide uncontrolled access to both paying visitors to city residents.
The Biltmore House in Asheville, NC provides, while consisting of ample grounds and an original primary structure, relies on activity or attraction-based management, with various alternative experiences including a restaurant and hotel, rather than museum-based management similar to how NPS-managed sites and other non-profit locations are. A museum-based approach allows researchers to draw conclusions to a wider range of places and landscapes. Lastly, both Fort Sumter and the Castillo de San Marcos predominately had only exposed masonry surfaces that are accessible to visitors and they generally lack enough exterior landscape area and secondary structures. While each of these sites has areas of visitor impact, based on the criteria, Thomas Jefferson’s Monticello met all the necessary selection qualifications.

3.1.3 Monticello Background and Current Conditions

Charlottesville, Virginia is the location of Monticello, home to Thomas Jefferson. Jefferson was the Nation’s third President, and he designed and constructed Monticello from 1769 until 1809 (see Figure 3.2). Monticello receives distinction as both a World Heritage site and as a National Register of Historic Places listed-property. The Monticello site consists of Jefferson’s house, multiple outbuildings, a cemetery, a visitor’s center, and historic gardens. 4

The primary structure is three-stories and twenty-one individual rooms. The iconic features of Monticello’s neoclassical styling include Doric columns on the east and west façades and a distinctive dome, which encapsulates the rotunda, projecting from
the upper story. Monticello has been open to visitors since 1923 when it purchased by the Thomas Jefferson Memorial Foundation (Monticello 2017). The interpretation of the site offers both docent-led and self-guided tours. Docents guide the tours within Jefferson’s house. Additional docent-led tours, including slavery and garden tours, are available to visitors as well. Visitors may also walk the grounds on a self-guided tour.

Previous research indicated several visitor impact issues present at Monticello (Bartlett 2013). Both direct and indirect damage is present within Jefferson’s house and along the exterior of the structure. Incidental and intentional direct impacts include abrasions to finished materials, evidence of wear and tear, and organic material build-up on surfaces.

Figure 3.2 View of the west façade of Monticello. Photo by author.
3.1.4 Research Questions

The research questions consist of two primary research questions and five secondary research questions. The primary questions guide the overall research methodology, while the secondary research questions aim to capture specific dimensions and variables of the primary research questions. The secondary questions draw from the literature and theoretical foundations related to site usage, management, and interpretation.

Primary research questions:

1) How does visitor-induced material damage correlate with the patterns of use and access of individual visitors at Monticello?
2) How, or to what degree, do management and interpretation strategies affect the actions of individual visitors as it relates to material degradation at Monticello?

Secondary research questions:

1) What is the degree of physical damage along the visitor path at Monticello?
2) How often does physical damage occur along the visitor path at Monticello?
3) Which areas of the site are most crowded or frequently used?
4) What is the average amount of time that visitors spend in a location?
5) How often do visitors engage in depreciative behavior?
3.1.5 Explanatory Propositions

Research indicates that visitors do have measurable and sustained physical impacts on historic structures and materials. Site experience is different for everyone. Behavior and visitor expectations affect how visitors interact with a site but also affect site management (Falk and Dierking 1992, 25). This relativistic view of human behavior explains the unpredictability of visitor behavior. Visitors have various experiences, backgrounds, and values (i.e. preexisting knowledge, tactile curiosity) that influence the way they behave at a site (Falk and Dierking 1992, 25). However, studies show that visitors often behave in predictable patterns within a museum environment, such as favoring pathways to the right or becoming fatigued at the end of a tour (Melton 1935; Gilman 1916).

Additionally, the General Value Principle, as stated by Stephen Bitgood, “predicts choice behaviors as a ratio of perceived experience divided by perceived costs” (Bitgood 2006). This theory or principle helps to explain the individual actions of visitors and their desire for stimulation in a museum environment with perceived costs of deprecative behavior. Based on these theories and principles, the research lends itself to the proposition that areas of congestion and physical location may play a role in the type of damage present. Spaces with higher density and greater periods of visitation may likely favor more incidental damage. Areas that are less crowded and more secluded may potentially favor more intentional damage, such as vandalism, due to the visitor feeling more secure as explained by variances in behavior and the General Value Principle.
In the 1950s, writer Freeman Tilden created a concept of interpretation to influence visitor behavior at national parks. While some parks and historic sites revered the visitor as sovereign (in that guides cannot tell visitors what to think about a site), Tilden suggested that interpretation does have to guide visitors on how to think about a space as well as how to interact with it (i.e. expected norms of behavior) (Tilden 1957). Although not stated as a specific theory, the theoretical notions related to the sovereign visitor and education, is a guiding principle in site interpretation. Additionally, current theory related to visitor-induced material degradation suggests that most damage comes from overcrowding and inappropriate management (Wallace 2012, 133). Based on these theoretical propositions it is possible that the case study may highlight a relationship between increased counts of material damage in those areas popularized or promoted by interpretation strategies (such as guides and signage). These strategies may also influence the type and degree of material damage as well. Specific interpretation language and reference to visitor impact and/or normative behaviors within the interpretation strategies could potentially result in lower counts of material damage or less intentional damage.

3.1.6 Units of Analysis

The general research strategy was a single case study with the overall unit of analysis at the site level and embedded units of analysis at the individual visitor, travel party, location, and interpretation levels. While visitors travel through the site either on
their own or with a group (i.e. school group, class, etc.), behavior and actions are as an individual unit, but travel parties may also influence the use of a site. Additionally, the individual visitor may make individual choices about their actions, but an interpretation strategy may also influence their actions (Kaplan et. Al 1998). Additionally, the multiple locations within the site which are emblematic of various levels of damage and use were part of the analysis. The observed location, Monticello, bounded the case.

3.2 Data Collection Strategy

3.2.1 Structure of Relationships

The understanding of visitor impact at historic sites presupposes a systemic relationship between visitor and historic site. Externally, both the individual visitor and the historic site can exist without each in the physical world, but they have an asymmetrical context specific relationship to each other. A site can be historic without having visitors. However, the necessary internal relationship between the two presupposes the site is historic in nature as defined by social and cultural values of historic significance and importance. Without these values, a structure may exist in the physical world, but individuals and society would not consider it historic and thus there would be no relationship with visitors. The existence of a historic site can change as values shift and are not concrete. The overall external relationship between visitors and historic sites presupposes that this internal relationship is already in place.
More narrowly, the specific aspect of the relationship between visitor and historic site, as it relates to visitor impact, is visitor-induced material damage and use. The relationship between visitor-induced material damage and visitor use is dependent on several internal or necessary relationships as well. The necessary internal relationship is a physical interaction between visitors and materials. Physical interaction can be both direct and indirect, such as physical abrasions or temperature and humidity increases. However, without this interaction, the relationship does not exist, but it is also asymmetrical given several conditions. The existence of the visitor-induced damage presupposes there is visitor use, but visitor use does not necessarily lead to damage. The definition of physical damage also presupposes a measurable and observable scale of an impact as some argue that any interaction with visitors leads to a material change. For the purposes of this research, the physical impact depends on the understanding that there can be both measures of no physical damage and physical damage.

Externally, the relationship between damage and use is dependent upon usage by the visitor as controlled through individual actions such as their travel path through a historic site, the usage of the visitor as controlled or influenced by management decisions, and the usage of the visitor as control by interpretation strategies. These relationships all influence the way visitors use a historic site, which may lead to, or even prevent, physical damage.
3.2.2 Concepts, Dimensions, Variables, and Measures

Site usage, management, and interpretation are three key concepts fundamental to understanding visitor-induced material degradation. Table 3.2 lists dimensions and specific variables measured by the proposed research. Regarding site use, dimensions related to material damage come from historic preservation and materials conservation literature. Levels of intervention and the assessed value of visitor impact vary between historic sites. The historic associations and levels of determined significance of a cultural heritage site affect the evaluation of the severity of material degradation but also any potential solutions for the mitigation of such (Morton and Hume 1976; NPS 1997; and Hoagland 1997). The amount of physical damage and the degree or extent of that damage is based on a rating scale measuring the dimensions of physical damage and damage value.

Concepts of congestion and popularity come from site management and relate to where visitors have access to and where they spend their time. Congestion and popularity derive from literature related to GPS tracking of visitors in the natural environment and national parks. Density per square foot and time spent in a location measure the dimensions of congestion and popularity (Becco et. Al. 2012; Beeco, Hallo et Al. 2005; Hallo et Al. 2012; Becco et. Al. 2014).

Concepts of interpretation and management regarding depreciative behavioral observation and quantification generally derive from museum and interpretation studies (Tilden 1957; Kaplan et. Al 1998; Bitgood 2006). The count of intentional impacts
and mentions or warnings about visitor behavioral expectations and visitor impacts within the available interpretation literature or site postings measure the dimension of personal choice.

### Table 3.2 Dimensions, Variables, and Measurements

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Variable</th>
<th>Measurement</th>
<th>Type of Data</th>
<th>Collection Method</th>
<th>Collection Instrument</th>
<th>Method of Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage Severity</td>
<td>Degree of Physical Damage</td>
<td>Rating Scale (1-4) for the degree of damage. (Minimal to Severe)</td>
<td>Observational and Archival</td>
<td>Archival Research, Conditions Assessment, GPS Visitor Tracking, Time-lapsed videography</td>
<td>Field Notes; ESRI Collector</td>
<td>ArcGIS Spatial Analysis, Qualtrics Heatmapping, and Pattern Matching</td>
</tr>
<tr>
<td>Damage</td>
<td>Amount of Physical Damage</td>
<td>Counts of Physical Damage</td>
<td>Observational and Archival</td>
<td>Archival Research, Conditions Assessment, Key Interviews</td>
<td>Field Notes; ESRI Collector</td>
<td>ArcGIS Spatial Analysis, Behavior Mapping with Timelapse2, Qualtrics Heatmapping, Pattern Matching</td>
</tr>
<tr>
<td>Congestion</td>
<td>Density</td>
<td>Number of Travel Parties in a Geographic Location per Square Foot</td>
<td>Observational Field Data and Survey</td>
<td>Conditions Assessment</td>
<td>GPS Data Loggers; time-lapsed video; Qualtrics</td>
<td>ArcGIS Spatial Analysis</td>
</tr>
<tr>
<td>Popularity</td>
<td>Time in Location</td>
<td>Average Time in Minutes and Seconds</td>
<td>Observational Field Data</td>
<td>Conditions Assessment, Participant Observation, Time-lapsed videography</td>
<td>GPS Data Loggers; time-lapsed video</td>
<td>ArcGIS Spatial Analysis</td>
</tr>
<tr>
<td>Personal Choice</td>
<td>Impacts</td>
<td>Hourly count of observed impact-inducing behavior</td>
<td>Observational and Key Interviews</td>
<td>GPS Visitor Tracking, Participant Observation, Time-lapsed videography, and Exit Survey</td>
<td>Time-lapsed videos and field notes</td>
<td>Behavior Mapping with Timelapse2, Qualtrics Heatmapping, and Pattern Matching</td>
</tr>
</tbody>
</table>

82
3.2.3 Evidence Collected

Visitor use and associated material damage is a confluence of multiple factors and thus the scope of evidence collected for the case study was multi-layered. The types of evidence included the examination of physical artifacts (the physical buildings); documentary evidence (administrative documents, formal studies related to impact, interpretation aids); archival records (organization records, conservation records, site maps, floor plans); interview data from staff; direct observation data on visitor behavior (location, areas of congestion, contact with materials); and a visitor exit survey.

Documentary evidence provided insight into management protocols and decisions affecting access (i.e. any limitations on visitors, types of tours, etc.). Archival records obtained on site include conservation reports to determine where areas of repair are and if some have been more susceptible to damage, sitemaps and floor plans of buildings assist with the examination of the physical artifacts and are necessary to understand the potential visitor path. Direct observation data assisted with determining the visitor path, how long visitors spent in pre-determined locations, areas of congestion, and behavioral observations on contact with materials. Interviews with conservation and management staff were necessary to understand areas of common repair, previous material damage, and observed previous behavior. A visitor exit survey helped to understand and correlate the observational data of where individuals went, what they wanted to see, and if they engaged in or witnessed depreciative behavior or if they were curious about particular areas of the site.
3.2.4 Data Collection Instruments

The research methodology used an explanatory sequential mixed method design that relied on two phases of data collection procedures approved through Clemson University’s Institutional Review Board (IRB). This design drew from a mixed methods approach but used multiple sequences of data gathering to explain the phenomenon of visitor impact. Relying on a combination of material science and social science research methods, the phased design consisted of identification and explanatory phases. Phase 1, the identification phase, consisted of a field conditions assessment and archival document research along with interviews with key Monticello staff. Phase 2, the explanatory phase, consisted of a series of direct observations and visitor exit survey, followed by expert review of findings with key Monticello staff. The following is a summation of the various collection instruments. The proceeding design sections expand the protocols for data collection and analysis for each method.

The examination of the physical artifacts (i.e. the building) was the first method of data collection employed since it guided the locations of other data collected during observation. This included a materials conservation assessment of the site noting where damage is, the type and extent, and other rival explanations for the appearance of damage (i.e. weather, poor materials, and poor construction). Documentary evidence and archival reports collected on site came from the available research archives at Monticello as well as some available scholarly reports on visitation, material damage, and conservation efforts at the site.
Secondly, the research relied on semi-structured interviews conducted with key conservation and management staff. Four qualitative interviews conducted with staff included conservation and management staff from the Restoration, Curatorial, and Historic Facilities department and management staff and guides from guest services and education. The title and name of the interviewees were changed during data coding and analysis to anonymous identifiers such as "Interview A, Interview B, and so forth" to remove any personally identifiable information. The interviews were between 30 minutes and one-hour long in length and guided by a questionnaire approved by Clemson University’s Institutional Review Board.

The research also conducted direct observation of visitors in two ways: 1) GPS trackers randomly assigned to visitors and 2) time-lapsed videography and direct observation of visitor behavior in predetermined locations that recorded specific habits and actions while in the space (touching wall surfaces, sitting on objects, leaning against materials) and whether it is intentional (deliberate action) or incidental (accidentally bumping into something or holding a handrail for balance). Exit surveys administered to visitors who received GPS location trackers, upon their return of the tracker and exit from the site, aid in analyzing the chosen pathways of visitors. Lastly, an expert witness review conducted with the previously interviewed key management staff allowed for validation and verification of the findings.
3.3 Phase 1: Field Conditions Assessment, Archival Review, and Interviews

3.3.1 Field Conditions Assessment Protocol

There are no set guidelines for a visitor impact materials conditions assessment report. However, there are general guidelines and practices for architectural documentation and building pathology as recommended by the National Park Service and National Center for Preservation Training and Technology (see Table 3.3) (NCPTT 2010). The field conditions assessment relied on a similar approach to those guidelines. The assessment of each structure proceeded with an examination of the foundation for material damage, external walls materials and finishes, internal wall materials and finishes, decorative finishes, and surrounding site features.

<table>
<thead>
<tr>
<th>Damage Rating</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Superficial</td>
<td>Very little surface stains or soiling, no loss to materials</td>
</tr>
<tr>
<td>2</td>
<td>Minor – Some damage, still functional</td>
<td>Noticeable paint loss, worn surfaces, minor soiling</td>
</tr>
<tr>
<td>3</td>
<td>Moderate – Still functional, requires intervention to remove/repair</td>
<td>Mold, mildew, surfaces worn to substrate, heavy soiling, missing elements of materials, vandalism or graffiti, heavily worn pathways</td>
</tr>
<tr>
<td>4</td>
<td>Severe/Substantial – Significant Damage, function impaired</td>
<td>Severe structural damage, requires closing of areas, collapse, replacement of materials, severe landscape damage</td>
</tr>
</tbody>
</table>

Table 3.3 Field Conditions Assessment Guide. Adapted from National Center for Preservation Training and Technology’s (NCPTT) “Rapid Building and Site Condition Assessment” (2005).
Figure 3.3 Examples of visitor impact related damages. Superficial damages (top left); minor damages (top right); moderate damages (bottom left); and substantial/severe damages (bottom right).
The assessment began with the primary house and then moved clockwise around the site to secondary structures and the surrounding site features and landscape. The research examined only areas accessible to visitors. The assessment was not necessary for areas not part of a tour or open for access such as storage or staff areas. This also includes rooms closed for preservation. The assessment recorded the damage location, type, and intensity (a measurement of damage height and width wear applicable). A rating scale of 1 to 4, with one being minimal and four being the most severe assessed the severity of the damage. A pilot study tested the rating scale developed and verified by general practice and in consultation with the site architectural conservator.

The conditions assessment included the use of photographs and field notes maintained in an ESRI ArcGIS Collector application. The advantages of using the Collector application included real-time tracking of conditions and exportable functions of data to ArcGIS or Microsoft Excel. The recorded data included the following:

1) Data and time of assessment
2) Location (Building, interior/exterior, surface: wall, floor, foundation)
3) Material type (masonry, plaster, wood, other)
4) Type of damage (abrasion, material build-up, vandalism, other)
5) Measurement of damage (width, height, depth)
6) New or original materials
7) Evidence of previous repairs
8) Notation of any mitigation methods in place (Plexiglas, formed metal, other)
3.3.2 Archival Data Collection

The archival data collection included a review of the administrative documents, as available, from the on-site archives at Monticello and literary journal. Reviewed documents included historical reports on restoration and preservation activities of the primary structure, associated outbuildings, and landscape. Additional documentation included visitation reports, conservation efforts, and documents related to interpretation strategy. Archival records such as organizational records, sitemaps, and floor plans guided the interpretation of the conditions assessment and ruled rival explanations for material damage.

3.4 Key Staff Interviews

3.4.1 Identification of Key Staff

Interviews with key staff members conservation and management staff from the Restoration, Curatorial, and Historic Facilities department and management staff and guides from guest services and education. The primary purpose of these interviews was to corroborate or validate findings (Yin 2009). Three types of questions covered basic demographic and background experiences at other locations/history with damage, present experience, and mitigation practices/policies. The members of the conservation and management staff from the Restoration, Curatorial, and Historic Facilities department are the persons most familiar with the materials and the conditions of the buildings. Often conservators do not record or document daily or routine maintenance
that does not involve a large undertaking. The interviews offered insight into the how often staff noticed damage, levels of repairs, frequent locations of damage, plans to manage the damage, and the location and identification of historic materials. The interviews were key to validate the findings of the conditions assessment. Additionally, staff from guest services and education provided information related to interpretation strategy, tour updates, and interpretation methods used to mitigate damage in any way. Lastly, selected interviews with docents served to provide insight into where they commonly observe depreciative behavior, what type of behaviors they observe, how often they witness certain behavior, and efforts or policies to mitigate depreciative behavior that incorporated in docent training programs.

3.4.2 Interview Protocol

The research includes a semi-structured interview format with a set of general questions, approved by Clemson University’s Institutional Review Board, conducted with each key informant. Interviews were between 30 minutes and one-hour long and the interviewer recorded data using a recording device and field notes. The interviewer recorded, transcribed, and analyzed each interview for content using MAXQDA analytic software. Table 3.4 lists example question wording for each interview.
<table>
<thead>
<tr>
<th><strong>Key Staff Member</strong></th>
<th><strong>Example Question Wording</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation and management staff</td>
<td>• Which areas do you commonly observe with damage?</td>
</tr>
<tr>
<td></td>
<td>• What mitigation efforts does Monticello take to mitigate the damage?</td>
</tr>
<tr>
<td></td>
<td>• How often is damage repaired and what repairs has Monticello completed previously?</td>
</tr>
<tr>
<td></td>
<td>• How often are conditions assessments complete?</td>
</tr>
<tr>
<td></td>
<td>• Have you ever witnessed a visitor engaged in depreciative behavior?</td>
</tr>
<tr>
<td>Head of guest services and/or interpretation</td>
<td>• What is the general interpretation strategy for the site?</td>
</tr>
<tr>
<td></td>
<td>• Do strategies vary by tour?</td>
</tr>
<tr>
<td></td>
<td>• How often are tours updated?</td>
</tr>
<tr>
<td></td>
<td>• Are interpretation strategies used to mitigate damage in any way?</td>
</tr>
<tr>
<td>Docents/Staff</td>
<td>• Have you ever witnessed a visitor engaged in depreciative behavior?</td>
</tr>
<tr>
<td></td>
<td>• Where is depreciative behavior commonly observed?</td>
</tr>
<tr>
<td></td>
<td>• How often is depreciative behavior observed?</td>
</tr>
<tr>
<td></td>
<td>• Are there efforts or policies in place to mitigate depreciative behavior? (i.e. removal from the site)</td>
</tr>
</tbody>
</table>
3.5 Phase 2: Observations, Survey, and Expert Review

3.5.1 GPS Visitor Tracking (GVT)

A common method for data collection of visitors use patterns for spatial and temporal analysis has been with the collection of data using GPS receivers. Studies show that there is a variation in the type of receiver used as well as the location of study, but primarily most studies rely on similar methods and protocols for sampling and distribution of units to participants. Methods include a predetermined sampling procedure based on visitor statistics, generally the assigning of a GPS data logger to a visitor or travel party, and then collecting the unit for analysis for geospatial patterns (D'Antonio and Monz, 2010; Wolf et al., 2013; Beeco et al., 2014: and Kidd et al., 2015).

Both active and stationary visitor observations provide triangulation of behavioral data and spatial movement patterns. Active observations include GPS Visitor Tracking (Beeco, et al., 2014) and direct tour behavior observations. Due to the distortion of GPS signal inside the primary structure, stationary visitor observations using time-lapse videography countered signal loss.

For a representative sample, the researcher intercepted visitors at a single entry point, the Monticello visitor’s center (see Figure 3.4). The researcher predetermined the interception location based on consultation with Monticello staff as the prime location to capture visitors entering and exiting the site. This allowed for capturing the greatest sampling of the population as well as ensuring the return of the GPS tracking units.
Using a random probability sampling method, the researcher approached the first visitor who entered the visitor’s center at fifteen-minute intervals between the hours of 8:30 am until 5:00 pm based on a use level ratio for the sampling day (Singleton and Straits 2010). Sampling stratification also occurred by day of the week and time of day to ensure representativeness (Singleton and Straits 2010). The sampling period was 21 days over a period of three months to account for variation in weather, visitor levels, and unanticipated closings as well as to reduce cost and travel. The data collection period occurred in the late summer/high fall season, avoiding major holidays.

During data collection, the researcher approached 242 individual sets of visitor travel parties. Of those approached, 240 parties agreed to participate in the study by voluntarily carrying a GPS unit during their trip to Monticello. This yielded a 99.17% response rate, 95% CI [98.03, 100.31]. With the response rate, sample size, and the confidence intervals considered, the sample is a strong representative of the high summer/early fall visitor population to Monticello.
Prior to beginning, the researcher gauged the participant’s interests in the study, informed the participants about the purpose of the study, and asked one member from each travel party (randomized by the most recent birthday) to participate. The researcher followed a recruitment script approved by Clemson University’s IRB which also obtained verbal consent from the participant. The visitor received one GPS data logger configured for the study. The GPS data loggers had a unique identifier and required no technical expertise or operation by study participants. Respondents returned the GPS data logger to the researcher when they left the site and the researcher destroyed identifying information upon the unit’s return.

The Canmore GPS Route Logger: Canmore GT-740FL, used for this study, recorded interval GPS locations as a waypoint every 15 seconds for intermittent data collection (Figure 3.5). The units were optimal because they did not have an LCD Interface that the participant could modify and had low power consumption. The GPS data loggers allowed an understanding of visitor travel patterns, density patterns, locations visited, and time spent in locations. The researcher downloaded the data upon completion of the collection and did not track in visitor movements around the site in real time. The individual data files or visitor paths combined into one dataset to evaluate overall visitor travel patterns and
density. While a visitor exit survey connected with the GPS data via a unique identifier, no personal information, such as the visitor’s name, address, phone number, or email was present on the exit survey. All responses were anonymous and participation by the selected respondents was voluntary.

3.5.2 Direct Observation

Direct observation of visitor behavior in predetermined locations allowed for the recording of specific actions and depreciative behavior. Examples of observed behavior included contact with architectural materials such as touching, sitting, or leaning and whether it is intentional (deliberate action) or incidental. The researcher participated in selected tours and observed actions along the site’s visitor path. Observation of the visitor path also occurred via motion-triggered video capture conducted inside the house that occurred every other day for one hour between 9:00 am and 1:00 pm and one hour between 1:00 pm and 5:00 pm. Varying the observation period allowed for the observation of potentially different behaviors. The observer used field notes to record types and frequencies of incidents observed and analyzed them using Timelapse2 image analyzing software and Qualtrics analytical software.

3.5.3 Motion-Triggered Videography

Motion-triggered videography using a Moultrie M-888 Trail Camera or similar model recorded visitor observations within the main structure and along Mulberry Row.
The conditions assessment of the site and consultation with site managers determined the selection points for the installation of the cameras. The selected locations included areas of the greatest concentration or degree of damage as well as locations where camera placement was possible (i.e. locations where cameras position did not require the use of a tripod or interfere with curatorial objects). The four recorded locations within the house included the entry hall, the south square, the Jefferson bedchamber, and the north square (see Figure 3.6).

The researcher programmed the cameras to record during the days of the week that coincided with GPS data logger distribution beginning at 9:00 a.m. and ending at 5:00 p.m. This also aided in the triangulation of data points within the main building to account for lost GPS signal with the data loggers. Visitor activity triggered the cameras which automatically began recording for a 15-second time-frame. Cameras recorded activity in public areas within the structure and exterior landscape where there was no reasonable expectation of privacy.
Figure 3.6 Motion camera locations. Entry Hall (top left); South Square (top right); Jefferson Bedroom (bottom right); and North Octagon (bottom left).
3.5.4 Exit Survey

The last method to record visitor movements involved the use of an exit survey. The researcher administered an exit survey to visitors using the GPS data loggers after the unit’s return. The survey measured and corroborated visitor movements during the use of the data logger. Questions reflected demographic information, geographic travel, and visitor observations while on respective tours. Qualtrics software on an electronic tablet device delivered the survey which took no more than five minutes to administer. Question guidelines and construction relied on formatting guidelines suggested by Dillman (2014) and included both closed and open-ended questions. Table 3.4 features the type of questions included in the exit survey. The researcher included a copy of the survey instrument, approved through Clemson University’s Institutional Review Board (IRB), as an appendix to the study.

<table>
<thead>
<tr>
<th>Category</th>
<th>Example Question Wording</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic Information</td>
<td>• How old are you?&lt;br&gt;• Is this your first-time visiting Monticello?&lt;br&gt;• How many times have you visited previously?&lt;br&gt;• How many times during the year do you visit historic sites in general?</td>
</tr>
<tr>
<td>Geographic Travel Information</td>
<td>• Please select the location where you spent the most amount of time during your tour today.&lt;br&gt;• Please select the location where you spend the least amount of time today.&lt;br&gt;• Which tour or tours did you participate in?&lt;br&gt;• Did tour the site as part of a docent-led tour or a self-guided tour?</td>
</tr>
<tr>
<td>Behavioral Observations</td>
<td>• During your tour did you notice any physical damage to the buildings or grounds?&lt;br&gt;• What type of damage did you observe?&lt;br&gt;• Did you observe anyone engaged in depreciative behavior (i.e. touching objects or going in restricted areas)?</td>
</tr>
</tbody>
</table>
3.5.5 Expert Review

The final phase of data collection consisted of an expert review conducted with the previously interviewed key management staff. Staff reviewed data analysis and results to allow for validation and verification of the findings. After a review of the findings, staff participated in individual semi-structured interviews. The interviews consisted of questions related to staff thoughts about the findings, if the results were what they expected or different from what they commonly observe or know about visitor impact at the site, and general thoughts about the damage. The researcher recorded discussion data using a digital recording device and field notes. A copy of the interview protocol instrument, approved by Clemson University’s Institutional Review Board (IRB), is an appendix to the study.

3.6 Data Analysis

Case study research uses a variety of data and collection methods to get a holistic understanding of a phenomenon (Yin 2009). The depth and quantity of the data collected require several methods for data analysis including thematic coding, pattern matching, and spatial analysis. However, the general strategy for data analysis relies on the data’s relationship, as previously discussed, to established theoretical propositions (Yin 2009, 130). The analysis relied on the use of both qualitative data analysis software and spatial data mapping to identify patterns of use and material damage. MAXQDA qualitative software allowed for the analysis of documentary and archival data using
memos, and on-going analysis. Transcription, thematic coding, and memos analyzed interviews conducted with staff and visitors to look for patterns or themes of behavior as it relates to physical damage. This included behavior related to interpretation strategy, promoted areas, signage, and messaging. Sample deductive categories for analysis included mentions of visitor impact, damage, and notes of previous repairs.

The analysis of the physical artifacts (i.e. the buildings) included an immediate coding of the conditions assessment using ESRI Collector and ArcGIS. A map of the observed damage using ArcGIS overlaid with the observational data obtained via GPS data loggers. ArcGIS functions cleaned visitor GPS data to verify the distance between point readings, acceptable levels of error, and to ensure recorded points match consistency with human behavior. ArcGIS allowed for density mapping and linger activities analysis using spatial modeling. The ArcCatalog function of ArcMap organized visitor path characteristics such as day of travel and size of travel party, while point and line density functions in ArcMap determined the density of the tracks by the time of day.

Qualtrics analytical software exported to Excel for allowed for analysis with MAXQDA and hotspot correlation with ArcGIS heat and density mapping. Observation of behavior and linger activities immediately analyzed through the coding field notes and memos assisted with identifying themes and patterns of behavior. Lastly, Timelapse2: Image Analyzer allowed for behavior mapping and content analysis using MAXQDA. The potential drawback to the image analysis is that it did not record discussion (i.e.
perhaps other visitors or docents telling people not to touch things, etc.). However, direct tour observations capture this data. Once constructed, the spatial layers of the physical conditions, along with the layers for use (density and linger time), pattern matching assisted with identifying spatial patterns of behavior and correlating them with observed physical damage or the lack thereof (Yin 2009, 102).

3.7 Threats to Validity and Reliability

3.7.1 Construct Validity

According to Yin (2009) using multiple sources of evidence (triangulation), establishing a reliable chain of evidence, and using key information or experts review the data and analysis assist with countering threats to construct validity when the data does not accurately measure the concepts of the research. For this study, the research relies on multiple sources of evidence for data triangulation (GPS tracking, IR, and observational) and to determine patterns of use. Additionally, documentary and archival evidence combined with interviews aid in determining the effects of interpretation on visitor use. The use of key informants, including conservation staff validates documentary, archival, artifact inspection used for the materials conservation assessment. Lastly, MAXQDA qualitative analysis software maintains a chain of evidence including field notes and documents.
3.7.2 Internal Validity

Pattern matching between the multiple sources of evidence interviews and rival explanations for material damage ruled out during the conditions assessment ensured that the case study was internally valid (Yin 2009). Architectural materials may deteriorate or fail for a variety of reason unrelated to visitor impact and contact. This includes inherent failures in the material, such as a soft or under-fired brick susceptible to efflorescence and moisture infiltration. Materials failures because of inappropriate construction, such as water infiltrations and the development of corrosion leading to spalling of concrete can occur. The materials conservation assessment of the site noting where damage is, the type and extent, and other explanations for the appearance of damage (i.e. weather, poor materials, and poor construction) assisted with ruling out rival explanations for the physical damage. Additionally, the selection of visitors for GPS tracking and the observation period ran concurrently during a time (i.e. late summer/high fall) that avoided major holidays or other special events likely to influence the type and number of average daily visitors.

3.7.3 External Validity

The external validity of research rests on how well the findings are applicable to other study populations or groups (Yin 2009, 48). External validity is often a problem with case studies, and more so with single case study designs. However, while a case study design may not draw generalizations to a larger population, it does have the
benefit of supporting the application of established theoretical principles. While case studies cannot predict behaviors, the results can demonstrate a theoretical understanding of visitor impact, in that the issues that are occurring at Monticello can form or support existing theory on visitor behavior and material degradation at other historic sites.

This study was based on a single case design. To be externally valid it abstracted to a theoretical understanding of visitor behavior at historic sites. This included understanding the correlation between use and theoretical underpinnings of interpretation strategies and management principles. For example, the principle of the sovereign visitor and education (Tilden 1957), the General Value Principle (Bitgood 2006), and theories related to the nature and influence of restorative environments (Kaplan et al., 1998) explain how environments affect individual actions. The General Value Principle (Bitgood 2006) explains the individual actions of visitors and their desire for stimulation in a museum environment with perceived costs of depreciative behavior.

Theories from environmental psychology suggest that surroundings may influence visitor behavior and explain why some depreciative behavior occurs as well as interpretation strategies that can influence it (Kaplan et al., 1998). The success of a case study design rests on how well the existing theories apply to the findings and whether the analytic propositions support the research (Yin 2009, 41). Enhanced by the case studies findings, the research can help corroborate, advance, or reject existing theoretical concepts (Yin 2009, 41).
3.7.4 Reliability

The goal of reliable research is to minimize bias and allow for replication of results. Since inherent bias exists within researcher and design, attempts taken to minimize the influence of that bias on the methods and analysis of the data included a defined case study protocol and maintaining a chain of evidence. The use of a case study protocol with defined methods for data gathering and analysis allows for testing of the operations at different historic sites. Full documentation of research procedures and protocols also documents the chain of evidence collected and analyzed.

3.8 Pilot Study

3.8.1 Testing

Prior to data collection and testing at Monticello, a pilot study completed at the John C. Calhoun house on the Clemson University campus assisted with testing and refining methods of data collection. While much lower in visitation levels and smaller in geographic size than Monticello, this location allowed for the testing of the GPS tracker signals within the site, the time of waypoint recording, testing of the protocols for participant selection, and the review of the clarity of questions in the exit survey. Additionally, the Calhoun house consisted of the main house, outbuilding, and a landscape for visitors to traverse allowing for testing of the GPS trackers under multiple contextual conditions.
3.8.2 Adjustments to the Methodology

The pilot study confirmed the methods employed worked to assess both visitor use and physical damage. Figure 3.7 displays images showing the overlay of the visitor path (blue and orange arrows), the location of identified damages (orange dots), and the geographic hot spots of damage-inducing behavior derived from camera units. The pilot study determined that the recording of 15-second waypoints was more useful in analyzing patterns than 5 second GPS waypoint, which created too much spatial noise during analysis. Additionally, several questions on the exit survey were repetitive and answered by other questions elsewhere in the survey. The proceeding research took into account the changes from the pilot study and adjusted the methodology accordingly.
Figure 3.7 Floorplan overlays showing visitor path and identified damages (orange dots) (top) and density map of damage-induced behavior (bottom).
CHAPTER 4

RESEARCH FINDINGS PART I

4.1 Introduction

The purpose of this research was to understand the relationship between material damage and visitor use and access at Monticello. The primary goals were to identify issues that could increase the risk of visitor impact and recommend improvements to reduce risks and aid with site sustainability. The research findings derived from two primary research questions and five secondary questions which guided the data collection and analysis. A variety of methods assisted with capturing various dimensions and variables of the two primary research questions. Table 4.1 lists the methods employed for data collection and analysis.

The research methodology used a sequential mixed methods approach. Part I of the research findings derives from the conditions assessment and key staff interviews. The conditions assessment encompassed the entire Monticello site including all buildings and landscape features that are part of the historic mountaintop area. The conditions assessment focused on material damages resultant of visitor impact and not those related to inherent material failures, environmental issues, or other non-human induced damages. Part II of data collection involved a geographic behavioral analysis to determine where visitors traveled while visiting Monticello, which areas of the site
demonstrated the highest levels of usage, and how often and where direct contact with finishes and architectural materials occurred with the first floor of Jefferson’s house.

### Table 4.1. Research Questions and Methods of Analysis

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Collection Method</th>
<th>Method of Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Research Question 1</strong>&lt;br&gt;How does visitor-induced material damage correlate with the patterns of use and access of individual visitors at a historic site?</td>
<td>Archival Research, Conditions Assessment, GPS Visitor Tracking, Participant Observation, Time-lapsed videography</td>
<td>ArcGIS Spatial Analysis, Pattern Matching, and Theoretical Propositions</td>
</tr>
<tr>
<td><strong>Primary Research Question 2</strong>&lt;br&gt;How, or to what degree, do management and interpretation strategies affect the actions of individual visitors as they relate to material degradation?</td>
<td>Archival Research, Conditions Assessment, Key Interviews</td>
<td>ArcGIS Spatial Analysis, Pattern Matching, and Theoretical Propositions</td>
</tr>
<tr>
<td><strong>Secondary Research Question 1</strong>&lt;br&gt;What is the degree of physical damage along the visitor path at Monticello?</td>
<td>Conditions Assessment</td>
<td>ArcGIS Spatial Analysis, Qualtrics Heatmapping, and Pattern Matching</td>
</tr>
<tr>
<td><strong>Secondary Research Question 2</strong>&lt;br&gt;How often does physical damage occur along the visitor path at Monticello?</td>
<td>Conditions Assessment, Participant Observation, Time-lapsed videography</td>
<td>ArcGIS Spatial Analysis, Behavior Mapping with Timelapse2, Qualtrics Heatmapping, Pattern Matching</td>
</tr>
<tr>
<td><strong>Secondary Research Question 3</strong>&lt;br&gt;Which areas of the site are most frequently used?</td>
<td>GPS Visitor Tracking, Participant Observation, Time-lapsed videography, and Exit Survey</td>
<td>ArcGIS Spatial Analysis</td>
</tr>
<tr>
<td><strong>Secondary Research Question 4</strong>&lt;br&gt;What is the average amount of time visitors spend in a location?</td>
<td>GPS Visitor Tracking</td>
<td>ArcGIS Spatial Analysis</td>
</tr>
<tr>
<td><strong>Secondary Research Question 5</strong>&lt;br&gt;How often do visitors engage in depreciative behavior?</td>
<td>Participant Observation and Time-lapsed videography</td>
<td>Behavior Mapping with Timelapse2, Qualtrics Heatmapping, and Pattern Matching</td>
</tr>
</tbody>
</table>
4.2 Monticello and Site Context

4.2.1 Monticello Brief Background

Monticello sits atop a mountain in Charlottesville, VA and was the home of Thomas Jefferson, third President of the United States and author of the Declaration of Independence. Jefferson retired to Monticello in 1809 and resided there until his death in 1826 (Leepson 2001:3). Construction of the Monticello site began in 1768, prior to Jefferson’s presidency, with the clearing and preparation of the land. Construction of Jefferson’s initial design for Monticello, which had several iterations, began in 1769 (Figure 4.1) (Leepson 2001:8). Upon completion of the present iteration, Monticello consisted of the main house (Monticello), two wings or pavilions to the north and south, and Mulberry Row which contained the outbuildings of the servant’s working and living

Figure 4.1 West façade of Monticello. Photo by author.
areas. Terraced vegetable gardens, flower gardens, orchards, and seven rotating crop fields all made up the Monticello estate (Leepson 2001).

Following a series of poor investments, extravagant spending, and, like George Washington, the cost of hosting visitors and family among other expenditures, Jefferson was under a mounting financial burden. Jefferson died with over $100,000 of debt (Leepson 2001:11). Jefferson’s daughter, Martha Randolph, auctioned Monticello in 1831 to satisfy the debts left by Jefferson. Thomas Turner Barclay purchased the property and subsequently sold it to Uriah Levy in 1834. Although, in a state of disrepair at his purchase and still a private residence, Levy opened Monticello to visitors during his tenure (Leepson 2001:4). Visitors, like those who came to Mount Vernon in the mid-nineteenth century during the ownership of the Washington heirs, made pilgrimages to the site in honor of the founding father. The Levy family posted guidelines for visitor behavior including time restrictions on their visit and advising no “lunching” on the grounds around the site (see Figure 4.2) (Harris and Ewing 1914-1948).

The Levy family heirs resided in Monticello for 89 years. The Levy’s were the longest single family to occupy Monticello until selling it in 1923 to the Thomas Jefferson Foundation, which has managed the site ever since. The Thomas Jefferson Foundation was responsible for the preservation and restoration of Monticello, the expansion of the site to visitors, the construction of a formal visitor’s center and educational facilities, as well as serving as the director and caretaker of continued research into Jefferson and the Monticello estate. Following on the heels of the Mount
Figure 4.2. View looking north toward Monticello from the South Pavilion area ca. 1914-1918. Source: Library of Congress, Harris & Ewing, photographer, “Monticello Path.”
Vernon Ladies Association’s purchase of Mount Vernon in the 1860s, Monticello’s preservation and restoration is a pivotal moment that punctuates the timeline of the American historic preservation movement.³

4.2.2 Site Context and Visitor Access

Monticello, as a historic site, is open to visitors for most of the year, except for select holidays. The visitor’s center, parking, museum, and other guest facilities are located at the base of the mountain. Monticello restricts access to the historic mountain top to ticketed customers and accessed via a shuttle or walking trail. Guides conduct timed-tours of Monticello, however, visitors may tour the grounds of the site on their own.

Additional tours, provided with admission to the site, include both a garden and grounds and a slavery tour. Both tours are optional and run on an hourly schedule to provide additional insight into Monticello for visitors. A shuttle stop is at the entrance to the east lawn and the trailhead connects near the grave and westernmost portion of the Mulberry Row walk. Figure 4.3 illustrates the location of the Monticello cultural resources in relation to each other. Monticello provides the map to the public and highlights the locations of the shuttle stops, walking trail, and location for the house tour.

³ For more on the preservation and restoration of Monticello as well as its role in American historic preservation see, Marc Leepson, Saving Monticello, (Charlottesville: University of Virginia Press, 2001) and Patricia West, Domesticating History, (Washington, DC: Smithsonian Institution Press, 1999).
Figure 4.3 Monticello Mountaintop Public Map for Visitors. Source and Credit: Monticello.org and the Thomas Jefferson Foundation
4.3 Conditions Assessment

4.3.1 General Findings

The visitor impact conditions assessment included Jefferson’s Monticello mansion, the secondary structures or outbuildings, and the historic landscape. Monticello’s Robert H. Smith Director of Restoration, Curatorial, and Historic Facilities assisted with the initial assessment of Jefferson’s mansion to ensure the validity of findings and association with visitation rather than previous repairs or material failures. The conditions assessment identified 353 total counts of visitor-induced damage across the property (see Table 4.2). Identified damage types included abrasions with minor and significant material loss, dirt, and oil build-up on surfaces from both hands and shoes, eroded flooring, and exterior pathway damage and erosion. Of the identified damages, 54% of the damages were superficial and 36% were minor (see Figure 4.4). Only 10% of the damages were moderate and none of the damages were severe or substantial.

However, the assessment did not include structural damages, such as potential damages to joists due to loading issues, unless they were inherently obvious to visual inspection.

<table>
<thead>
<tr>
<th>Damage Rating</th>
<th>Definition</th>
<th>Mansion (All Floors)</th>
<th>Outbuildings</th>
<th>Landscape and Grave</th>
<th>Total Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Superficial</td>
<td>76</td>
<td>92</td>
<td>21</td>
<td>189</td>
</tr>
<tr>
<td>2</td>
<td>Minor</td>
<td>76</td>
<td>22</td>
<td>30</td>
<td>128</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>24</td>
<td>6</td>
<td>6</td>
<td>36</td>
</tr>
<tr>
<td>4</td>
<td>Severe/Substantial</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>176</td>
<td>120</td>
<td>57</td>
<td>353</td>
</tr>
</tbody>
</table>
The typically observed visitor impact to Monticello is superficial to minor and primarily consists of surface-level staining and the minor wearing of architectural finishes. However, cosmetic issues still affect the significance and presentation of a historic site like Monticello. The significance of Thomas Jefferson, the high-style architectural design, standards of display, etiquette, and propriety at Monticello reflect an elite household. Abrasions, surface dirt, debris, and other physical markings on finished surfaces may not lead to immediate physical deterioration, but they may degrade the intended appearance of the structures (Fitch 1972, 314 and Honey borne 1990, 231). Additionally, degraded space may contribute to additional damage as it can often embolden subsequent visitors to do the same (Fitch 1976, 328).

![Monticello Conditions Assessment](image)

*Figure 4.4 Monticello Conditions Assessment of Damages (all locations)*
Surface-level visitor impact damages typically are distinctive from traditional material failure or other conservation issues. Superficial and minor damages consist of surface stains, noticeable paint loss, worn surfaces, and minor soiling. Impacts such as soiling from dirt and oil build-up present themselves as darkened patches, marks, or smears on surfaces (Figure 4.5). Typically, these impressions are more predominant on wood, plaster, painted, or otherwise finished surfaces. They are noticeable as darkened marks on surfaces and often different in texture due to the biological matter. Generally, identified moderately rated damages consisted of finished architectural surfaces worn to the substrate, sections of missing materials, and heavily worn pathways. Material abrasions that remove finished surfaces and reveal a small amount of substrate were more prevalent in the Textile Shop and the Monticello mansion.

As most overall damages were superficial to minor, they also appeared to be related to incidental or unintentional depreciation rather than intentional depreciation. Intentional depreciation, which would be vandalism, graffiti, and deliberate removal of architectural features was minimal. Intentional depreciation was most prevalent along
the landscape with visitors exiting designated pathways and cutting across the landscape.

The greatest concentration of total damage was within the Monticello mansion. However, the mansion does include combined assessments for the basement and three floors of the building (see Figure 4.6). This accounts for a greater concentration as density and geographic analysis did not consider altitude. The outbuildings displayed the most superficial damage, accounting for 49% of total superficial damage (see Figures 4.7–4.9).

The Monticello mansion accounts for the most minor and moderate amounts of damage. The mansion is the most visited location on the site and receives the highest amount of visitor traffic. Visitors concentrate in higher numbers within the rooms of the mansion than among the outbuildings where dispersal happens across the site. Mansion rooms may contain up to 25 individuals plus a guide at any given time during a tour. Additionally, most of the damage, while depreciative in nature, is more incidental or unintentional depreciation rather than malicious depreciation.
Figure 4.6 Geographic Dispersal Pattern of Identified Visitor Impact
The most exposed and vulnerable locations were the door architraves (see Figure 4.10). Greater damage was present along the entrances and exits to each room. Visitors may spread out upon entering a room, but they all pass through the narrow entryways. Narrow pathways of the eighteenth-century house now accessed by the public at rates much higher than those of private use. During the months surveyed, 132,778 individuals visited the Monticello site, equating to 32.3% of all total visitors for 2018 (Monticello Internal Attendance Summary, 2018).

The higher concentration of superficial damage among the outbuildings is noteworthy as well. While density patterns and concentration of visitors may play a role in limiting the damage to superficial rather than minor or moderate, additional theories help explain the difference in distribution as well. Typical damage included markings on walls from hands and feet, evidenced by multiple occurrences of shoe impressions. Within the outbuildings, this damage was noticeably lower in height on the wall surfaces than in the mansion. Not including the architraves or baseboards, within the house, the average height of impact on wall surfaces was 38 inches compared to the average height in the outbuildings of 18 inches.

Bitgood’s (2006) theory of the General Value Principle may help explain why visitors’ behavioral and impact patterns may vary in areas that have unguided or minimally guided access, such as in the Monticello outbuildings. The General Value Principle suggests a visitor will gauge the relative costs of their behavioral choices with
Figures 4.7 through 4.9 Locations of Superficial, Minor, and Moderate Visitor Damage
the benefits it produces (Bitgood 2006). In this instance, the level of decorum may play a role in why the type of damages are different between the mansion and outbuildings. The mansion represents a high-end space with decorated, finished surfaces and more restrictions on expected behaviors compared to the outbuildings (Fitch 1972). The outbuildings are more vernacular in construction with fewer elements of decoration. As the type of decorum changed the damage changed as well. As the rooms become less visually important, visitors may be more inclined to break the rules of expected behavior. Superficial damage from foot patterns suggests that perceived relief from standing, by placing a foot against the wall in an area with lower decorum, would be a perceived benefit with a lower perceived cost.

4.3.2 Monticello Mansion

The Monticello mansion itself receives the greatest amount of damage at the Monticello site. Fifty percent of all identified impacts were within the mansion (see Figure 4.11). The first floor displayed the most damage, followed by the third floor, basement, and second floor (see Table 4.3). Abrasions and soiling are the predominant types of damages located in the mansion.
### Table 4.3 Visitor Impact Damage within the Monticello Mansion

<table>
<thead>
<tr>
<th>Damage Rating</th>
<th>Definition</th>
<th>Basement</th>
<th>First Floor</th>
<th>Second Floor</th>
<th>Third Floor</th>
<th>Exterior</th>
<th>Total Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Superficial</td>
<td>4</td>
<td>34</td>
<td>5</td>
<td>29</td>
<td>4</td>
<td>76</td>
</tr>
<tr>
<td>2</td>
<td>Minor</td>
<td>12</td>
<td>38</td>
<td>7</td>
<td>18</td>
<td>1</td>
<td>76</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>3</td>
<td>14</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>Severe/Substantial</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>19</td>
<td>86</td>
<td>13</td>
<td>52</td>
<td>6</td>
<td>176</td>
</tr>
</tbody>
</table>

Figure 4.11. Breakdown of visitor impact among locations.
The main house tour of Monticello traverses the first floor of the mansion only. Visitor access to the second and thirds floors is only as part of the Behind the Scenes tour which Monticello offers at limited times each day. During these tours, visitors traverse more rooms on the third floor than the second. Also, rooms on the third floor have more seating which causes more impact with the wall surfaces. The third floor also contains Jefferson’s famed dome room. Although this room is empty, visitors spread out against the walls and impact appears largely along the baseboards at an average height of 8”. Damage also exists on the sills of the rotunda/dome room’s window from leaning to peer outside (Figure 4.12). Most of this damage is superficial to minor. Upper-story rooms do not receive as much traffic first-floor rooms.

The first-floor house tour of Monticello, which is the most popular and the most frequently offered, passes through all rooms on the first floor, except for one room used by docents as a staging area between tours. Figure 4.13 highlights the path of the first-floor tour with entrance and exit locations highlighted in green. The tour begins in the
entrance hall, traveling through the south passage into the south square and into the library and study cabinet areas. The tour proceeds through Jefferson’s bedroom and into the entrance hall and parlor. From the parlor, the tour advances through the dining room and into the north octagon. From the north octagon, visitors return to the north passage and exits through the north side of the house. During busy times of the year, tours enter the house every five minutes (Staff Interview 2018).

Figure 4.13 Visitor path along the first floor of Monticello. Drawn by author. Not to scale.
**Figure 4.14** displays the damages identified within the first floor of the mansion. Green indicated superficial damages, yellow indicated minor damages, and red indicates moderate damages. Most damages within the mansion concentrate along the door architraves. The average height for the center of architrave damage is 44 inches. This is a typical height for hand placement when moving through doors. The range for wall damage is between 34-50 inches in height, comparable to general hip and shoulder height. Damage observed along the baseboards averaged 8 inches in height. Mitigation measures such as formed metal sheathing around the baseboards in several rooms and
narrow passageways, as well as Plexiglas boards around the bottom of doors, help to protect the historic materials from visitor impact. Narrow corridors and entries that require turning are especially susceptible to damage from wheelchairs and strollers that navigate the passageways.

The greatest concentration of noticeable moderate damage is along the floorboards throughout the mansion (Figure 4.15). Wear to the floor finishes appears lighter in color along the edges of rooms where exposed flooring meets the floor covering. The placement of a stanchion in some of these areas mitigates damage, but many of the areas are along the edges of room entries where restricting visitors is more difficult.

Figure 4.15 Example of worn floor finishes. Photo by author and used with permission of the Thomas Jefferson Foundation.
Figure 4.16 Examples of visitor impact within the mansion. Abrasions and loss of material to baseboards (top left); erosion and material loss to architraves along with metal surrounds for mitigation, highlighted in red (top right and bottom right); and soiled and abraded chair rail (bottom left).
The conditions assessment revealed that the presence of wear rooms may be
generated with the number of available surfaces that visitor encounter. For example, in
the entry hall, although it is the largest room on the tour, objects block most of the wall
surfaces from direct visitor contact. The wall surfaces are either blocked by chairs,
curatorial displays, or other objects. This prevents much damage in the room. The most
visible damage in this room is from chairs that visitors accidentally knock into the walls
causing superficial to minor marks on the wall surfaces (see Figure 4.16).

Stanchions and curatorial objects similarly block exposed areas in the parlor and
dining rooms, which minimize damage in these rooms. It is noteworthy that the size of
the entryway, the amount of available surface contact space, and the interpretation or
positioning of objects in rooms appear to play a role in either mitigating or fostering
specific impacts. The conditions assessment does not reveal one factor having greater
influence than another, however, visual heat mapping of visitor behavior, address in the
following results section sheds some light on additional factors that influence damage.

4.2.3 Pavilions and Outbuildings

The conditions assessment revealed that the outbuildings contain 34% of all
identified visitor impact. Additionally, the outbuildings contain the greatest percentage
of all superficial damages for the site with 49% of total superficial damage (see Table
4.4). Ninety-five percent of the identified damages in the outbuildings are superficial to
minor. The damages range from superficial staining and marks on wall surfaces to worn
finishes, missing elements, and delamination contribution in some areas. Additionally, most of the outbuildings displayed footprints along the wall surfaces.

In addition to the north and south pavilions, which extend along the north and south sides of the mansion, there are five additional outbuildings accessible to visitors: a stable, the Hemmings cabin, a workman’s house/textile shop, a storehouse for iron, and a garden pavilion. The outbuildings, except for the garden pavilion, are situated along the southern side of Mulberry Row which runs east to west. The garden pavilion is located within the gardens to the west of Mulberry Row, behind the other outbuildings. All outbuildings are accessible to visitors during their visit to the site. For the purposes of this analysis, the conditions assessment considered the north and south passages that connect to the north and south pavilions as part of the north and south pavilions, respectively.

<table>
<thead>
<tr>
<th>Damage Rating</th>
<th>Definition</th>
<th>South Pavilion/Passage</th>
<th>North Pavilion/Passage</th>
<th>Stable</th>
<th>Hemmings Cabin</th>
<th>Textile Shop</th>
<th>Store House</th>
<th>Garden Pavilion</th>
<th>Total Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Superficial</td>
<td>53</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>17</td>
<td>1</td>
<td>8</td>
<td>92</td>
</tr>
<tr>
<td>2</td>
<td>Minor</td>
<td>10</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Severe/Substantial</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>64</td>
<td>12</td>
<td>5</td>
<td>2</td>
<td>24</td>
<td>1</td>
<td>12</td>
<td>120</td>
</tr>
</tbody>
</table>
The south pavilion is a wing that extends from the southern portion of the main house (see Figure 4.17). The wing itself features seven rooms that open to the south. The rooms include a kitchen on each end, a cook’s room, a smokehouse, an exhibit on the life of Sally Hemmings, a Hemmings interpretive room, and a storage room. The pavilion connects to the Monticello mansion via an underground passageway that adjoins the basement and continues to the north pavilion. A colonnade supported by brick columns projects from the south façade of the pavilion. The colonnade shelters the entrances to the wing’s rooms. Above the west-end kitchen sits a second-story room that Jefferson used while constructing Monticello. The second-floor deck of the south pavilion provides access to this room.

The north pavilion has a generally similar layout. Non-historic restrooms and a café punctuate the western half of the pavilion. The conditions assessment did not address these non-historic areas. Exhibits located in the east end as well as an exposed ice house complete the pavilion. The ice house is a 16” in diameter and bookended by the pavilion rooms on the west side and the entrance to the north passage on the east.

Historic images from 1905 highlight the absence of paved or surfaced pathways at Monticello near the south pavilion (see Figure 4.18). Although there is visible wearing to the landscape near the south pavilion, the property was still a private residence in 1905. The Levy family allowed the public to visit Monticello during this time, so the damage is likely a confluence of multiple factors and not strictly related to visitor influence.
Figure 4.17. View of the South Pavilion in 2018, looking northwest. Photo by author.

Figure 4.18 View of the South Pavilion in 1905. Source: Library of Congress.
Wear along the south pavilion is generally superficial to minor (see Figure 4.19). The greatest concentration of wear along the south pavilion is in the east end kitchen. Height of the wear generally concentrates from the floor to approximately 30” in height with an average height of 18 inches. Along the architraves wear centers at an average height of 46 inches. Damages include contact marks from objects that scrape the surfaces and footprints and build-up along the lower third of the walls. Some areas display erosion to surfaces and exposure of the substrate below. The architraves along the east and south entrances display minor wear. Like the mansion, most wear along the architraves appears to be a result of visitors touching or brushing against the architraves when entering or exiting a room. Superficial wear also presents itself on the south façade surface of the pavilion near the entrance to the rooms.

There are several areas of concern of delamination due to moisture exasperated by continuous visitor contact. The wear itself is not a cause of visitors but visitor impact enhances the deterioration. In general, unless delamination restricted itself to areas with immediate and direct conflict with a visitor area, the assessment did not note it as related to impact. Areas of concern are along the south wall of the colonnade between the smokehouse and the cook’s room and along the southeast corner of the smokehouse. However, the most predominant area is along the south façade of the pavilion. Seating benches are located adjacent to the delamination and observation analysis observed visitors leaning back against the wall. The delamination in the area adjacent to the bench indicates likely visitor influence on the condition.
Figure 4.19 View of damage within the south pavilion. Dirt and oil-build up and surface staining (top left and top right); delamination likely enhanced by visitors (bottom right); and material build-up along the kitchen architrave (bottom left).
Even exhibits, such as the exhibit on the life of Sally Hemmings, an enslaved person at Monticello who gave birth to several of Jefferson’s children, which opened in the Summer of 2018, show observable signs of visitor impact. Two rooms comprise the newest interpretive additions to the South Pavilion. Most of the impact is superficial and comprised of footmarks on walls and minor wearing to exposed walls adjacent to visitor seating in the room that contains a video about Hemmings’ life. In the adjacent room to the west, the impact is primarily superficial and consists of marks on the lower third of the wall surfaces (Figure 4.20). Footprints and toe impressions represent much of the damage and are generally located at an average height of 18 inches.

Figure 4.20. Superficial impact from dirt build-up on west wall, Hemmings Room in the South Pavilion. Photo by author.
Most of the visitor wear along the north pavilion is around the ice house and the areas immediately adjacent to it (Figure 4.21). Damages include dirt on walls, evidenced by footprints, and oil build-up on the ice house door where visitors braces themselves to view inside. The conditions assessment did not consider the delamination in the passageways associated with visitor impact, only potentially enhanced by it from visitors removing a portion of the peeling finish. Within the north passage, a buttress portion that projects into the passage itself suggests contact with visitors. The noticeable wearing of the finishes on the corner as well as build-up or dirt and oils indicates contact with visitors. Observational studies revealed visitors resting and leaning on this area as well as placing objects just as purses or bags to rest on top. Figure 4.22 presents views of observed damages within the north pavilion and north passage.

Figure 4.22 View of the north pavilion, looking west. Photo by author.
Figure 4.22 Views of damage within the north pavilion and north passage. Dirt and oil build-up on ice house (top left); footprints and staining on wall near ice house (top right); erosion and material build-up within the south passage (bottom right); and delamination in the north passage, not from visitors (bottom left).
The stable sits at the east end of Mulberry Row. The stable is stone construction with a wood-framed upper portion. A dot trot style opening provides egress to the south side of the stable. The visitor impact damage at the stable primarily consists of superficial to minor scrapes and build-up along the east room door and some areas of minor gravel erosion within the passageway. Portions of the doors exhibit wear from the attached hardware and opening and closing of the doors which is not visitor related. Gravel is also near the information sign to the west to assist with erosion control. However, on the south side of the building, there is moderate erosion to the landscape near the entry doors to both rooms (see Figure 4.23).

![Figure 4.23 View of the stable (left) and view of wear to the stable door architrave (right). Photos by author.](image)
The Hemmings cabin/servants’ house and the storehouse for iron displayed the least amount of damage of all the outbuildings. This is due to several reasons. First, the log construction of the cabins does not make dirt and oil-build up readily visible unless the build-up compounds over an extended time. Second, Monticello reconstructed both the Hemmings cabin/servants’ house and the storehouse in 2014, so the architectural materials have less visitor exposure than the other outbuildings (Figure 4.24). Third, the size of the interior space of each building limits access to visitors compared to access in the south pavilion and the textile shop.

Optional slavery at Monticello tours begins in front of the Hemmings cabin/servants’ house. The only observable damage at this location was gravel tracked into the interior of the space. Gravel can cause erosion and scraping of materials, but visible damage consisted of minor wear to the door threshold. Additionally, the storehouse for iron did not exhibit any visible wear except for minor wear to the threshold at the entry.

Figure 4.24 Hemmings’ cabin/servants’ house (left) and storehouse for iron (right).
The conditions assessment revealed that the textile shop contained the most amount of impact behind the south pavilion (Figure 4.25). The textile shop accounted for 24 instances of visitor wear which is 20% of all outbuilding damage. Staff recently repainted the architraves in the textile shop. As such the architraves only display superficial, if any signs of wear at all. Most wear concentrates along the exposed wall surfaces. Like the rooms of the south pavilion, the wear appears to come from visitors placing their feet against the wall, placing their toes against the wall while leaning towards the windows, and brushing up against the wall surface with their feet when passing through. The wear exists from the base of the floor to approximately 28” in height with an average damage height of 18 inches. While most of the wear is superficial to minor, continuous contact eroded some of the finished surfaces below the windows causing damage to the substrate (see Figure 4.26).
Figure 4.26 Views of visitor damage within the textile shop. Material build-up and minor surface erosion (top left); material build-up and visible footprint (top right); and material build-up and erosion of surfaces below the widows in the east and west room (bottom right and left).
The garden pavilion sits on the south end of the lower garden to the south of Mulberry Row (Figure 4.27). Monticello reconstructed the garden pavilion in 1984 based upon historical research and Jefferson’s writings (Monticello.org 2018). Conditions assessments of the garden pavilion revealed twelve counts of visitor impact, all superficial to minor.

The most impact is along the southeast and southwest corners of the structure where chairs contact the wall surfaces and nearby window frames. Damages include scrapings to the walls resulting in the removal of finishes in several locations. There is also noticeable material build-up from visitor contact along the walls in the northwest corner of the structure (Figure 4.28). There is also cracking along the plaster walls, but this appears to be from settlement issues rather than from visitor impact.
4.3.4 Landscape and Grave

The landscape and grave areas had the lowest percentage, 16%, of visitor impact of the entire site. The conditions assessment identified 57 total counts of visitor impact within the landscape and grave areas. This included 21 observed superficial damages and 30 minor damages. The damages included minor erosion along the edges of pathways and near the edges of buildings, including the textile shop (Figure 4.29). The cemetery which contains Thomas Jefferson’s grave had only minor staining on Jefferson’s tombstone from coins left as a sign of respect and remembrance of visitation to the grave. The grave itself is protected by an iron fence and is not directly accessible to visitors.

Figure 4.29 Landscape erosion near the east window on the west façade of the Textile Shop (left) and wear along the edge of the pathway near the South Pavilion and visitors sitting on objects, facing south (right). Photos by author.
Moderate landscape damages account for six instances within the landscape assessment. The moderate landscape damage was only 17% of the total count of observed moderate damage for the site. Most of this damage concentrates between the south pavilion and Mulberry Row. These areas are to the south and west of the south pavilion and west kitchen location (see Figure 4.29). While there are designated brick-lined or paved pathways in these areas, the damages are indicative of visitors diverting from the pathways.

Additionally, the historic trees planted along Mulberry Row also display signs of visitor impact (Figure 4.30). Portions of the roots of many of the trees are partially above ground. The roots display signs of erosion and abrasion resulting in missing elements from the tops of the roots (see Figure 4.31). The Thomas Jefferson Foundation restored much of the historic landscape since its acquisition of the property. However, the resources are still significant as part of the historic cultural landscape of Monticello. The damage is more predominate along the northern edge of Mulberry Row than the southern end. Soil erosion from the hillside to the north plays a role in exasperating this
condition. While the damage is observable to visible inspection, an arborist should determine any long-term damaging effects on the root system.

Figure 4.31 Abrasions to tree roots along Mulberry Row (top left); erosion to landscape between Mulberry Row and South Pavilion (top right); erosion to landscape on south façade of stable (bottom left); and erosion to landscape near west end of South Pavilion, facing south toward Mulberry Row (bottom right).
The concentration of damage in the South Pavilion yard is likely for two reasons. First, there is no designated pathway. Visitors would need to walk east down the brick colonnade of the south pavilion to reach a designated pathway that leads to Mulberry Row. Mulberry Row and the South Pavilion are within a short line of sight of each other. Thus, the shortest distance for travel is directly across the grass through the South Pavilion yard. Observational analysis revealed visitors bypassed the designated pathways and cut across the grassy area on numerous occasions (Figure 4.32).

Figure 4.32 Visitors cutting across the South Pavilion yard toward Mulberry Row (top and bottom).
The second reason for this damaging behavior is a lack of signage telling visitors to stay on designated pathways. Without signage, visitors are unaware of their impact on the historic landscape. Existing signage dictates where tours begin and also exists at the boundaries of the mountain top site delineating staff use and visitor use (Figure 4.33). There is no signage to direct visitors to 1) stay on pathways and 2) assist with minimizing their impact in the areas with observed damage. Researchers have shown that specific interpretation language on signage and reference to visitor impact and/or normative behaviors within interpretation strategies results in lower counts depreciative behavior, whether intentional or incidental (Johnson and Swearingen, 1992). Additionally, informal conversation with Monticello grounds crew assisted with identifying temporary construction paths built between Mulberry Row and the West Lawn that visitors frequently use to cut across the grass as well.

Figure 4.33 Examples of signage at Monticello. Photos by author.
Lastly, the conditions assessment did not reveal any visible wear, beyond nominal path usage, in the gardens themselves, outside of the garden pavilion. Spatial distribution findings, discussed further in the proceeding chapter, reveal that the garden area was one of the least visited areas of the site during the time of this study. The garden is visible from Mulberry Row, which allows visitors to view it without traveling through the garden directly. Additionally, the garden has little to no shade during the summer months (Figure 4.34).

In conclusion, the conditions assessment suggests two main causes for the differences in damage distribution across the site. Continual maintenance within the mansion and various opportunities to spread visitors throughout the site, including at the base of the mountain, aid in reducing or redistributing impact. Damage is minimal in recently painted areas such as the textile shop architraves. However, superficial damage is present in areas that

Figure 4.34 View of the vegetable garden, facing southwest. Photo by author.
recently opened to the public with new interpretation such as the Hemmings exhibit in the South Pavilion.

In this instance, the General Value Principle (Bitgood 2006) and the theory of museum fatigue aid in explaining this damage and behavior in these areas. Visitors get “museum fatigue” meaning they tire as they visit, and they spend less time looking at exhibits (Gilman 1916). Visitors may be more inclined to lean on surfaces and rest themselves against things if they visit locations toward the end of their visit. Additionally, the General Value Principle suggests that because some areas are more secluded than others and in this instance the level of decorum between the mansion and outbuildings changes, there are likely perceived changes in expected behavior in these different spaces.

4.4 Interview Assessment

4.4.1 Introduction

Key interviews conducted with Monticello staff aided in the understanding visitor and staff protocols for site management and interpretation, identifying and evaluating visitor-induced damages, and understanding visitor behavior and observations. Four qualitative interviews conducted with staff included conservation and management staff from the Restoration, Curatorial, and Historic Facilities department and management staff and guides from guest services and education. The title and name of the interviewees were changed during data coding and analysis to
anonymous identifiers such as "Interview A, Interview B, and so forth" to remove any personally identifiable information.

Interviews were semi-structured and were approximately 30 minutes to one hour in length. The primary purpose of the interviews was to corroborate or validate findings from the conditions assessment and observational studies (Yin 2009). Three types of questions asked in the interviews covered basic demographic and background experiences at other locations/history with damage, present experience, and mitigation practices/policies. Memos and on-going analysis techniques assessed the information from the interviews.

4.4.2 Staff and Visitor Protocols

Interviews with staff highlighted the procedures and timelines used to administer tours and instructions to visitors. Guides and guest services staff generally divide the labor for guest experience and instruction. Prior to beginning their tour, guests receive instructions for expected behavior and rules for visitation from guest services staff. Staff instructs visitors that they cannot have food, drink, or gum inside the house. Staff request guests silence cell phones and not to take any photographs while inside the house. Regarding behaviors that may cause damage, guest services staff advise visitors not to touch or lean on anything in the house and that they carry backpacks should around the front rather than the backs (Interview C and D 2018). Changing the way visitors carry backpacks helps to avoid striking objects on the walls or
throughout the house. House guides will let visitors know if there are any additional instructions. Lastly, Monticello does have several issues with access due to the size of rooms and passageways within the house. Guest services staff offer smaller umbrella strollers and smaller wheelchairs that guests can transfer to while on the tour of the house.

The typical house tour of the first floor is 40 to 45 minutes and averages five minutes spent in each room, plus time for the interpreter to move from space to space. Tours begin on the east portico and work clockwise through the house, exiting at the north side of the first floor. Monticello limits tour sized to 25 persons regardless of age group or type of tour. Guides themselves primarily spend most of their time onsite in the house and give a range of 4 to 6 tours per day (Interview C 2018). In addition to regular house tours, guides may also five behind the scenes tours, school tours, and special tours. Typically, guides break large school groups into smaller ones and stagger the groups on house tours with the general public tours so that school tours do not comprise a complete block of time of house tours (Interview D 2018).

Interviews suggest that other guides or supervisors are involved if there is an emergency or safety procedure involved with a guest. The supervisor is also responsible for instituting regulations with unruly or disruptive visitors, children making disruptive noises, etc. Additionally, if damage occurs within the house, a docent records the incident in a log book relayed to the restoration department to address (Interview A and C 2018).
Interviews reveal that guides receive extensive and ongoing training on the history of Monticello. Guides partake in classroom sessions and readings along with hands-on training on how to work with different guests and talk about difficult subjects for a month or so before they begin a tour (Interview C 2018). Guides put together and develop their own tour programs, rather than relying on a scripted tour, focusing on different aspects of the house. The tour and education services department approve the tours. Guide variation is a possible explanation for why visitors may not move in a predictable pattern within each room as each guide varies their tour or discusses different aspects of each room.

During select times of the year when visitation is heavy, examples include spring break and July 4th, Monticello offers walk through house tours. Other times of the year with increased visitation include the summer months (June, July, and August), and October. October visitation levels are closer to levels seen in July. The walk-through model of the house moves more visitors through rather than doing timed docent-led tours. Guides stationed each room provide information to visitors as they pass through at their own pace. Only July 4th, increased visitation also comes from the hosting of a naturalization ceremony of approximately 70 to 80 people on the west portico which Monticello had hosted for 54 years (Interview D 2018). Interviews also suggested that Founder’s Day (April 13th) is another day of the year with increased levels of visitation. On this day Monticello gives medals to members of the community during a ceremony on the west lawn.
4.4.3 Damage and Repairs

Since its acquisition by the Thomas Jefferson Foundation, Monticello has undergone a series of repairs and restorations. According to interviews periods of intense restoration occurred from the 1940s through 1955. During this time, staff replaced floor joists replaced with steel beams among other repairs. In 1991 staff restored the roof and wings. Although restoration has been a major part of the preservation of Monticello, 80% of buildings and materials are in a state of preservation and efforts restored 20% of the material at one or another (Interview A and B 2018). Replicated finishes include whitewashes and wallpapers, however, the brick, trim, and 95% of the floors are original to Jefferson’s time (Interview A 2018). Additionally, staff installed ADA ramps to allow access to disabled guests.

Recent maintenance includes the installation of UV-reducing film on the first-floor windows in 2005 which cuts 80% of visible light into the house. Painting, whitewashing, staining are ongoing efforts. The staff does notice a high volume of wear patterns on edges or next to pathways which confirmed the analysis from the conditions assessment which confirms with the conditions assessments. Additionally, restoration staff touches up baseboards and trim annually, including the North Octagon which was recently repainted. Visitor damages result in wear and abrasion to chair rails and doors. Interviews also suggested an explanation for why damages in the house and property are relatively superficial to minor in extent. In addition to various repairs and repainting
staff conduction seasonal and annual assessments and inspections to identify damage or needed repairs (Interview A 2018).

4.4.4 Behaviors and Observations

Several interviews asserted that visitor impact is a minor problem in terms of the overall experience of the site (Interview A 2018). Interviewee D suggested that “Overall guest are pretty respectful of where they are visiting” (Interview D 2018). While interviews assert that there are some issues with kids climbing trees on the property, wear and tear issues are more a result of visitation volume which the site plans for. Additionally, signs are in place to mark road areas but do not advise visitors on behavior. However, even in the absence of a sign, interviews suggest that unrestricted areas like the vegetable garden pathways “guests are pretty respectful” (Interview D 2018).

Interviewees also suggest that they have not noticed any visitors causing damages in the house or any direct misuse of space, only inadvertently, never deliberately. Although, restoration interviews advised that in the north privy visitors pick at the gypsum delamination (as noted in the conditions assessment). Inside the house, incidents range from knocking into objects, such as pictures, with backpacks, along with occasional incidents of fainting, vomiting, and bleeding. Areas more prone to damage are the smaller rooms, such as the south square and Jefferson’s bedroom. Most damage is from abrasion and areas with smaller doorways are more likely to show damage. Commonly observed areas with damage include doors, baseboards, especially
in the dining room and tearoom. Damage also comes from feet against the walls both within the mansion and outbuildings. Overall, interviewees observe that say visitor impact is a minor issue and account for only 10% of damages overall (Interview A and B 2018).

4.5 Part I Conclusions

Conditions assessments and interviews support the idea that most visit-induced damage at Monticello is superficial to minor and is generally the result of attrition and high levels of visitation. Materials and maintenance routines also play a role both in the degree and intensity of the damage. While visitor impact is depreciative in nature, most visitor actions are incidental rather than done with malice or negative intentions. However, General Value Principle and museum fatigue theories aid in explaining why some of the damage occurs in greater concentration in some locations rather than other. Lastly, extensive training by guides and continual maintenance by staff with seasonal and annual conditions assessments likely account for the minimal amount of moderate and substantial damage at the site.
CHAPTER 5
RESEARCH FINDINGS PART II

5.1 Usage Assessment

5.1.1 Introduction and General Findings

Part I of data collection for this study focused on on-site analysis. Conditions assessments and key staff interviews assisted with verifying visitor induced damages. They also aided in understanding management and interpretation protocols that influence visitor use and access. Part II of data collection involved a geographic behavioral analysis to determine where visitors traveled while visiting Monticello. GPS visitor tracking and density analysis determined which areas of the site received the highest levels of use and how long visitors spent in these areas. Additionally, visitor observation studies shed light on visitor behavior and how often impact-inducing activities occur.

From a location at the Monticello visitor center, predetermined based on consultation with staff as the prime location to capture visitors entering and exiting the site. During data collection, the research team approached 242 individual sets of visitor travel parties. Of those approached, 240 parties agreed to participate in the study by voluntarily carrying a GPS unit during their trip to Monticello. This yielded a 99.17% response rate. Based on the response rate, sample size, and resulting confidence
intervals and levels, the sample is highly representative of the high summer/early fall visitor population to Monticello.

General findings from the geographic behavior analysis include the following:

- 240 travel parties participated in the study, representing 673 total visitors.
- The average travel party to Monticello consists of 2.8 visitors.
- The average time spent at the historic Monticello site is 2 hours and 51 minutes.
- Visitation times ranged from the least at 40 minutes to the greatest amount of time on site at 6 hours and 11 minutes. These total times do not include time spent at the visitor center and museum area at the base of the mountain.
- 11 of the participating parties made two trips up and down from the Monticello site to the visitor center. This represents 4.5% of participants.

5.2 GPS Visitor Tracking and Density Analysis

The use of Global Positioning Systems (GPS) for tracking visitor use in recreational areas and outdoor environments has increased within the last decade (Riungu et al., 2018). The main reason for the upswing in studies is the increase of locational accuracy of GPS signals improved in 2000 with the lifting of government prohibitions on data (Hallo et al., 2012). Since that time, advances in technology allowed researchers to refine the methodology and the use of GPS data loggers to study use patterns. Figure 5.1 presents a summary of several uses and methods for GPS Visitor Tracking within the last fifteen years.

Additionally, changes and improvements in GPS Visitor Tracking technology and the accuracy of GPS units has increased greatly since 2008 (Hallo et al., 2012). Natural
resource and transportation studies primarily define the research patterns for GVT use and a key limitation, prior to this study, in the use of GVT methods has been at historic and cultural sites. Although researchers have used tracking technology that makes use of Geographic Information Systems (GIS) analysis of visitor densities at Machu Picchu and Pompeii (Wallace, 2016 and Comer et Al., 2016), they have not relied on the use of visitor participation with data loggers.

Figure 5.1 Methods and Research in Spatial Tracking Design
Previously, methods of recording visitor use at historic sites relied on interviews, questionnaires, and travel logs among other self-reported data. However, the use of GPS data loggers to record visitor routes and paths while visiting historic sites proved to be useful in understanding geographic hotspots across the Monticello site as well as providing information to help guide future priorities at Monticello. To achieve a better understanding of visitor’s travel habits and observations while visiting the site, visitors also received an exit survey upon return of the GPS tracker unit. The purpose of the survey was to assist with gathering basic demographic information about the participants in the study and their visit to Monticello.

The sample period for GPS tracking was 21 days. Sampling occurred on both weekdays and weekends to account for any difference in visitation levels during the week. Table 5.1 breaks down the stratification of sampling based on the day. All visitors proceeded from the visitor center and accessed the mountaintop via a shuttle or a walking trail. The analysis did not include data collected at the visitor center as this area is not part of the historic Monticello mountaintop.
Table 5.1. Stratification of Sampling Dates for Distribution of GPS Trackers

<table>
<thead>
<tr>
<th>Intercept Date</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday, July 17</td>
<td>4</td>
<td>1.67%</td>
</tr>
<tr>
<td>Thursday, July 18</td>
<td>5</td>
<td>2.08%</td>
</tr>
<tr>
<td>Friday, July 19</td>
<td>9</td>
<td>3.75%</td>
</tr>
<tr>
<td>Saturday, July 20</td>
<td>9</td>
<td>3.75%</td>
</tr>
<tr>
<td>Sunday, July 21</td>
<td>13</td>
<td>5.42%</td>
</tr>
<tr>
<td>Friday, August 9</td>
<td>13</td>
<td>5.42%</td>
</tr>
<tr>
<td>Saturday, August 10</td>
<td>9</td>
<td>3.75%</td>
</tr>
<tr>
<td>Sunday, August 11</td>
<td>13</td>
<td>5.42%</td>
</tr>
<tr>
<td>Monday, August 12</td>
<td>12</td>
<td>5.00%</td>
</tr>
<tr>
<td>Tuesday, August 13</td>
<td>10</td>
<td>4.17%</td>
</tr>
<tr>
<td>Wednesday, August 14</td>
<td>12</td>
<td>5.00%</td>
</tr>
<tr>
<td>Thursday, August 15</td>
<td>11</td>
<td>4.58%</td>
</tr>
<tr>
<td>Friday, August 16</td>
<td>11</td>
<td>4.58%</td>
</tr>
<tr>
<td>Saturday, August 17</td>
<td>10</td>
<td>4.17%</td>
</tr>
<tr>
<td>Saturday, October 19</td>
<td>13</td>
<td>5.42%</td>
</tr>
<tr>
<td>Sunday, October 20</td>
<td>19</td>
<td>7.92%</td>
</tr>
<tr>
<td>Monday, October 21</td>
<td>8</td>
<td>3.33%</td>
</tr>
<tr>
<td>Tuesday, October 22</td>
<td>8</td>
<td>3.33%</td>
</tr>
<tr>
<td>Wednesday, October 23</td>
<td>16</td>
<td>6.67%</td>
</tr>
<tr>
<td>Thursday, October 24</td>
<td>17</td>
<td>7.08%</td>
</tr>
<tr>
<td>Wednesday, October 25</td>
<td>18</td>
<td>7.50%</td>
</tr>
<tr>
<td><strong>Total GPS Trackers</strong></td>
<td><strong>240</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Canway software removed the data from the data logger upon return. Preliminary data management occurred when exporting the dating to Microsoft Excel. In this instance, the data streamlining procedure removed times recorded on the unit prior to distribution and after the return of the tracker. ArcGIS further streamlined preliminary data for spatial analysis by reviewing collected data points for levels of error. Human behavioral patterns, proximately to preceding and proceedings GPS points, and the recorded visitor path assisted...
with deleting or adjusting GPS waypoints recorded in error (Beeco et al., 2013). **Figure 5.2** illustrated an example of an error points recorded by a GPS tracker when the point bounced several miles from the site and then back to the location in a fifteen second period. After any necessary point deletion or adjustment of error, GIS analysis removed waypoints recorded at the visitor center.

**Figure 5.2 Example of GPS tracker recording error highlighted in red.**

**Figure 5.3** displays the collected tracks overlaid on the Monticello site. The visitor’s center is visible near the lower or southern portion of the map and the mountaintop makes up the area to the north. The shuttle to the site travels on a counterclockwise route beginning at the visitor center, stopping along the east walk, continuing to the grave area, and finally returning to the visitor center.
Figure 5.3 Map of the Monticello site showing all GPS tracks combined.
The shuttle runs on a continuous loop during the day leaving every 5 to 10 minutes. The rounded trails to the east and west on the map represent travel on the shuttle.

The other alternative to reaching the site is the Monticello trail. The s-shaped path visible to the east of the return shuttle path is the trail. While the shuttle route is one-directional, visitors may ascend or descend the site via the trail. The trail is approximately 0.35 miles in length from the visitor’s center to the grave. The grave is located along the southwestern portion of the site and is approximately 0.25 miles from the Monticello house. Fifty percent of visitors, 95% CI [43.67, 56.33], use the trail at some point during their visit, either to access the mountain or return. 87.9% of visitors, 95% CI [83.77, 92.03], use the shuttle at some point during their visit to access the mountain or return along a portion. According to the exit survey 87.67% or 192 participants self-reported that they used the passenger shuttle at some point during their tour, which validates the GPS tracker analysis.

Of the visitors who participated in the study, 57.08% of respondents were male, 42.47% were female, and 0.46% of respondents preferred not to answer. Most participants, 97.5%, represented individuals from the United States. International respondents accounted for 2.5% and represented individuals from France, the United Kingdom, India, and Western Australia. Most visitors, 71.69%, were visiting Monticello for the first time during the study and of the repeat visitors, 64% had only visited once before. In general, there was a lack of familiarity with the site, although 71.43% of respondents report visiting historic sites 1 to 3 times per year.
The analysis looked at historically significant areas within the site determined from background research and popularized by visitor materials to assess for patterns of use. These included the house, the north and south pavilions, Mulberry Row, the lower garden, and the Jefferson gravesite. Table 5.2 breaks down the percentage of use by area, assessed by the total count of GPS trackers at the given locations. The analysis identified that Mulberry Row in its entirety and the Monticello house areas are the most highly traveled to by visitors. 95.8% and 95.4% of all visitors, respectively, travel to these areas while visiting Monticello. The most under-visited of location is the lower garden with only 58.8% of visitors traveling there. The conditions assessment also revealed that the lower garden had the lowest levels of visitor impact (see Figure 5.5). The south and north pavilions, which contain exhibits and visitor services such as restrooms and a café are the next most visited areas, respectively.

<table>
<thead>
<tr>
<th>Location</th>
<th>Percentage of Visitors to Location</th>
<th>Confidence Interval</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Garden</td>
<td>58.8%</td>
<td>0.623</td>
<td>52.57, 65.03</td>
</tr>
<tr>
<td>Grave</td>
<td>60.8%</td>
<td>0.618</td>
<td>54.62, 66.98</td>
</tr>
<tr>
<td>South Pavilion</td>
<td>83.3%</td>
<td>0.472</td>
<td>78.58, 88.02</td>
</tr>
<tr>
<td>North Pavilion</td>
<td>87.5%</td>
<td>0.418</td>
<td>83.32, 91.68</td>
</tr>
<tr>
<td>House</td>
<td>95.4%</td>
<td>0.265</td>
<td>92.75, 98.05</td>
</tr>
<tr>
<td>Mulberry Row</td>
<td>95.8%</td>
<td>0.254</td>
<td>93.26, 98.34</td>
</tr>
</tbody>
</table>
Figure 5.4 Monticello visitor use density.
Additionally, kernel density analysis assessed the number of waypoints from the individual units in a given location. Kernel density spreads the known quantity of each point from its location, creating a smoothing effect, rather than calculating density based on a specific neighborhood as point density does. Based on the geospatial density analysis, the areas with the greatest density are the house and Mulberry Row as well as the pavilions and the east walk staging area (see Figure 5.4). The east walk staging area is where visitors wait to begin their house tour.

In addition to density and frequency of use, the analysis also assessed the average time spent in locations by calculating each track’s total location time from entry to exit of a geographic area and then averaged among the tracks within that area. Table 5.3 displays the average time, in minutes and seconds, spent in the designated historically significance areas. Visitors spend the most amount of time in the house at approximately 53 minutes. Additionally, the average house tour is 45 to 50 minutes in length. However, visitors frequent the house most often and spend the most time there which correlates with areas of high damage concentration. According to the exit survey,

<table>
<thead>
<tr>
<th>Location</th>
<th>Average Time in Location in Hours, Minutes, and Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Garden</td>
<td>0:15:20</td>
</tr>
<tr>
<td>Grave</td>
<td>0:04:04</td>
</tr>
<tr>
<td>South Pavilion</td>
<td>0:14:56</td>
</tr>
<tr>
<td>North Pavilion</td>
<td>0:13:18</td>
</tr>
<tr>
<td>House</td>
<td>0:53:17</td>
</tr>
<tr>
<td>Mulberry Row</td>
<td>0:24:33</td>
</tr>
</tbody>
</table>
82.73% or 182 respondents reported they spent the most amount of time in the Monticello house and the least amount at Jefferson’s grave.

Figure 5.5 Image overlay of density patterns and observed visitor impact locations at Monticello.
5.3 Exit Survey Analysis

Visitors received the exit survey upon return of the GPS unit. Visitors took the survey using an electronic tablet which recorded the survey with the unique identifier tied to each GPS track to link the survey data with the track. Two hundred and twenty of the 240 participants completed the survey, which is a response rate of 91.7%. Visitors who did not complete the survey either returned the tracker at an unknown time when the researcher had stepped away from the distribution point or stated they were in a hurry and did not have time for the survey.

The greatest percentages of visitors were employed or self-employed (61.64%), followed by retirees at 29.22%. The greatest age ranges among participants was in the 60-69 range with 28.77% and in the 50-59 range with 21.83%. Most, 93.15% visited with friends or family. In general, 61.41% of visitors reported that they spent an average of 2 to 4 hours at the site.

In addition to various demographic data visitors also answered questions related to their travel pattern at Monticello and their observation of physical damage at the site. Only 15.14% of the visitors noticed damage during their visit. Most did not notice damage or wear not paying attention to this. Of those that did observe damage, 55.1% of observed damage was inside the house. The second most was among the landscape, including Mulberry Row, the flower gardens, and the vegetable garden.
When asked to elaborate on any additional damages they saw while on their tour, visitors’ comments ranged from superficial wear and tear including wear on steps, paint, doorway, thresholds, and grass to visitor-induced damages including vandalism. Additionally, visitors stated the following observed damages:

- Name etched on window in daughter’s bedroom
- Worn grass new Sally Hemings display
- A toddler pulled a chunk of wood of a reconstructed cabin near Mulberry Row
- Broken glass on interior door
- People have written their names in wooden furniture
- Eroded lawn near gathering areas, short cuts from house to gardens

Visitors also answered questions regarding the behavior observations of other visitors. Only 26.15% or 57 visitors witnessed visitors touching surfaces or objects. Of those touching surfaces or leaning on objects, 45.57% leaned on walls or doorways and 49.37% touched surfaces. Most comments from visitors stated that others leaned on walls, doorways, and furniture. Several suggested that the impact was instantaneous or unintentional. In additions to comments about leaning on walls or doorways, visitor comments regarding another visitor’s behavior included:

- A woman fell and hit a door
- Child sat on bed in the slave house
- Young children playing with books in the library
- The guide gave several warnings against touching for preservation
5.4 Behavioral Heat Mapping and Observational Analysis

In addition to GPS visitor tracking, the research also relied on time-lapsed video cameras within the house to record behavior (see Figure 5.6). The walls of the house distort GPS signal within the individual rooms, time-lapse cameras assisted with observations of the visitor path through the mansion as well as observations on depreciative behaviors. Cameras placed in consultation with Monticello staff identified

![Figure 5.6 Map of camera placements with cone of view shaded in gray.](image)
target areas with frequently known impact and areas with the greatest levels of exposed surfaces. Additionally, consideration for placement included areas where cameras were out of visitor’s reach and general sight lines, locations where cameras could sit without needing additional mounting, and locations where they would not obscure the visitor tour path. These criteria generally removed hallways and small passageways from view as there was no place to position a camera.

When triggered by motion, the cameras recorded a 5-second video. A ten-second break occurred between captures to avoid continuous recording. The videos captured data from 9 am until 5 pm. The cameras collected data for 20 days during the GP5 tracker sampling period, except for October 25. Total hours per day recorded among the four cameras was 32 hours. In total the cameras recorded approximately 640 hours of data. To assist with data analysis stratified random sampling selected one hour

Figure 5.7 Data analysis with TimeLapse2 software.
between 9 am and 1 pm and one hour between 1 pm and 5 pm each day from the cameras for analysis. This resulted in approximately 160 hours of sampled video data. TimeLapse2 digital analyzation software (see Figure 5.7) assisted with tallying and categorizing counts of impact, while Qualtrics analytical software developed the heat map of spatial observations.

Table 5.4. Observed Counts of Impact-Inducing Behavior

<table>
<thead>
<tr>
<th>Impact</th>
<th>Entry Hall</th>
<th>South Square</th>
<th>Jefferson Bedroom</th>
<th>North Octagon</th>
<th>Total Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touching</td>
<td>45</td>
<td>44</td>
<td>26</td>
<td>18</td>
<td>133</td>
</tr>
<tr>
<td>Leaning</td>
<td>14</td>
<td>50</td>
<td>56</td>
<td>63</td>
<td>183</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>68</strong></td>
<td><strong>94</strong></td>
<td><strong>82</strong></td>
<td><strong>86</strong></td>
<td><strong>324</strong></td>
</tr>
</tbody>
</table>

Video review observed 250 individual groups that entered the mansion during the sample period. The average group size was 20 individual per group for an approximate total of 5,000 observed visitors. There were 324 total counts of impact inducing behaviors such as touching or leaning (Table 5.4). Counting efforts tallied impacts once per person per room. Based on the sample population, 324 counts of impact-inducing behavior equal 6.48% of visitors, 95% CI [5.72% to 7.08%), that commit a depreciative act, whether intentionally or unintentionally.

Most impact-inducing behaviors occur in the South Square and the North Octagon. Twenty-nine percent of behaviors occurred in the South Square and 26.5%. in the North Octagon. The size of the space and amount of available surface area (i.e. walls
to lean on) likely contributes to this. Visitors primarily lean against the north wall and chair rail and touch the door and architraves when entering the South Square. In the North Square, visitors also touch the door and architraves while entering the room. They also lean against the wall and architrave to the west and south in the greatest concentrations. **Figure 5.8** are examples of observed behaviors captures by the time-lapsed cameras.

**Figure 5.9** is a heat map showing the areas with the greatest concentration of observed impact-inducing behavior. The map reveals that the entry hall receives the least amount of impact-inducing behaviors. Most impacts concentrate near the door where visitors place their hands while entering the room. Although visitors spread out spatially more in this room than others based on the differences in room size, curatorial objects and collections also block most of the wall surfaces from contact. As observed with the conditions assessment, the entry and exit points of the observed rooms received the highest level of impacts. **Figure 5.10** displays behaviors in relation to the visitor path.
Figure 5.8 Video captures showing leaning in the South Square (top) and touching the architraves in the North Octagon (bottom).
Figure 5.9 Heat map showing locations of observed visitor damage-inducing behaviors within the camera placement areas.
Figure 5.10 Heat map showing locations of visitor damage inducing behaviors in relation to the visitor path. Green arrows represent entry and exit points and blue arrows indicate the first-floor path.
Video observations also reveal that visitors also reflect or subconsciously imitate guide behavior. While this study and analysis did not address staff behavior, in instances where guides touched surfaces or leaned on them, visitors also did the same. **Figure 5.11** illustrates a visitor touching the architrave while exiting the North Octagon. This action was immediately preceded by a guide observed touching the same areas and exiting right before the visitor.

During the sample period staff corrected only one instance of visitor behavior and that was for taking a photo inside the mansion. Other visitors in groups obscured staff from seeing visitors taking photos inside. In due fairness, the guides conducting large tours of 25 persons and focus on interpreting the house. Not every instance of behavior is visible to the guides either.

**Figure 5.111** Video capture of visitor touching architrave in the North Octagon.
Lastly, a combined heat map shows the relation of the observed damage-inducing behaviors in relation to both the visitor path and the observed damages (Figure 5.12). Green, yellow, and red points indicate superficial, minor, and moderate damages. Again, camera placement did not observe heat map locations in the passageways, the parlor, and dining room. Based on this, the greatest concentrations of observed damage appear to correlate with the locations of damage-inducing behaviors along the visitor path of the first floor of the mansion. These are also areas where visitors have access to the greatest amounts of surface areas in each room, which may play a role in the number of visible impacts.

Figure 5.12 Combined map of visitor impact-inducing behaviors, tour pathway, and observed visitor impact damages.
5.5 Expert Review

The final phase of data collection consisted of an expert review conducted by the previously interviewed key management staff. Staff reviewed data analysis and results to allow for validation and verification of the findings. After a review of the findings, staff participated in a semi-structured interview. The interview consisted of questions related to staff thoughts about the findings, if the results were what they expected or different from what they commonly observe or know about visitor impact at the site, and general thoughts about the damage.

The staff did not have quantifiable GPS data on day-long visitor movements through the site prior to this survey. So, the data is useful to Monticello with longer-term planning and preservation efforts. Additionally, staff generally agreed that patterns of use are similar to what they expected and generally know from guest surveys. In terms of material damage, the intensity of the damage inducing-impacts seen between the Cabinet and Bedchamber area was more than expected. However, the location of the damage throughout the house was not surprising given the previous conservation and restoration efforts.

5.6 Part II Conclusions

Density maps and observational analysis support the idea that most visitor-induced damage generally correlates with areas of higher visitation and time spent in locations. Available surface contact areas, however, do play a role in the amount and
type of impacts. Participant observations and visitor surveys both suggest that while visitor impact is depreciative in nature, most visitor actions are incidental rather than done with malice or negative intentions. However, as stated before, the General Value Principle and museum fatigue theories aid in explaining why some locations are more prone to damage than others.

Lastly, extensive training by guides and continual maintenance by staff with seasonal and annual conditions assessments likely account for the minimal amount of moderate and substantial damage at the site. Staff express dos and don'ts of acceptable behavior to visitors at the start of their tour. Monticello also posts these guidelines on their website. However, there is limited signage within the site to advise visitors of behaviors and observations within the house suggest that not all impact-inducing behaviors are immediately observable to guides for enforcement.
6.1 Discussion

The strength of this study is in the multiple sources of data and analysis used to assess visitor impact at Monticello (Yin 2009). Factors influencing material damage come from various sources, including site use and access, material conservation factors, and management and interpretation strategies. Analysis has shown that all of which play some role in the degree and intensity of visitor-induced material damage at a historic site. The case study and the multiple sources of evidence helped to uncover how visitor visitor-induced material damage correlates with the patterns of use and access of individual visitors at a historic site and to what degree management and interpretation strategies play a role in material damages.

The primary goals of this research were to identify issues that could increase the risk of visitor impact. Additionally, the research proposed to recommend improvements to reduce risks and aid with site sustainability. The research findings derived from two primary research questions and five secondary questions which guided the data collection and analysis. Table 6.1 is a summary of the primary and secondary research questions and findings.
### 6.2 Overall Research Findings

#### Table 6.1. Research Questions and Methods of Analysis

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Findings</th>
</tr>
</thead>
</table>
| **Primary Research Question 1**  
How does visitor-induced material damage correlate with the patterns of use and access of individual visitors at a historic site? | Damages in the areas that have the greatest concentration of use, available surface contact areas, and time spent in location affect both degree and intensity of the damage. For example, visitors frequent the house most often and spend the most time there which correlates with areas of high damage concentration. |
| **Primary Research Question 2**  
How, or to what degree, do management and interpretation strategies affect the actions of individual visitors as they relate to material degradation? | Promoted areas such as the house and mulberry row do receive the highest levels of visitation. Additionally, visitors’ behavioral and impact patterns vary in areas that have unguided or minimally guided access, such as in the Monticello outbuildings. It is possible the level of decorum may play a role in why the type of damages are different between the mansion and outbuildings. As the rooms become less visually important, visitors may be more inclined to break the rules of expected behavior. |
| **Secondary Research Question 1**  
What is the degree of physical damage along the visitor path at Monticello? | The conditions assessment identified 353 total counts of visitor-induced damage across the property. Most were minor to superficial. Identified damage included abrasions with material loss, dirt, and oil build-up on surfaces, eroded flooring, and exterior pathway damage and erosion. Of the identified damages, 54% of the damages were superficial and 36% were minor. |
| **Secondary Research Question 2**  
How often does physical damage occur along the visitor path at Monticello? | The greatest concentration of total damage was within the Monticello mansion. The outbuildings displayed the most superficial damage, accounting for 49% of total superficial damage. |
| **Secondary Research Question 3**  
Which areas of the site are most frequently used? | Mulberry Row in its entirety and the Monticello house areas are the most highly traveled to by visitors. 95.8% and 95.4% of all visitors, respectively, travel to these areas while visiting Monticello. |
| **Secondary Research Question 4**  
What is the average amount of time visitors spend in a location? | Visitors spend the most amount of time in the house, approximately 53 minutes. Visitors spend approximately 4 minutes at the grave, which is the least amount of time spent at the identified site locations. |
| **Secondary Research Question 5**  
How often do visitors engage in depreciative behavior? | There were 324 total counts of impact inducing behaviors such as touching or leaning. Based on the sample population, 324 counts of impact-inducing behavior equal 6.48% of visitors, 95% CI [5.72% to 7.08%], that commit a depreciative act, whether intentionally or unintentionally. |
6.2.1 Research Finding 1 and Propositions

Research theories suggest that visitors will weigh their actions and their desire for stimulation in a museum environment with perceived costs of depreciative behavior (Bitgood 2006). Based on this, the research design proposed that areas of congestion and physical location may play a role in the type of damage present. Spaces with higher density and greater periods of visitation would favor more incidental damage. Conversely, areas that are less crowded and more secluded may potentially favor more intentional damage, such as vandalism, due to the visitor feeling more secure as explained by variances in behavior and the General Value Principle.

However, the research suggests that security, congestion, and use play roles in damage type, but so does the level of decorum and amount of available contact area. Seclusion or lack of enforcement or a guide does play a role in the type of damage present, but rather in terms of intensity, not damage type (intentional versus incidental). Outbuildings do not contain as many curatorial objects, generally no guide or docent is present, and more direct contact areas are available to visitors. The mansion represents a high-end space with decorated, finished surfaces and more restrictions on expected behaviors compared to the outbuildings (Fitch 1972). The outbuildings are more vernacular in construction with fewer elements of decoration. As the type of decorum changed the damage changed as well. As the rooms become less visually important, visitors may be more inclined to break the rules of expected behavior. While superficial damages still occur within the house, they are not to the
level of superficial impacts noticed in the outbuildings. The house is more secured and
directed by guides which plays a role in limiting the intensity of damages, rather than
depreciative actions.

The research found that higher damage counts occur in areas that have the
greatest concentration of use, available surface contact areas, and time spent in a
location. All of which affect both the degree and intensity of the damage. For example,
visitors frequent the house most often and spend the most time there which correlates
with areas of high damage concentration. The higher concentration of superficial
damage among the outbuildings is an interesting finding as well. Damage in the
outbuildings was more superficial than in the house or elsewhere on the Monticello site.
Damage included markings on walls from hands and feet, evidenced by multiple
occurrences of shoe impressions. The damage was also noticeably lower in height along
the wall surfaces than in the house.

Additional areas with high visitation, interestingly have the lowest levels of
observable impact. There are likely three reasons for this 1) there are already
designated pathways through the garden, unlike other landscape areas that receive
damage, 2) the area is larger which allows for visitors to spread out more suggesting size
may play a role in damage, and 3) aside from the garden building, there are no
additional structural resources for visitors to come in contact with.
6.2.2 Research Finding 2 and Propositions

The research proposed that there was a relationship between increased counts of material damage in the areas popularized or promoted by interpretation strategies (such as guides and signage), based on the notion that interpretation can be used to guide visitors on how to think about a space as well as how to interact with it (i.e. expected norms of behavior) (Tilden 1957). These historically significant areas within the site, determined from background research and popularized by visitor materials, included the house, the north and south pavilions, Mulberry Row, the lower garden, and the Jefferson gravesite. The research also proposed that interpretation strategies may also influence the type and degree of material damage as well. Specific interpretation language and reference to visitor impact and/or normative behaviors within the interpretation strategies could potentially result in lower counts of material damage or less intentional damage.

The research found, firstly, that promoted areas such as the house and mulberry row do receive the highest levels of visitation (see Figure 6.1). The site promotes these areas in the guidebooks, museum exhibits, and they additionally serve as areas of interest on both the additional slavery and garden tours. They are also part of the historically significant portions of the site for interpretation into Jefferson’s architectural and landscape designs.
Additionally, the research proposed that there was a difference in visitors’ behavioral and impact patterns in areas that have unguided or minimally guided access, such as in the Monticello outbuildings. However, the research found that the difference was more likely due to interpretation strategies and material access, rather than the existence of interpretation signage. While the level of decorum and access to material may play roles in why the type of damages are different between the mansion and outbuildings, it is possible that lack of signage in the interpretation that also plays a role in the amount of superficial damage seen in areas such as the outbuildings. Without signage, visitors are aware of their impact on historic resources and landscape. Existing

![Figure 6.1 Monticello Mountaintop Public Map for Visitors with Promoted Sites. Source and Credit: Monticello.org and the Thomas Jefferson Foundation](image-url)
signage dictates where tours begin and delineate staff use and visitor use. However, there is no signage to direct visitors to 1) stay on pathways and 2) assist with minimizing their impact in the areas with observed damage.

6.3 Recommendations

6.3.1 Recommendation 1

The Monticello preservation staff complete annual assessments and the required preservation and restoration activities as needed. The minimal amount of moderate damages and the lack of severe or substantial damages reflects the attention and care to the buildings and landscape of Monticello. Increased cyclical maintenance in the outbuildings to remove build-up or marks on wall surfaces and architraves may help with 1) reducing additional impacts and 2) preventing the damage from becoming more severe requiring painting or more intensive repairs. Additionally, degraded space may contribute to additional damage as it can often embolden subsequent visitors to do the same (Figure 6.2) (Fitch 1976, 328).
6.3.2 Recommendation 2

Increased signage in the outbuildings or at least a mention to refrain from putting feet on walls in the interpretation of the site may assist with limiting some damages in the outbuildings (see Figure 6.3). Understandably, warning signs should not cover the interior of the mansion and outbuildings. Too many signs may take away from the aesthetics of the site, but additional reinforcement may assist with limiting impacts (Fitch 1976).

Additionally, signage along the landscape or included in the visitor maps could potentially assist with limiting visitors from cutting across pathways. Lastly, increased reinforcement by the guides when they witness incidents occurring as well as being more conscious that visitors often mimic even incidental actions might reduce damage-inducing behaviors.

While messaging can take the form of both personal or non-personal communication, non-personal meaning written or other forms of communication not from an individual, studies that center on the evaluation of the effectiveness of non-personal messaging generally show that messaging does assist with minimizing impacts.
(Johnson and Swearingen, 1992). However, factors such as the content of the message and the background of the visitor play a role in the overall effectiveness of the mitigating undesirable behaviors.

For example, research related to trail usage and messages encouraging visitors to stay on designed trails at Mt. Rainer National Park revealed that the installation of posted signs directing desired behavior was effective at modifying visitors’ actions but also dependent upon the content of the message communicated on the sign (Johnson and Swearingen, 1992). Signs with message content intended to appeal to the morals or values of individuals and their impact on surrounding nature proved to be less effective than those that threatened fines or fees (Johnson and Swearingen, 1992).

In addition to the threat of sanctions or repercussions for undesired behavior, researchers have shown that messages that include additional explanations for requested visitor behavior, specifically those which refer to positive consequences, are more successful in influencing behavior than those that only had a directive on requested behavior (Ham, 2013, 89). Ham (2013) refers to this as the “reasoned action approach” which encourages individuals to think about the positive consequences of their behavior which in turn influences their attitudes and ultimately their actions (Ham, 2013:89).
6.4 Implications

6.4.1 Historic Preservation

The development and refinement of significance in historic preservation theory and practice reflect an evolutionary role of the meaning and importance assigned to historic resources. The concept of significance lies in the theoretical underpinnings of historic preservation theory rooted in mid-nineteenth century ideals. These theoretical underpinnings form the basis of professional historic preservation activities and are necessary for understanding the development and refinement of significance in the American historic preservation model. The assignment of significance to historic resources reflects changing values and approaches to historic preservation.

Within the field of historic preservation, this research assists with determining the effects of physical damage on historic materials and the extent to which those damages range in severity. Physical impacts to historic sites have the potential to affect the significance of those sites by affecting their integrity and the ability to display their significance. By understanding how and where those impacts occur and the factors that influence them, historic preservation professionals can better address the impacts and institute mitigation measures before visitor-induced damages impact material integrity and significance.
6.4.2 Historic Site Management and Interpretation

This research also assists with determining the extent to which use, interpretation, and management play a factor in the location of damage as well as the type of damage. The research also allows for the drawing of abstractions to larger theories of museum experience and site management, including a deeper understanding of how the General Value Principle also applies to the number of exposed materials as well as the hierarchy of space. This is an additional understanding to visitor behavior in addition to simply the security of the space influencing actions.

6.4.3 Visitor Use and Access

Lastly, the research assists with providing data used to develop preservation management strategies to limit the visitor-induced material damage. A process-based framework for the assessment of visitor impact allows preservationists and site managers to better balance retaining both the significance and integrity of a historic site while remaining sustainable and accessible. The assessment of impacts also allows for increased understanding of the influence of visitor’s awareness of impacts on the quality of the visitor experience.

Comprehensive understanding of the interconnection of damage and site usage also affords better site accessibility and damage mitigation without restricting access. While from a historic resource perspective this understanding helps to balance the retention of significance and integrity of the resource with visitation. One potential
method for a better understanding of visitor use and spatial relationships to physical
damage is GPS Visitor Tracking (GVT) used in this study. Derived primarily from studies
designed to assess visitor use at national parks and outdoor areas (Hallo et al., 2005 and
2012; D’Antonio et al. 2010; D’Antonio and Monz, 2010; Beeco, et al., 2014; and
Taczanowska, 2014) the current research demonstrates that various approaches to the
technology have application with understanding visitor use at historic sites as well.

6.5 Limitations

While the research assists with understanding the multiple factors that influence
material damage at historic sites and with the development of preservation plans for
sustainable visitation, the reliance on a single case study and the nature of qualitative
research limit the application of the research findings. The reliance on theoretical
propositions limits the ability of the research to draw generalizations to the larger
population of visitors to historic sites and their predictive behaviors. The findings cannot
predict where visitors will go or the location or extent of damage at other historic sites.
However, the research and findings aid in understanding theoretical principles that
guide visitor behavior such as risk versus reward or the General Value Principle (Bitgood
2006) which allow for the development mitigation strategies elsewhere.

Additionally, the contextual and situational nature of historic sites limits the
research’s generalizability to specific patterns of wear. Due to the differences in
construction, materials, use, management, and other contextual considerations,
generalizations about the rate of wear or the lifespan of a material when exposed to visitor interaction cannot be determined at other historic sites.

6.6 Recommendations for Future Research

Visitor impact research at Monticello highlighted several other areas for research into material degradation. Visitors enhanced surface delamination in several areas of the pavilions and passageways. Further qualitative assessments into the tactile nature of visitors might enhance the understanding of why some visitors engaged in touching objects and why some do not. While depreciative acts appear to be minor at Monticello, archaeological sites or those with less guidance often suffer from graffiti, vandalism, and enhancement of neglect. The research could aid in understanding potential mitigation measures to limit damages. Furthermore, material specific research into the role of additional coatings or consolidants may assist with limiting the build-up of dirt and oil materials on wall surfaces and architraves. Based on this research these areas appear to be the most vulnerable locations to impact.

Additionally, continued research at Monticello could address more qualitative aspects of visitor experience and how visitors perceive various spaces based on the level of decorum. Understanding of visitor perception could aid in understanding spatial differences in material damage type and degree. Findings may also shed light on why different behavior occur in different spaces.
Additionally, in terms of continued visitor impact research at other historic sites, GPS visitor tracking (GVT) has proven to be an effective way of understating spatial-temporal distributions of visitors and users of natural environments, but application in historic environments has been a limitation of recent research. This is likely for two reasons; many historic sites contain only a single structure with minimal exterior environments, especially those in urban areas, making use of GPS technology within the interior relatively ineffective due to signal loss. Secondly, architectural conservation studies and materials conditions efforts with a minimal focus on spatial distribution patterns, save for recent carrying capacity studies and artifact-based museum studies, dominate visitor impact studies of use at historic sites.

Research at larger cultural sites such as Pompeii or Machu Pichu (Wallace, 2016 and Comer et Al., 2016) used methods for assessment of spatial distribution (infrared tracking and google earth mapping) but did not rely on GPS tracking of individual visitors. While this research assists site managers at large archaeological sites including the Valley of the Kings or Hadrian’s Wall, there remains still a need for understanding use at small sites with the goal of sustainable visitation. The application of GPS Visitor Tracking presents new and dynamic opportunities for understanding the spatial distribution of visitors that can assist with limiting damage to historic structures, development visitor use management plans, ensuring the quality of visitor experience, and assisting with site planning for facility or infrastructure improvements.
6.7 Conclusion

This research indicated that visitor impact will exist if historic sites are accessible to the public. Visitor impact presents itself at sites with a million visitors per year and sites with as little as 8,000 visitors. However, there are opportunities for mitigating visitor impact. For example, changes to interpretation plans or visitor guidelines may limit or disperse damage from high-impact locations. Various attractions or areas of visitation assist with spreading visitors through a site rather than concentrating density in a given location. This can likely assist with mitigating impacts. Additionally, when impact does occur, it is often the result of attrition and incidental impacts rather than malicious or intentional events. Regardless of the severity of the damage. Furthermore, the number of surfaces that are available for contact appears to influence the amount of damage present. Balancing between access and impact, including understanding potential sacrificial materials, is a key component to maintaining site sustainability and continued visitation.

Finally, visitor impact is a complex field of study. Multiple factors including use, interpretation, and management can influence the degree and severity of visit-induced material damages. While impact itself may not be generalizable to various sites, a processed-based framework for its assessment can assist with understanding the factors that influence visitor impact at other historic sites. Continued research into refining methods of assessment allows for a more in-depth understanding of the interrelationship between usage patterns and physical damage.
APPENDIX A: IRB APPROVAL

IRB2018-177 Amendment #1 Approval: Data Collection at Thomas Jefferson’s Monticello

1 message

Nalinee Patin <npatin@clemson.edu>   Mon, Jun 18, 2018 at 10:25 AM
To: Carter Hudgins <chudgin@clemson.edu>
Cc: "barteby@clemson.edu" <barteby@clemson.edu>

Dear Dr. Hudgins,


Amendment requested:

1. Adding Thomas Jefferson’s Monticello as a research site (Please send copy of site letter.)
2. Adding focus group session with staff

No change in this approved research protocol can be initiated without the IRB’s approval. This includes any proposed revisions or amendments to the protocol or informed consent document(s). Any unanticipated problems involving risk to subjects, complications, and/or adverse events must be reported to the Office of Research Compliance immediately.

All team members are required to complete the CITI human subjects training course, http://www.clemson.edu/research/compliance/irb/training.html.

All research involving human participants must maintain an ethically appropriate standard, which serves to protect the rights and welfare of the participants. This involves obtaining informed consent and maintaining confidentiality of data. Research related records should be retained for a minimum of three (3) years after completion of the study.

The Clemson University IRB is committed to facilitating ethical research and protecting the rights of human subjects. Please contact us if you have any questions and use the IRB number and title when referencing the study in future correspondence.

All the best,

Nalinee
Monticello Visitor Exit Survey

Directions to Administrator:

Please record the GPS Data Logger Unit number below prior to administering the survey to the participant.

HELLO AND WELCOME

The purpose of this research is to understand visitor use and impact at historic sites. You will be presented with information relevant to your experience at Thomas Jefferson's Monticello and asked to answer some questions about your visit. Please be assured that your responses will be anonymous.

The survey should take you less than ten minutes to complete. Your participation in this research is voluntary. You have the right to withdraw at any point during the study, for any reason, and without any prejudice. This research has no known risks. This research will benefit the academic community to understand visitor use and management of historic sites. Your identity or personal information will not be disclosed in any publication that may result from the study. If you would like to contact the Principal Investigator in the study to discuss this research, please e-mail Carter Hudgins at chudgin@clemson.edu or the Co-Investigator, Laurel Bartlett at bartleb@clemson.edu.

By clicking the button below, you acknowledge that your participation in the study is voluntary, you are 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason.

☐ I consent, begin the study (1)

☐ I do not consent, I do not wish to participate (2)
1. What is your preferred gender?
   - Male (1)
   - Female (2)
   - Prefer not to answer (3)

2. What is your zip code or your country of origin if you are visiting from outside of the United States?

3. Which of the following best represents your current status?
   - Student (1)
   - Employed/Self Employed (Not a student) (2)
   - Retired (3)
   - Other (4)
   - Prefer not to answer (5)
4. Is this your first-time visiting Thomas Jefferson's Monticello?
   - Yes (1)
   - No (2)

5. How many times have you visited Monticello?
   - 1 (1)
   - 2 (2)
   - 3 (3)
   - 4 (4)
   - 5 or more times (5)

6. How many times per year do you visit historic sites in general?
   - 1-3 (1)
   - 4-6 (2)
   - 7-9 (3)
   - 10 or more (4)
   - I do not visit any other historic sites (5)

7. How much time did you spend at Monticello today?
   - Less than 1 hour (2)
   - 1 to 2 hours (3)
   - 2 to 3 hours (4)
8. How did you visit Monticello today?

- As part of a school tour (2)
- As part of an organized travel tour (3)
- By myself (4)
- With friends/family (5)
- Other (6)

9. How many persons visited Monticello with you including yourself?

- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- More than 5 (6)
10. Which tour(s) did you participate in/purchase tickets for during your visit? Please select all that apply.

☐ Monticello Day Pass and House Tour (Guided tour) (1)
☐ Monticello Day Pass and Unguided Walk Through House Tour (2)
☐ Behind the Scenes House Tour and Day Pass (3)
☐ Hemmings Family Tour (4)
☐ Family Friendly Tour and Day Pass (5)
☐ Evening Behind the Scenes Tour (6)
☐ Slavery at Monticello Tour (7)
☐ Gardens and Grounds Tour (8)
☐ Monticello Private Guide Tour (9)

11. Did you take the passenger shuttle to or from the visitor's center?

☐ Yes (1)
☐ No (2)
12. Which location(s) did you visit during your tour today? Please select all that apply.

☐ Thomas Jefferson's House - Monticello (1)

☐ Hemmings Cabin (2)

☐ Stable (3)

☐ Textile Workshop (4)

☐ Vegetable Garden (5)

☐ Mulberry Row (6)

☐ West Lawn and Gardens (7)

☐ Storehouse (8)

☐ Garden Pavilion (9)

☐ Joinery Chimney (10)

☐ Jefferson's Grave (11)

☐ African-American Graveyard (12)

☐ Visitor and Education Center (13)

☐ Picnic Area (14)
13. Which location did you spend the **most** amount of your time visiting?

- Thomas Jefferson's House - Monticello (1)
- Hemmings Cabin (2)
- Stable (3)
- Textile Workshop (4)
- Vegetable Garden (5)
- Mulberry Row (6)
- West Lawn and Gardens (7)
- Storehouse (8)
- Garden Pavilion (9)
- Joinery Chimney (10)
- Jefferson's Grave (11)
- African-American Graveyard (12)
- Visitor and Education Center (13)
- Picnic Area (14)
14. Which location did you spend the **least** amount of your time visiting?

- Thomas Jefferson's House - Monticello (1)
- Hemmings Cabin (2)
- Stable (3)
- Textile Workshop (4)
- Vegetable Garden (5)
- Mulberry Row (6)
- West Lawn and Gardens (7)
- Storehouse (8)
- Garden Pavilion (9)
- Joinery Chimney (10)
- Jefferson's Grave (11)
- African-American Graveyard (12)
- Visitor and Education Center (13)
- Picnic Area (14)

15. The following are questions related to your experience at Monticello and the observance of potential behaviors or physical damage at the site. Again, please be assured that your responses are completely anonymous.
16. During your tour did you notice any physical damage to the buildings or grounds?
   
   [ ] Yes (1)
   
   [ ] No (2)
   
   [ ] I was not paying attention to this (3)

17. If you did notice physical damage to the buildings or grounds, what type of damage did you notice? Please select all that apply.

   [ ] Dirt on walls or railings (1)
   
   [ ] Missing or worn paint (2)
   
   [ ] Worn doorways and floorboards (3)
   
   [ ] Worn pathways or landscape features (4)
   
   [ ] Other (5)

18. Please elaborate on any other damage you may have noticed.
19. Which location(s) did you view any damage at during your visit? Please select all that apply.

- Thomas Jefferson's House - Monticello (1)
- Hemmings Cabin (2)
- Stable (3)
- Textile Workshop (4)
- Vegetable Garden (5)
- Mulberry Row (6)
- West Lawn and Gardens (7)
- Storehouse (8)
- Garden Pavilion (9)
- Joinery Chimney (10)
- Jefferson's Grave (11)
- African-American Graveyard (12)
- Visitor and Education Center (13)
- Picnic Area (14)
20. Did you witness any visitors touching (either accidentally or intentionally) surfaces or objects within any of the buildings?

- Yes (1)
- No (2)
- I was not paying attention to this (4)

21. What types of incidents did you witness?

- Leaning on walls or doorways (1)
- Touching surfaces (2)
- Touching or picking up objects (3)
- Other (5)

22. Please elaborate if you witnessed any other types of incidents.
23. Did you witness any visitors going in areas that were restricted or blocked from access? (i.e. behind railings, into closed rooms, or walking off established pathways)

☐ Yes (1)

☐ No (2)

☐ I was not paying attention to this (3)

24. Where you restricted from accessing any areas of the site during your visit?

☐ Yes (1)

☐ No (2)

25. Which areas were not accessible to you?

26. Do you plan to visit Monticello again?

☐ Definitely yes (1)

☐ Probably yes (2)

☐ Might or might not (3)

☐ Probably not (4)

☐ Definitely not (5)

Thank you for taking the time to complete this survey!
REFERENCES


