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# Museum Professions Outdoors: Implementing Integrated Pest Management Strategies for Outdoor Collections at Historic Sites

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**Museum Professions Outdoors:  
Implementing Integrated Pest Management Strategies for  
Outdoor Collections at Historic Sites**

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**Submitted in partial fulfillment of the requirements for the degree of  
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Seton Hall University  
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## **Abstract**

Due to budgetary constraints, historic houses, more so than museums, provide a different standard of care for their outdoor collections with regards to pest management. Typically, this leads to a historic house waiting until a problem occurs, rather than preventing problems. The prevention of problems is a standard of care more easily and typically carried out on indoor collections. Consequently, outdoor collections fall more easily into disrepair. This does not have to be the case.

Although a relatively new strategy, an Integrated Pest Management Plan (IPM) could be instituted for the historic house's outdoor collection, similar to that of its indoor collection. This plan is not foolproof, but it can significantly reduce the amount of damage and the rate at which the damage occurs. To truly appreciate the possibilities of this strategy, this paper will examine three anonymous case studies in the tri-state area. Interviews have been conducted regarding this subject with the directors, comptrollers, and collections staff of all these sites.

Additionally, an IPM will actually save the historic houses money, especially when compared to the cost of continual treatment. There is only a small amount of literary information available on the best practice for outdoor collections. This paper will discuss new areas of registration practices and technology that will benefit the field as a whole.

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## **Disclaimer**

Very few museum-trained professionals are eager to admit to pest infestations within their institutions. Pest problems tend to carry negative connotations, such as a site is unclean or that their collection is poorly cared for. In order to allow the professionals of three historic sites to speak freely about their pest troubles, this thesis will keep the identities of both the sites and the individuals that work at them anonymous.

## **Chapter One – Introduction**

## **Dangerous Situation**

At this moment in rural Northern New Jersey, a precious piece of American history is deteriorating. In Building F of Site A, during the early 1800s, nearly a decade of study culminated in the first public demonstration of the electro-magnetic telegraph. The result of this demonstration became the Morse code. The structural beams on the second floor of Building F still contain the nails used to string about two miles of wire around the room for that demonstration. Consequently, the building is on the National Register of Historic Places.<sup>1</sup> Despite this, Building F has fallen into such disrepair that it is potentially structurally unsound.

Building F has four floors, including a basement and an attic. Every floor, with the exception of the attic, currently contains pertinent information relating to family life in the nineteenth century, such as agricultural and milling equipment, and telegraph information, including working demonstrations and exhibitions teaching about the influence of the telegraph on American history.<sup>2</sup> Sadly all of this history is decaying and going to waste because of pest infestations.

A personal inspection of Building F revealed that the basement of Building F contains original aqueduct pipes laid in the 1830s in order to sustain the agricultural lifestyle of the site. One is ceramic and the other is a hollowed out cedar tree trunk. The basement level also contains the grinding stones of a milling station and original structural support beams. The ceramic pipe has mold problems, causing the edges to flake away. The cedar pipe is molded and has a termite infestation. The milling equipment and

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<sup>1</sup> "National Register of Historic Places, National Park Service," n.d., <<http://www.cr.nps.gov/nr/index.htm>> (3 March 2007).

<sup>2</sup> Site A: Birthplace of the Telegraph (Morristown: Country Park Commission, 2003), 2.

the support beams suffer from a powder-post beetle infestation that has lasted for at least the last seven years. The beams and equipment are being eaten from the inside out. Many beams are simply dust on the inside, making the second, third, and fourth floors unstable for both the objects and visitors.<sup>3</sup>

The second floor contains milling equipment, including two 600 pound milling stones, perched dangerously on the unstable beams of the basement. This floor teaches visitors about the life of a miller, specifically about the grinding and processing of grain. Because of the pressure on the basement beams, the exterior wood of one corner of the second floor has begun to bow, placing strain on the stairwell and frame of the entire structure. The area where the milling stones are located has been roped off because any additional weight in this area of the floor may cause the collapse of the floor or the beams beneath it.

The third floor is dedicated to the telegraph. There is a powder-post beetle infestation in the walls and ceiling. Birds nest on the windowsills. Every spring there is a ladybug infestation. During the winter of 2006-2007, a family of birds died in one of the walls. In an attempt to retrieve the birds, a large hole was been knocked into one of the third floor's walls, allowing an animal infestation of squirrels and raccoons.

The attic is home to raccoons. Several have been trapped and taken offsite, but they continue to return. The hole on the third floor allows them to travel through the walls and between all the floors. The attic smells of animal feces. Lastly, as part of the milling process, Building F has an attached wheelhouse, which contains a working water

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<sup>3</sup> Emily Holland, "Personal observation," (14 January 2006).

wheel. The raccoons also live in this area. Swamp crickets have infested this area. This area of the building is considered structurally unsound and is roped off to visitors.<sup>4</sup>

Why has this happened? How has it happened? And what can be done to fix it? Many reasons cause historic houses to be under-funded. These fiscal constraints lead to greater problems, such as employment of non-museum trained staff and improper preservation techniques of buildings and collections. Often, sincere pest problems occur before a building can even be registered as a historic site. With a tight budget and a poorly trained staff, treatment of pest problems is often very difficult.

Historic site staff members tend to be over-worked, under-paid. Their resources are stretched very thinly in an attempt to preserve their collections. Outdoor collections<sup>5</sup> and the historic building themselves are often left unprotected from pest infestation because of two antiquated beliefs. The first is that collections stored outside are there because the original function of the object was for outdoor use. In other words, objects stored outside are outdoors because they were meant to be. The second belief is that objects stored in the outdoors or in unheated buildings are of a lesser value than collections stored inside, and therefore, they require less attention. These ideas could not be more false.

Current museum and historic site practice tells us that every historic artifact has a story to tell. Therefore, it is the job of a collections manager to preserve the objects so the stories can be told. The issue becomes how can the preservation of outdoor collections be accomplished in easy and cost-effective ways?

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<sup>4</sup> Ibid.

<sup>5</sup> To clarify, the phrase 'outdoor collections' refers not only to statues or other objects that are displayed outside of a building, but also, to collections that are stored in non-temperature controlled buildings or environments.

## **The Current Best Practice for Outdoor Collection Care**

According to the American Association of Museums (AAM), a conservation plan is considered to be the best practice for outdoor collections and is therefore, essential. In other words, a historic house should have its outdoor collections assessed by a conservator who will establish a written and prioritized plan for cleaning and repair of both the objects and storage. This plan should then be followed through to the best of a collections manager or registrar's ability and funding.<sup>6</sup>

Rebecca Buck states, "A conservation plan . . . is really essential. However, implementation is hard enough for a medium size museum with some money for conservation and collection care, but there is rarely enough staff to follow through. Since conservators are so expensive, we try to hire them to do the overview and teach staff how to follow through with cleaning methods. . . . In small museums or historic houses, the [shortage] of staff and money leads to a problem."<sup>7</sup>

Clearly, what is considered the best standard of care for museums with large collections budgets is not an option for historic houses because of the cost required. With very limited collections budgets, a conservator is usually not an option for historic sites. Therefore, an alternative way to care for outdoor collections must be established.

An Integrated Pest Management plan, or IPM, is a cheaper and more effective way to care for outdoor collections. An IPM is a four-step process, in use since the mid-1980s that controls pests through careful observation and modification of museum or historic house behaviors and environments. IPM plans instituted for outdoor collections

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<sup>6</sup> Rebecca Buck and Jean Allman Gilmore, ed., The New Museum Registration Methods (Washington, DC: American Association of Museum, 1998), 17. Rebecca Buck is the head registrar of the Newark Museum in Newark, New Jersey and is largely considered to be one of the top registrars in the museum field.

<sup>7</sup> Rebecca Buck, "Re: Thesis help," 21 January 2007, personal e-mail, (22 January 2007).

will not only save money, they will provide a better standard of care for items kept outdoors or in non-temperature controlled buildings. The implementation of an IPM for outdoor collections will have a large impact on what is considered the best practice for outdoor collections in the registration field.

### **What is an IPM?**

Originally, IPM was an agricultural term that referred to the development of new pest control methods that did not rely on the continuous use of pesticides to keep crops healthy and pest free. In the early 1980s, the Smithsonian Institution adopted the main IPM principles for use in museums and historic houses. There are three main steps: monitoring for pests, targeting treatment only where it is needed and modifying the environment to discourage pest attack.<sup>8</sup>

Using as much local information and expertise as possible, an IPM seeks to recognize and identify priorities for action, identify the responsible staff members to carry out the IPM, take action immediately on high priorities, and establish procedures for forward planning, financing, and review. In order to produce a successful plan, six components must be understood by all museum or historic site staff members, not just the collections department. Avoid pests by keeping them out, prevent pests by denying them a conducive living environment, recognize the main pest species and the damage they cause, assess the problem through inspection and trapping, solve pest problems by

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<sup>8</sup> Wendy Jessup, "Integrated Pest Management: Not a Fad or Fancy Term But a Valid Operational Strategy," *AIC News*, (1997): 3.

improving the environment and carrying out appropriate treatments, and review IPM procedures periodically and change them when necessary to improve the strategy.<sup>9</sup>

As historic sites suffer tight budgets, it is important to first identify priorities and plan to establish an outdoor IPM in achievable steps. One person, either the registrar or collections manager, should be in charge of implementing an IPM, demonstrating that it is effective in high risk areas, and then adapting the program for other areas of the site. Also, a successful IPM should include all staff. The registrar or collections manager should train staff to identify problems and report them to the collections department. This is important because a historic site's collection is often larger than the collections staff (usually one or two people) can handle by themselves. Therefore, inspecting the site for signs of pest damage can take up virtually all of a collections manager or registrar's time. With the entire staff looking for signs of pests and reporting possible damage to the collections department, areas can be treated and prevention systems can be put in place without straining the collections staff's valuable and limited time.

In the case of indoor collections, two factors in pest defense have naturally been established, a fairly stable temperature and an initial barrier against pest. Because it is impossible to control the temperature of outdoor collections, the way to raise the standard of care for these objects is to make sure that they are pest free. As the first step to an IPM is keeping pests out, historic houses should treat the existing problems and then seal off further access to non-temperature controlled buildings. After an initial barrier against pests has been established, further measures of prevention and other cost saving measures can be considered, such as individually sealing the outdoor collection from harm.

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<sup>9</sup> David Pinniger and Adrian Meyer, Pest Management in Museums, Archives, and Historic Houses (London: Archetype Publications, Ltd., 2000), 2-4.

Outdoor collections can typically be divided into three media: wood, metal, stone. After an initial barrier is created, each object can receive prevention methods based upon the materials an object is composed of.

## **Chapter Two – Background Information**

*In order to understand what makes an IPM so important, one must understand why historic houses are poorly funded, and consequently, the impact this has upon outdoor collections' care.*

## Why Are Historic Houses Poorly Funded?

The general consensus among historic site directors, museum directors, and historic site comptrollers is that there are seven main reasons, among others, that historic houses are poorly funded. This paper will discuss the ‘big seven:’ market saturation, community relevance, shrinking audience base, impact of 9/11 and Iraq war, changes in grant funding, changing technology, and perception. The budgetary pressures placed on historic houses as a result of these constraints cause a lowered standard of collections’ care for collections in general, but particularly for outdoor collections.

*Market Saturation:* The American Bicentennial in 1976 marked the beginning of a major expansion in the number of historic houses and sites restored as public museums, springing from a renewed sense of remembering the country’s past.<sup>10</sup> According to the director of Site B, “There was a proliferation of these attractions created during the 80s and 90s. There are now too many of these [houses and museums] competing for the same limited pool of [money]. Those unable to change with the times, and adjust their programming and interpretive techniques to reflect changing interest in their audience have perhaps suffered the largest decline in attendance, and likewise, funding.”<sup>11</sup> The director of Site C agrees, stating, “There is just too much competition for time, money, and interest with the public today.”<sup>12</sup>

*Community Relevance:* The comptroller for Site B explains, “Traditional communities are changing quickly with the new wave of post Cold-War immigration to the United States. Historic house museums and/or historic sites that were once the corner

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<sup>10</sup> “Chapter Eleven: New Interpretations at Valley Forge,” n.d., <<http://www.nps.gov/archive/vafo/treese/treese11.htm>> (3 March 2007).

<sup>11</sup> Site B Director, “Re: Thesis help,” 22 January 2007, personal e-mail (2 February 2007).

<sup>12</sup> Site C Superintendent, “Superintendent’s View on Directing Historic Site C,” interview by Emily Holland, (19 September 2006), 2.

stones of community history to a relatively homogenous group of citizens (Anglo, African-American, Italian, etc.) now find themselves in communities with a very different ethnic and/or socio-economic composition. These new audiences may not be attracted to these historic sites, since they believe they are not relevant to their own experience.”<sup>13</sup>

*Shrinking Audience Base:* Site B’s comptroller goes on to say, “There has been a ‘paradigm shift’ in how most middle income families spend their leisure time hours. Recreational activities such as sports, gambling, electronic gaming, and beach time have replaced more ‘traditional’ family vacation activities such as visiting museums and natural history attractions. Furthermore, the traditional audience attracted to historic sites (educated, older adults) is shrinking as this audience ages and dies. Younger generations are not being rooted in the culture of visiting historic sites, as those 40+ years and older once were.”

Both Steve Miller, director of the Morris Museum, located in Morristown, New Jersey and the director of Site C agree with this assessment. Miller states, “Cultural institution visiting habits seem to have changed and fewer people are visiting historic houses and sites.”<sup>14</sup> The director of Site C believes that historic houses, “just have not done a great job up keeping up [with changing times] and consequently, money is going to new, more exciting things.”<sup>15</sup> The Internet has further rendered historic sites out-of-touch by bringing about new, dynamic educational programs and innovative ways of learning that historic sites cannot or have not embraced because of backward thinking and budget constraints.

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<sup>13</sup> Site B Comptroller, “Re: Thesis help,” 22 January 2007), personal e-mail (2 February 2007).

<sup>14</sup> Steven Miller, “Re: Thesis help,” 28 January 2007), personal e-mail (28 January 2007).

<sup>15</sup> Site C Superintendent, 2.

*Impact of 9/11 and the Iraq war:* Virtually all not-for-profits have suffered between a 20-30 percent decline in direct funding from their donors, both private and public as well as foundations since 9/11 and the Iraq war. Larger institutions have been able to weather the storm and adjust their staffing levels and programming accordingly.<sup>16</sup> Small institutions, including a large percentage of historic house museums and small historic sites, have not been able to keep pace, and were forced to close. It has also become extremely difficult to find volunteers to staff historic sites, especially when many American households have both parents, and many children, working just to pay the bills.<sup>17</sup>

*Changes in Grant Funding:* The guidelines for traditional sources of government grant funding have changed. Much more emphasis is placed on programs. Site B's director now tries to invest time into socially and culturally diverse experiences, educational programming, and collaborations with other institutions, giving them hope that their institution and its programs are sustainable. Unfortunately, many historic houses and sites struggle to adapt to meet these guidelines.<sup>18</sup> The director of Site C agrees, believing many sites to be "shortsighted."<sup>19</sup> Most historic houses simply were not restored for such purposes. The days of funding for restoration and programs at historic house museums for the "wealthy white owners" are long gone, according to the director of Site B.<sup>20</sup>

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<sup>16</sup> Geoff Edgers, "Citing Budget Woes, Museum of Fine Arts lays off 23 Staffers," n.d., <[http://www.boston.com/ae/theater\\_arts/articles/2004/06/03/citing\\_budget\\_woes\\_museum](http://www.boston.com/ae/theater_arts/articles/2004/06/03/citing_budget_woes_museum)> (3 June 2004).

<sup>17</sup> Miller, 2.

<sup>18</sup> Susan Boren, "Historic Preservation: Background and Funding," in CRS Report for Congress 96-123 (2003), 4.

<sup>19</sup> Site C Superintendent, 1.

<sup>20</sup> Site B Director, 1.

*Changing Technology:* The comptroller for Site B states, “Technology has been a blessing and a curse for historic site audiences. Many potential visitors of historic house museums and historic sites now prefer ‘virtual tours’ from the comfort, and low cost, of their home computers. Visitors are savvier, and expect to find new technology incorporated into historic sites, such as video, audio, and pod-casting technology. When this is not the case, many choose to go elsewhere.”<sup>21</sup> Miller adds, “Over the past thirty years, museums have caused people to expect more from them, in the way of programs, activities, events, and educational and instructional technology. The reasons historic houses and sites were originally preserved was not necessarily for programs but to save something of historic value from destruction. Thus, the rather static life of these places results in a lessening of public interest as people go elsewhere.”<sup>22</sup> For example, most historic sites wish to recreate an era of the past through the use of its collection. Once this era has been created, the purpose of preserving the site has been fulfilled. Beyond this point, little can be done to change this image or to make it more exciting or interesting to the public.

*Perception:* Right or wrong, the director of Site B believes that there is a popular perception in the United States that historic house museums are “stuffy, boring, and antiquated.” Until these perceptions change, funding for such attractions will suffer. Cultural attractions perceived as more exciting, educational, and innovative, such as children’s museums, living history sites, art centers, cultural centers, aquariums, science

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<sup>21</sup> Site B Comptroller, 2.

<sup>22</sup> Miller, 1.

centers with ‘hand on’ activities and approaches, and planetariums, will continue to be more effective in fundraising and attracting visitors.<sup>23</sup>

The combination of these factors clearly puts pressure on historic houses to cut corners financially in as many areas as possible. Unfortunately, this means that collections’ care is cut back as well, leading historic sites to treat problems when they occur, rather than preventing them before they happen. Consequently, as indoor collections are easier to maintain because of the ability to produce and sustain consistent temperatures and humidity levels, they receive a better standard of care than outdoor collections. Once again, this does not need to be the case.

### **Why do Outdoor Collections Receive a Lower Standard of Care?**

A combination of factors contributes to the deterioration of outdoor collections, particularly those of historic houses or sites. Tight finances, existing damage, and public perception are the largest contributors to this problem. Tight budgets cause great difficulties for historic sites. Specifically, if a site is experiences financial difficulties, costs must be cut in as many areas as possible. The area of collections’ care is vulnerable to budget cuts. Registrars and collection managers feel pressure to use the cheapest means of pest treatment and prevention and are often forced to put important conservation or restoration projects off in an attempt to help keep their site open. Often times, employment of a full-time registrar or collections manager cannot even be afforded in the first place and volunteers or unpaid interns take over care of the collection with little or no training as to how to properly or professionally care for the artifacts. With a tight budget, priorities need to be established regarding collection care. Because

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<sup>23</sup> Site B Director, 2.

of misguided perceptions of outdoor collections, this is often how these artifacts come to receive second-rate care as seen in Building F of Site A. In other words, collections become subject to dust, decay, disrepair, and pest infestations.

The reason behind the creation of historic houses also plays into why outdoor collections are plagued with such pest problems. The reasons historic houses and sites were originally preserved was not necessarily for programs, but to save something of historic or societal value from destruction.<sup>24</sup> Usually, this meant that a group of concerned citizens, rather than museum professionals were responsible for the care and upkeep of the historic property, at least for a time. Because these individuals were unfamiliar with museum care procedures, pest problems occurred and were left untreated resulting in large infestations to be dealt with at a future time by trained museum professionals. In almost all cases, registrars or collections managers who treat pest problems rather than preventing them do so because the problem occurred before their arrival and they had no choice.<sup>25</sup> Given the option, surveyed registrars or collections managers would choose to prevent rather than treat a problem, as it is cheaper and easier to care for collections in this manner. However, this is often not an option because of staff shortages, expense, and the fact that problems often already exist in historic sites or houses.<sup>26</sup>

Lastly, assumed value and perception dictate collections' care. Many people, including registrars and collections managers, believe that if an object, such as a plow or shovel, was originally designed for use in the outdoors, than it can withstand the

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<sup>24</sup> Miller, 1.

<sup>25</sup> Emily Holland, "Thesis Help, Short Survey for Collections Managers," 5 February 2007, <RCAAM@SI-LISTSERV.SI.EDU> (7 February 2007).

<sup>26</sup> Ibid.

elements. In other words, it is outside because it is meant to be there.<sup>27</sup> This is a common, misguided view. No historic object can withstand the exposure of the outdoors without damage. Changing temperatures, humidity, precipitation, and the changes of the modern world, such as acid rain and pollution, all take their toll on these objects. The last problem with the perception of outdoor versus indoor objects has to do with value.

Indoor collections may consist of any variety of objects, however, they are considered to be, and often are, of a higher value than the objects outside the house. Indoor collections can contain furniture, textiles, fine china, and paintings. When compared to agricultural equipment, it seems wiser to try to care more for the indoor, i.e. more valuable objects. Therefore, under a tight budget, when money must be saved, funds for collection care go toward the more valuable, indoor collection. However, experienced professionals in the field of registration and collections' care believe that all objects are important and should be equally cared for. This is why an IPM, a strategy normally applied to indoor collections should be considered as a responsible, cost saving method of collections' care for outdoor collection.

In summation, several factors contribute to a historic house providing a different standard of care for outdoor collections with regards to pest management. Typically, this leads to a historic house waiting until a problem occurs, rather than preventing problems before they occur. The prevention of problems is a standard of care more easily and typically carried out on indoor collections. Consequently, outdoor collections fall more easily into disrepair. This does not have to be the case.

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<sup>27</sup> Ms. Green, "Green's View of Collections Management, Site A," interview by Emily Holland, (14 July 2006), 2.

An IPM, a relatively new strategy, accepted as standard practice by the Smithsonian Institution in Washington, DC as of the mid-1980s, could be instituted for the historic houses' outdoor collection, similar to that of its indoor collection.<sup>28</sup> The plan is not foolproof, but it can significantly reduce the amount of damage and the rate at which the damage occurs. To truly appreciate the possibilities of this strategy, this thesis will examine three case studies in the local tri-state area of New Jersey, New York, and Pennsylvania. These sites shall be referred to as Site A, a site with no outdoor IPM, Site B, a site instituting an outdoor IPM, and Site C, a site with a successful and functioning outdoor IPM. All sites are located in Northern New Jersey. The sites will be kept anonymous to protect the institutions' reputations.

IPM plans instituted for outdoor collections will not only save money (especially when the cost of prevention is compared with the cost of continual treatment), they will provide a better standard of care for items kept outdoors. Currently, there is only a small amount of literature available on the best practice for outdoor collection. This paper will present a new type of strategy that will have a large impact on what is considered the best practice for outdoor collections in the registration or collections' care field, benefiting the field as a whole. The goal of historic sites and museums is to provide, preserve, and display art and artifacts for the purpose of educating the public. Therefore, the goal of the field of registration is to find the easiest, most cost-effective, safest, and most successful way to preserve and care for collections so that display and education can be accomplished. This paper will prove that an outdoor IPM is the best new method for achieving these goals.

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<sup>28</sup> Jessup, 2.

### **Chapter Three – Case Studies**

*In order to truly understand how easily an IPM can be instituted and how it can serve as a cost saving measure while providing the best standard of care for an outdoor collection, three historic sites will be examined, Site A, Site B, and Site C, all located in Northern New Jersey.*

## Site A

Site A contains seven buildings and spans 7.5 acres in a rural area of Northern New Jersey. The site was constructed during the early years of the Industrial Revolution, i.e. around 1800. The site contained five buildings in its original configuration, whereas the twentieth century saw the addition of two other buildings. This site has no established indoor or outdoor IPM plan.

Among the original buildings is the restored house of the former proprietor of an iron forgery that ran from the early to mid-1800s. Apart from the historic façade of the house, the collection is entirely indoor and features original furnishings, period antiques, and portraits of the proprietor and his first wife, painted by Samuel F.B. Morse in 1837. Building F, as mentioned in the introduction, is perhaps the most historically significant original building on the site. The building houses antique pipes, gristmill, and telegraph equipment. The building is open to the elements and has no heating or cooling system, essentially rendering the building's indoor collection as an outdoor collection.

The remaining three original buildings relate to the site's agricultural background. In addition to running a forgery and gristmill, the proprietor was also a farmer. A granary building contains an exhibition on early farm machines and tools; a homestead carriage house displays an exhibit dedicated to the iron forgery and displays iron working instruments such as hammers and anvils. Another carriage house is used for workshops, school programs, and special activities. It is not used for collections. None of the three buildings have heating or cooling systems.

The two remaining buildings on the site, Building L and Building E are not original structures. Building L has been restored to become the Visitors' Center and holds

an exhibition pertaining to the forgery's contribution to the construction of steamships. Building E holds permanent collections that will never be displayed, such as iron and ceramic fragments found on the site.<sup>29</sup> Building E's collection is an outdoor collection.<sup>30</sup>

According to Ms. Green,<sup>31</sup> former Collections Manager and Curator of Site A, the largest pest problems experienced by the site were insect infestations, rodents, and raccoons. An infestation by powder-post beetles in the basement of Building F proved especially challenging. Similarly, a mouse infestation occurred in the proprietor's house, whereas raccoons inhabited the attic of Building F, and seasonal hornet nests are still to be found in all outdoor buildings. In addition, birds nested in Building F and the carriage house that contains collections. Moreover, the entire site experiences a general insect infestation.<sup>32</sup>

Only three percent of Site A's budget goes into general collections' care, approximately \$800 of a \$250,000 dollar budget. Green allotted this money into three categories, exhibits care, conservation, and maintenance supplies. Exhibits care received more than half of these funds in the form of boxes and proper storage for the indoor collection. There were areas of overlap between outdoor and indoor collections, such as a

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<sup>29</sup> The outdoor collections in Building E consists of items found on the site with little to no historic value, including broken bottle and pottery shards, pieces of iron, and other broken remnants of life on the site prior to its time as a National Historic site. The large amount of these pieces, combined with their lack of relevance to the current exhibitions has rendered them, in the eyes of the Curator, to be unusable objects. However, as Site A is a historic site bound to the public trust, these pieces cannot be thrown away without going through a formal deaccessioning process. As this would take extensive time and manpower not currently available to Site A because of more pressing collections matters, Green decided to simply store the pieces in Building E until a more permanent deaccessioning can occur. As the pieces were of little value, storing them in adverse collections was not an issue. The pieces are stored in Building E because it is a house that is not original to the site and therefore not relevant to the story that Site A hopes to convey to the public. The house is also not currently open to the public because the basement support beams have rotted and the house is structurally unsound. The house has eventually been scheduled to be completely renovated using monies received from a grant given to Site A by the New Jersey Historical Commission.

<sup>30</sup> "Site A: Birthplace of the Telegraph," n.d., <[http://www.parks.morris.nj.us/speedwell/temp\\_index.htm](http://www.parks.morris.nj.us/speedwell/temp_index.htm)> (10 August 2006).

<sup>31</sup> All staff names will be changed to protect the integrity of the sites used.

<sup>32</sup> Green, "Interview," 5.

vacuum that could be used for both collections, but on the whole, collections' care money was spent on indoor collections. The money spent on the outdoor collection, about \$300, went to the removal of rodents and sticky traps. Money that could be going to prevention must go to cleanup, and this is why Green believes that no indoor or outdoor IPM exists at Site A.<sup>33</sup>

Funding sincerely impacts the way in which collections are cared for. It is “impossible to care for objects properly in [Site A’s] environment.” Temperature and humidity extremes as well as a lack of air circulation take their toll on the outdoor collection and each season brings new challenges. Mold is a problem in spring, buildings are hard to access and work in during the winter. Additionally, “[they] do not get what [they] need from the budget,” such as maintenance supplies. For example, in 2006, the site could not afford pest traps because priorities had already been established to first, restore the building exteriors through a grant provided by the New Jersey Historical Commission and to produce new exhibitions with the remaining collections budget. Not surprisingly, the outdoor collection suffered from new pest infestations, specifically mice in the carriage house.<sup>34</sup> Although there are conservation grants that Site A could apply for, Green chooses not to undertake the application process claiming, “You still need to treat issues yourself and that is very difficult if you are understaffed. It is presently impossible for [Site A].”<sup>35</sup>

Currently, for the indoor collection, Green sets traps near collections and once every two months for sensitive materials and once every four months for non-sensitive materials. She records what kind of bugs have been trapped. She also checks a hydro-

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<sup>33</sup> Ms. Green, “Re: Questions,” 27 January 2007, personal e-mail (27 January 2007).

<sup>34</sup> Green, “Interview,” 3.

<sup>35</sup> Ibid.

thermograph once a month to determine temperature fluctuations. Despite knowing what the issues are, Green cannot change the temperature to make it more stable, nor can she control the pest damage. Besides bi-monthly dusting and laying out mouse and sticky traps, nothing is currently being done for the outdoor collections, which actually make up a majority of Site A's collection.<sup>36</sup> The County Park Commission, of which Site A is a part, recommends a chemical spraying of the buildings each spring to deter pests, but Green avoids using chemicals unless it is absolutely necessary, as they are "unsafe for both museum staff and visitors."<sup>37</sup>

Clearly, Site A's standard of collections' care is well under the recommended standards laid out by the American Association of Museums (AAM).<sup>38</sup> Despite Green's belief that it is far easier and cheaper to prevent than treat, the problems of Site A have always existed, so she is left with no choice. "Prevention is almost a luxury," states Green. She believes that in order to turn the site's collection care around, she would need an assistant collections manager who would be solely responsible for the maintenance, vigilance, and handling of environmental issues that affect the collection. This would allow for periodic checking (of roofs, windows, and basements especially) of problems so that Site A could prevent rather than react to pest infestations. However, this is very unlikely considering the current budget constraints. Also, without "unlimited funds" no kind of climate control can ever be established for the outdoor collections. At a cost of approximately \$800 to \$1,000 per fiscal year, the standard of care being provided to Site A's collections is "poor at best," especially for outdoor collections. Green jokes that with

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<sup>36</sup> Ibid, 4.

<sup>37</sup> Ibid.

<sup>38</sup> Michael W. Schantz and James H. Duff, "Report to the American Association of Museums Accreditation Committee on the Subsequent Accreditation of Montclair Art Museum, Montclair, New Jersey," 16 June 2006, 7-8.

500 times her current budget, she could provide museum quality care for her collections.<sup>39</sup>

The solution is simpler. There are two ways in which Site A could provide a better standard of care for their outdoor collections: temperature and humidity regulation and pest prevention. As there seems to be no way to provide a stable climate without spending thousands, if not millions of dollars over the collections budget, the only way to raise the standard of care is to prevent pests. An IPM is a cheap and effective way to do this. After examining two more case studies, this paper will go into greater detail as to how this may be done.

## **Site B**

Site B is a living historical farm site. Under cultivation since the eighteenth century, the 200-acre site aims to recreate the historic time period between the turn-of-the-century and the 1920s. The site contains two dwellings that visitors may tour: a former residence, which contains indoor collections, and a farmhouse, restored to the period of 1918-1927. In addition to these structures, as a living historical farm, a percentage of the collection is outdoor and is stored and used in the re-creation of the time period.<sup>40</sup> The collection includes “agricultural equipment (from small items like milk jars to large items like tractors and silage choppers), decorative arts (including furniture, artwork, clothing, china), and . . . transportation items (cars, carriages and sleighs). [Site B] also has a manuscript, periodical, map, book, and photograph

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<sup>39</sup> Green, “Interview,” 4.

<sup>40</sup> “Site B Living Historical Farm,” n.d., <<http://www.parks.morris.nj.us/parks/ffmain.htm>> (10 August 2006).

collection.”<sup>41</sup> In general, most of the collections are housed indoors. The site also has livestock such as pigs, horses, chickens and cows and raises crops, like tomatoes and corn. One of the main attractions to Site B is visitor interaction with the animals, such as viewing cows being milked, feeding chickens, and watching plowing. Site B has an indoor IPM plan and the beginnings of an outdoor IPM.

The main conservation issues of Site B are caused by insects boring holes in the outside of the former residence and the farmhouse; birds, such as woodpeckers, boring holes in the two structures; and animals, such as deer, geese, and mice nesting in or leaving droppings on the outdoor collections. For example, geese droppings are often found on agricultural tools. Mice droppings are often found on or inside transportation vehicles. Food, such as dried corn, is often involved with the outdoor activities that happen at Site B, which inadvertently attracts animals to the areas where the outdoor collection is stored.<sup>42</sup>

Although Site B has a lower annual budget than Site A, of \$150,000, \$4,700 is designated for collections’ care. \$1,500 is used for archival supplies and collections-related needs, \$1,200 goes to exhibition supplies, \$500 is set aside for library and archival needs and \$1,500 is specifically dedicated to the residence’s upkeep. Additionally, a trust is in place through the Trustees of Site B to take care of conservation needs. For example, a wagon was conserved in 2006 at the cost of \$25,000. The trust paid for the project.<sup>43</sup>

The indoor IPM at Site B is fairly standard and very effective. A conservator visits the site once a year and makes care recommendations. The collections manager,

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<sup>41</sup> Ms. White, “Re: Questions,” 6 May 2006, personal e-mail (13 September 2006).

<sup>42</sup> Ms. Blue, “Re: Survey,” 19 August 2006, personal e-mail (25 August 2006).

<sup>43</sup> Ms. White, “Re: Thesis help,” 21 January 2007, personal e-mail (14 February 2007).

Ms. White, and assistant collections manager, Ms. Blue, enact these suggestions and perform weekly maintenance of these collections which includes checking for pests, dusting, recording changes in the collections, and adjusting the environments of items that show change. Outdoor collections are treated differently, but the beginning signs of an IPM are now in place.

Because Site B is also part of the County Parks Commission, it takes advantage of the chemical spraying offered to them by the County Pest Management Department (CPMD), a service refused, for the most part, by Site A. The Pest Management Department comes at “various times during the year and sprays the perimeters of buildings and other outdoor collections, such as carriages, as well as setting up traps for animals and insects.”<sup>44</sup> Although the use of chemical treatments prevents a great deal of damage to outdoor collections, this is not the standard of care preferred by White.

Funding prevents the CPMD from coming as often as is necessary. Additionally, there is no one at the CPMD trained in museum practices. Limited funds prevent education and training for the CPMD personnel. Money shortages also limit staff at Site B from having a better understanding of how to control the environments of outdoor collections in order to create an atmosphere that promotes prevention rather than treatment of pest problems.<sup>45</sup> Ideally, White wishes to move away from chemically treating problems altogether, but currently funding prevents this as well.

With a larger budget, White would like to install a deer fence around the entirety of Site B, which would sincerely reduce the amount of large pest damage to outdoor collections. She would also have conservators visit the site more often so that their

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<sup>44</sup> Blue, 1.

<sup>45</sup> Ibid.

professional recommendations for the outdoor collection could be followed by the collections staff of Site B.

Site B is well on its way to implementing an outdoor IPM, which would improve the care of outdoor collections as well as serving as a cost saving venture. The outdoor collections are well cared for from pest attack at the moment, but chemical treatment is not a safe or inexpensive option for visitors, staff, and the animals of the site. An IPM is a chemical free strategy that could aid this collection. Combining an IPM with the existing diligence of the collections management staff at Site B will create a safe and well cared for outdoor collection in a relatively short amount of time.

### **Site C**

Site C is a commemorative encampment historical site located in Northern New Jersey. The site is part of a larger contingency of five sites that preserve the area occupied by the Continental Army during the Revolutionary War. Its main purpose is to interpret this history. The site consists of a proprietor's house, headquarters of a General in the Revolutionary War, reconstructed soldier huts, and walking trails.<sup>46</sup> The collection of Site C is extensive, containing objects ranging from textiles, paintings, and prints to furniture and decorative arts. The site also houses an archive containing 225,000 manuscripts and a research library of approximately 50,000 volumes. The majority of the collection is housed indoors in proper storage that is pest free and temperature controlled, thanks to a written and closely followed indoor IPM, put into place three years ago by head collections manager, Mr. Grey. The outdoor collection consists of cannons and the historic façades of the buildings themselves. Although still an unwritten policy, Grey has

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<sup>46</sup> "Site C," n.d., <<http://www.nps.gov/morr/>> (10 August 2006).

established an outdoor IPM for Site C that has been running cheaply and efficiently for the past two years. With regards to the outdoor collection, the largest pest issues faced are mice, termites, and mold.<sup>47</sup>

Although Site C seems remarkably well put together with regards to pest management, fiscal constraints still affect this site. The overall operating budget of the site is 1.2 million dollars. Of that, \$12,000-15,000 is devoted to the Cultural Resources budget. This is further broken down into Collections' Care, about \$2,000, and the Landscaping budget, which receives the rest of the money. Grey then disperses the \$2,000 "as necessary for routine collections operations."<sup>48</sup> He approximates that in any given year \$500-1,000 goes toward pest management and of that about \$50-100 goes to outdoor pest treatment and prevention.<sup>49</sup> This money pressure affects Grey's collection care in what he believes to be two main ways: lack of personal and consequently, lack of time. The staff he has is stretched too thinly working as best they can with the indoor collection. Currently, there are two collections staff members, including Grey. He believes there should be six, as the lack of staff causes preventable problems to happen, rather than a lack of knowledge on the part of staff members.<sup>50</sup>

With six people working as collections staff, Grey knows that Site C could much better handle the "day-to-day goes on" of their collection.<sup>51</sup> The indoor collections, already stable, would present few if any problems. (Currently, it suffers from occasional

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<sup>47</sup> Mr. Grey, "Grey's View of Collections Management, Site C," interview by Emily Holland, (28 August 2006), 2.

<sup>48</sup> Mr. Grey, "Re: Thesis help," 21 January 2007, personal e-mail (22 January 2007).

<sup>49</sup> Ibid.

<sup>50</sup> Grey, "Interview," 2.

<sup>51</sup> Grey, "Interview," 3.

book mite, silverfish, and textile beetle infestations.<sup>52</sup>) Grey and his staff could focus on the outdoor collections. Also, one staff member could be dedicated to staying in contact with conservation and preservation groups, thereby keeping the site up to date with the latest preservation techniques. At present, there is no written outdoor IPM plan. This concerns the collections department because if either or both members leave the site for any reason, the outdoor collection could be poorly cared for or forgotten, depending upon the diligence of new hires. The indoor IPM is clearly written out, leaving detailed instructions as to how to care for and how often to care for each object in the collection. Records have been kept about former infestations. They record how they were treated and list the warning signs of new outbreaks. This kind of process should be implemented for the outdoor collections as well. The collections staff is only able to check the status of the outdoor collection once every one to three weeks, making it “difficult to detect and respond when things are happening.”<sup>53</sup>

So what does a highly successful indoor IPM entail? To begin with, temperature and humidity levels are controlled in each display and storage room. The temperature is set to 65 degrees Fahrenheit and the humidity remains at 50 percent. UV filters are on all the windows and the shades are drawn at all times. On a weekly basis, collections staff vacuum and dust the collection, marking pests caught in sticky traps or mousetraps and laying out new traps if necessary. Freezing, boric acid insecticidal gel, and rat poison had been used to treat severe infestations in the past, prior to Grey’s implementation of an IPM. These weekly cleanings and inspections give the collections department a very

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<sup>52</sup> Book mites and silverfish attack the archival collection, while textile beetles infest textiles. When infestations occur, Grey and the collections staff isolate the affected objects, lay sticky traps to catch more insects, and vacuum the objects until the infestation is gone.

<sup>53</sup> Grey, “Interview,” 4.

good sense of the building they are working in, including the normal “drafts, smells, and noises,” so they are aware of what is normal for their collections and what is not. Being so familiar with their collection allows them to easily detect and correct any issues that might occur.<sup>54</sup>

The outdoor collection receives a similar sort of care as the indoor collection, but because of budgetary constraints, it receives less of it. Grey believes that the first rule to any successful pest management plan is vigilance. He goes as far as to say, “The cheapest preventative method is observation.”<sup>55</sup> As the collections department does not have the time to check the outdoor collections as frequently as the indoor collections, other members of the staff, such as Park Rangers, have been trained to observe the outdoor collections and report any problems they discover to the collections department. This way, should a problem arise between the outdoor collections’ care checks, Grey can react immediately. In addition to the support received by non-collections staff, Grey applies diatomaceous earth laid around the buildings and outdoor collections of Site C.

Diatomaceous earth is an all-natural form of soil that deters insects and other pests from disturbing outdoor collections.<sup>56</sup> (Its properties and usefulness will be discussed in greater detail in the IPM Implementation portion of this paper.) Chemical treatment is used as a last resort and has not been needed since the institution of an IPM three years ago. Lastly, all staff members are very aware of the proximity of trees, shrubs, and other foliage in relation to the façades of buildings and other outdoor collections.<sup>57</sup> Flora is cut back so as

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<sup>54</sup> Ibid, 3.

<sup>55</sup> Grey, “Email,” 1.

<sup>56</sup> Sherry Butcher-Youngmans and Gretchen E. Anderson, “A Holistic Approach to Museum Pest Management,” AASLH Technical Leaflet 171 (1990): 1-8.

<sup>57</sup> Grey, “Interview,” 2.

to avoid contact between plants and buildings or cannons. This approach helps to prevent any kind of pest transfer between the foliage and the outdoor collection items.

What contributes to the successful indoor and outdoor IPMs at Site C? Grey attributes success to three factors. One is pure luck. Prior to Site C becoming a historic site, the buildings were all well built, well maintained and inhabited by private owners. Not enough time passed between private ownership and state ownership of the site to allow serious pest issues to develop. Two, Grey credits his education and continued learning about IPMs. Already a trained museum professional, Grey is continually in contact with the Canadian Conservation Institute (CCI), Northeast Document Conservation Center (NEDCC), and National Park Service Conservation (NPSC) services in order to stay up-to-date on the latest developments in collections' care and pest prevention. Email advice from these sites is free. He also tries to attend two to three workshops on collections' care each year. Lastly, Grey credits the participation and cooperation of all his staff, not just the collections department. With full-staff monitoring, problems are easily avoided, prevented, and treated if need be.<sup>58</sup>

Prior to the implementation of an IPM, Grey states that the collections of Site C were receiving "adequate care" at almost double the cost of the site's current collections budget. An IPM took three years to fully implement for the indoor and outdoor collection, but each year, the cost of care went down and the standard of care went up. Now he believes the collection, both indoor and outdoor, receives "excellent" care at "a fraction of the former cost."<sup>59</sup> Although Grey believes that more collections money could

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<sup>58</sup> Ibid, 3.

<sup>59</sup> Grey, "Email," 1.

provide a written outdoor IPM plan, more staff, more collections monitoring, and more outreach to conservation groups, the collection is stable and very well cared for.

### **Case Studies Analysis**

As the Case Studies of Sites A, B, and C have presented, the outdoor care practiced by Sites B and C produces a collection that is well cared for, clean, and almost completely pest free. By contrast, Site A, with its lack of an outdoor IPM, has experienced the deterioration of valuable historical artifacts. It is not hard to see that Site C is providing a better standard of care for its outdoor collection, as is Site B, although to a lesser degree. A visitor can notice the difference in cleanliness alone, simply by visiting the sites. Upon leaving the Factory Building of Site A, one visitor remarked, “That has to be the dirtiest building I have ever seen!”<sup>60</sup> If the opinions of visitors, people who generally may not know anything about the professional care of museum collections, are not enough proof of this, one can ask the collections managers of the sites themselves. Grey believes the outdoor collections of Site C receive, “excellent care,”<sup>61</sup> White calls the standard of care at Site B “adequate, but not [her] preferred method of treatment,”<sup>62</sup> while Green judges the standard of care at Site A to be “poor at best.”<sup>63</sup> As a matter of fact, when asked about her knowledge of the other sites, Green has called the standard of care at Site C “enviable.”<sup>64</sup> Perhaps Site C is enviable, but its standard of care is achievable by both Sites A and B.

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<sup>60</sup> Emily Holland, “Personal observation,” (14 July 2006).

<sup>61</sup> Grey, “Email,” 1.

<sup>62</sup> White, “Email, 22 January 2007,” 2.

<sup>63</sup> Green, “Email,” 1.

<sup>64</sup> Ibid.

Another incentive to instituting an IPM for outdoor collections is cost efficiency. Over the long term, an outdoor IPM system will save money. As the budget is a serious concern when planning anything new for a historic site, instituting an IPM is a positive, easy-to-make change. Interestingly enough, both Site A and Site C dedicate the same relative percentage of their yearly operating budget to the care of their outdoor collections. An IPM has obviously aided in providing a higher standard of care as the outdoor collections of Site C experience a safe and pest-free environment, whereas the outdoor collections of Site A continue to suffer from infestations.

Meanwhile, Site B has provided a pest-free environment for its collection as well; but at what cost? Every occurrence of soliciting the County Pest Management Department to spray around the perimeter of buildings and outdoor collections or to remove large pests such as deer or geese amounts to costs of approximately \$500.<sup>65</sup> Spraying pesticides saves the staff considerable time, which can be dedicated to other collections-related tasks, chemical treatment of objects can be unsafe for staff, visitors, livestock and other animals, and potentially the objects themselves. As the example of Site C shows, an outdoor IPM can be maintained on less than one percent of the annual budget and provides a cheaper and safer alternative to the pest control strategy that is currently being practiced at Site B.

Although it took Site C three years to fully implement an indoor and outdoor IPM, they began the process at the same budgetary level as had been allotted to the site in prior years and managed to lower the cost of care for their collection by almost half while simultaneously increasing the standard of care that the objects received.<sup>66</sup> This is mostly

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<sup>65</sup> Ms. White, "Re: Pesticide Costs," 13 March 2007, personal e-mail (15 March 2007).

<sup>66</sup> Grey, "Email," 2.

due to the fact that the first step to a successful IPM is vigilant observation, which is free. Grey states, "Vigilance is the cheapest form of pest prevention."

Site C has shown that an IPM is an effective way to care for outdoor collections. How can historic sites, such as Sites B and A, follow this example? In other words, how can historic sites begin to implement an IPM in cost-effective ways?<sup>67</sup>

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<sup>67</sup> It is important to note that the large number of buildings and the extensive structural work that the buildings need to become sound will cause Site A will take longer to fully establish an outdoor IPM. However, there are small improvements to the non-temperature controlled buildings that can be implemented now which will improve the current condition that collections are stored in. If Site A works slowly, perhaps improving one building at a time, an IPM is possible, but it will certainly take a few years to be fully established.

## **Chapter Four – IPM Implementation**

*An IPM has several steps. This section specifically details the steps needed to implement a successful IPM plan at a historic site. It will also provide an estimated cost for these steps.*

Before discussing how historic sites, such as Sites A and B, could institute an outdoor IPM and thereby increase the standard of care for their collections in a cost-effective manner, the steps of an IPM will be outlined here. Speaking broadly, a collections manager or registrar should recognize and identify priorities for action in the collection. In high-risk areas, treatment should occur immediately and then future prevention techniques should be applied. Later on, preventative steps can be applied to areas of the collection that were not at high risk.<sup>68</sup> Lastly, the IPM procedures should be continually reviewed and improved upon in order to continue to provide an outdoor collection with the best standard of care possible.

The way to implement an IPM is to avoid pests by keeping them out, prevent pests by denying them a conducive living environment, recognize the main pest species and the damage they cause, assess the problem through inspection and trapping, solve pest problems by improving the environment and carrying out appropriate treatments, and review IPM procedures periodically and change them when necessary to improve the strategy.<sup>69</sup>

To carry out these steps effectively, all staff should be given a knowledge of what an IPM is, what it entails, and training as to what kind of pest related damage to look for and subsequently report to the collections department. The first step for historic sites is to treat the existing problems and then seal off the buildings from further pest access. After the exterior of the buildings are sealed off from pests, each object can receive prevention methods based upon its composition.

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<sup>68</sup> Susan J. Bandes, Caring for Collections: Strategies for Conservation, Maintenance, and Documentation (Washington, DC: American Association of Museums, 1984), 22-23.

<sup>69</sup> Pinniger, 7.

### *What to Look for in the Initial Assessment?*

Before implementation, a collections manager must make sure that the buildings themselves are sound. In other words, are the houses' structural systems intact? The structural system of a house refers to the elements of the house that support its weight. These elements are the load-bearing walls and frame of the house (the vertical and horizontal beams within the walls and in the basement of the house that support the weight of the house and the roof), the stone or concrete foundation of the house, and attic frame, which seals together the frame and load-bearing walls.<sup>70</sup>

The first warning sign that a house is unsound, or can no longer support its own weight, are cracks. Cracks indicate that a house has moved in some way. All houses settle with time due to temperature changes causing contractions or a change in the ground under the house, and most cracks do not signify a problem. Watch for stepped cracks in a brick or stonewall, chimney, or load-bearing wall, a straight-line crack across a ceiling in the middle of a room, and horizontal cracks in the foundation. These types of cracks imply that there is something wrong with the actual construction of the house that is causing it to collapse inwardly, making the house structurally unsound.

Other indicators of an unsound house are sagging floors or roofs; one side of the building being lower than the other; a pronounced slope to the floors, doors, or windows; and large cracking in the foundation of a building. Any of these conditions indicate that for one reason or another, the house is unsound and must be completely renovated by a professional. If this is the case, only temporary IPM measures can be put into place before reconstruction of the structural systems of the house occur. In some instances, the

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<sup>70</sup> Charles E. Fisher and Hugh C. Miller, ed., Caring for Your Historic House (New York: Harry N. Abrams, Inc., 1998), 41.

house may be so badly in disrepair that it cannot be saved. The house must be demolished.<sup>71</sup>

### ***Step One: Treat Existing Problems in High Risk Areas (Year One)***

#### *Façades*

After determining that a building is sound enough to proceed, the first step in instituting an IPM is to look for high-risk areas in the outdoor collection that need immediate treatment. After this, the exteriors of the buildings should be sealed off from further pest access. So, what should collections managers be looking for to signify a high risk to the collections? This is a two-part question, as the collections managers should look for indicators to both the façades of buildings and to the collections themselves.

When dealing with façades, high-risk means that the type of problem has or will open up the building to pest infestation, and if left untreated, can cause the building to become unsound. The main high-risk indicators are mold; a lack of paint or stain; cracking paint or paint loss; flaking, rotting, or broken wood; or cracking masonry.<sup>72</sup>

Mold indicates an excess of moisture, which usually stems from improper ventilation or drainage on the outside of the house. Mold can cause a high-risk problem when left untreated because it keeps moisture locked into its roots and therefore, pressed tightly up against the outer structure of a building. This moisture will damage and deteriorate both wood and masonry. Most mold can be treated by scrubbing it with a soft

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<sup>71</sup>Building E and Building F of Site A show these signs. Both buildings will need to go through an extensive and expensive renovation process that involves the rebuilding of much of their outer walls and structural systems.<sup>71</sup> Fortunately, Site A applied for a grant from the New Jersey Historical Society to restore both of these buildings. The site received the grant in 2006 and began massive structural renovations to both of these buildings to be completed by 2009. In the mean time, Green can protect and care for the objects in each of these buildings individually, as the buildings exteriors are too damaged at the moment to create an initial barrier against pests.

<sup>72</sup> Fisher, 44.

brush dipped in a mixture of one part distilled water, one part bleach. Also, improved ventilation, such as a screened, open window or a fan will help. Mold is high-risk when, after a bleach solution has been tried, the mold seems to go deeply into the wood or masonry. If penetration has occurred, a conservator or historic contractor should be consulted. As most sites already have bleach and distilled water as part of an existing cleaning routine, this IPM procedure can be done at no additional cost to the collections budget.<sup>73</sup>

A lack of paint or stain; cracking paint or paint loss; and rotting, flaking, or broken wood are interconnected to the same problem. Paint or stain protects wood from the elements. If untreated wood is exposed to the elements, it will rot or flake and break away, creating holes in the building's outer structure and exposing both the façade and collections stored inside the building to pest attack. If limited surface damage is present, such as blistering, peeling, or alligatoring, scrap away the damaged paint and apply a layer of paint or stain. This will usually correct the problem. If small amounts of broken or flaking wood are present and can be removed to avoid contaminating surrounding wood, such as a damaged shingle or flaking edge, cut away or remove the damage and replace it with a new part, such as a new shingle, and repaint it to match the rest of the building. If the damage has penetrated the outer structure of the house, the damaged section of the house will have to be replaced by a professional historic contractor.<sup>74</sup> In most cases, historic houses have paint onsite that matches the color of their buildings. If this is not the

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<sup>73</sup> Laura Hartz, "Uninvited Guests: Protecting Collections from Pests," paper presented at the Conservation Center for Art and Historical Artifacts, Philadelphia, Pennsylvania, 7 April 2006, 4.

<sup>74</sup> Fisher, 84.

case, one can of paint is more than enough to touch up many buildings and will cost approximately \$25-50. Individual replacement shingles run from \$3-6.<sup>75</sup>

Lastly, cracking masonry can expose a building to pest infiltration. Cracking in the brickwork, stonework, or foundation of a building is problematic in many ways. One, it can cause a building to become structurally unsound. Two, cracks that are large enough to penetrate the outer layer of a building provide a passageway for insects and small animals to get inside the building, thus, exposing collections therein. If cracks are deep enough to expose the inside of a building to the elements, it is beyond the abilities of a collections manager to correct and a conservator and a historic contractor must be contacted immediately. However, for smaller issues, such as cracks in a chimney, caulks, sealants, and cement can be applied. Caulk or similar sealants should be used where wood or metal abuts a masonry surface, such as window frames. Cement can be pressed into cracking walls or foundations. Caulk can be found at any hardware store for less than \$2 and a typical bag of cement costs about \$30.<sup>76</sup>

These symptoms can be present and do not necessarily indicate that a pest infestation has occurred or will occur, but these symptoms must be closely monitored in the future to make sure that their status does not change and that the improvements made continue to be effective. If they worsen, a conservator or historic buildings contractor should be consulted. To assess if pest infestation has occurred, a collections manager should now check the current status of the collections within the buildings.

Identifying these issues and taking steps to correct them has begun the process of sealing off the exteriors of historic buildings from further pest problems. After an initial

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<sup>75</sup> "Search Engine," 2007, <[www.homedepot.com](http://www.homedepot.com)> (15 March 2007).

<sup>76</sup> Ibid.

barrier has been created, low-risk façade issues that do not penetrate the interior of the building, such as ascetic problems (unsightly damage that presents no real or immediate danger to the house), mold growth over painted or stained surfaces, or superficial cracks and or damage, can be treated by using the same techniques as previously discussed for more serious issues.<sup>77</sup>

### *Collections*

If any signs of an insect or rodent infestation are present, this is considered a high risk to the collection and must be treated immediately. When searching for insect infestations, be sure to concentrate on dark corners and dead spaces, particularly in attics and basements. Areas where food may be present, such as kitchens, also present a danger. Windowsills and filtration units can also harbor insects. Birds' nests, live animals as well as their food, and potted plants also tend to carry large numbers of insects.

When searching, be methodical and use a flashlight. Search under and inside all objects, moving them if possible. Every area of display and storage must be examined. The best indicators of a pest infestation are live insects, but dead insects or fragments can also indicate a problem. Frass (insect excrement), silk webbing, or the cast skins of larvae are also signs of a problem. Lay sticky traps in the corners of each room being inspected for basic monitoring. These traps are effective because dead insects often serve as food for others bugs and will attract them to the traps as well, giving the collections manager a broader view of the types of insects, and how many, pose a threat to the collection. Keep a log containing information about what type of insects are found, what stage of life the

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<sup>77</sup> Sherry Butcher-Youngmans, Historic House Museums: A Practical Handbook for their Care, Preservation, and Management (Oxford: Oxford University Press, 1993), 162.

insect was in (larvae, adult), and what indicates its presence in the collection (frass, webbing). Once the types of insect have been determined, treat the infestation by species. For example, use pheromone traps for species such as furniture beetles and biscuit beetles, but use fumigation for powder post beetles, as different species of pest are susceptible to different kinds of poisons.<sup>78</sup>

After a careful initial inspection, set up a notebook or computer document that records the condition of each object. Using non-collections staff for extra help if necessary, conduct follow up inspections once a week for the next month, and note any changes to the objects. Photograph or record the damage and remove the object or objects in the affected area for treatment. Changes would include any new holes or piles of fresh dust or frass, deterioration of the object itself, or webbing. All frass comes in distinctive shapes, which will also aid in determining which traps to set. Some species may hibernate, so the only way to know if the species is truly gone is to wait, continue to examine affected areas, and re-treat the next year if the problem still exists.

After the problem appears to be clear, the institution of an initial barrier, including diatomaceous earth, will significantly reduce the amount of insect damage. Insect traps are often the most expensive part of an IPM. A pheromone trap can cost up to \$6 a piece. Sticky traps for general monitoring are about half the price.<sup>79</sup> However, both kinds of traps can last for a full season and are very effective. Also, after the outside structure can serve as an initial barrier against pests, the necessity of these traps will lessen and costs will consequently drop.<sup>80</sup>

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<sup>78</sup> Pinniger, 52-53.

<sup>79</sup> [www.homedepot.com](http://www.homedepot.com).

<sup>80</sup> Biological Infestations (Trenton: Curatorial Services Division, National Park Service, 1988), 2.

Rodent detection is far easier than insect detection. Although these animals are nocturnal and secretive, the signs and traces that they leave behind are very noticeable and can determine an infestation. Droppings (distinctive for each species), half-eaten food or packing, footprints and tail marks in dust, smears, and chewing marks or holes and the amount of these signs that are present will let a collections manager know not only that an infestation has occurred, but also, the relative size of the infestation. If an infestation is present, there are three ways to treat.

Traps, sticky boards, and poisons all have good and bad points. Break back traps or single or multi-live traps are the most common rodent traps available. Break back traps can be effective if they are set up correctly, with the 'food end' being placed against a wall in an area of high rodent activity. Break back traps work on a spring release mechanism. When the weight changes on one end of the trap, such as from a mouse walking over it, the spring releases and snaps down on the rodent, breaking its back and killing it. However, if an animal is injured, rather than killed, it will adapt, as rodents are very quick learners, and become very unlikely to be caught using a trap in the future. Single or multi-live traps are more effective because they are less likely to hurt or frighten the rodents; therefore, they will not become trap-shy. Live traps work on a weight release system. When a rodent enters the trap, the added weight on the floor of the trap release a trap door behind the animal, leaving it alive, but trapped inside the cage. After an animal is trapped, humane killing or relocation of the animals can occur. Trapping is most effective when used with other control techniques.<sup>81</sup>

Sticky boards work through the use of a sticky glue on a board placed in the area where the rodents are present. The animals stick to the glue and are held there, allowing a

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<sup>81</sup> Pinniger, 92.

collections manager to remove the trap and humanly kill the animal. Once again, this method causes rodents to become trap-shy and is inhuman. Its use should be avoided. Lastly, poisons can treat infestations. They are the most effective treatment.

Two kinds of poisons exist, acute poison and chronic poison. Acute poison works on a single feed principle; an animal eats enough of the poison in one dose to kill it. However, this does not always occur. Some rodents do not eat enough to cause death. They will just experience very unpleasant symptoms before rodent recovers. These rodents will never eat poison again. Chronic poison is a better option. Animals eat small doses over a number of feeds, which do not cause unpleasant symptoms if eaten and a condition in the animal that will cause it to die over time, such as the prevention of blood clotting. A combination of multi-live and chronic poison seems to produce the most effective results. It may take two or more years to fully clear a rodent problem. All staff should be aware of an infestation and the signs of them so the collections manager can respond immediately to new signs of a problem. Mousetraps usually run between \$2-5 each and poison costs about \$30 for a season.<sup>82</sup>

While the current problems are being treated in a historic building, the next and most important step to pest prevention in the future should be implemented: sealing off the exterior of the building from further pest attack. It is a surprisingly easy process. If completed in the first year, the costs of pest prevention in the second year of the IPM will go down, while the standard of collections' care improves.

***Step Two: Sealing Off Building Exteriors, Creating an Initial Barrier Against Pests (Year One)***

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<sup>82</sup> [www.acehardware.com](http://www.acehardware.com).

As a collections manager should have already determined at this stage of implementing an IPM where the problems lie in a building by examining the façade, structural system, and collections, corrections can begin. First, any tree, shrub, grass, or other foliage that comes into contact with or hangs over a building should be removed immediately in order to prevent pest transfer from flora to the building. Besides the man hours required, most sites already have a saw and gardening equipment as part of their regular maintenance equipment. This strategy can be done at no additional charge to the collections budget.

Second, all holes in the building, roof, doors or windows must be sealed. For any major patching of large holes that could lead to the building becoming unsound or a major pest infestation, a historic buildings contractor must be contacted. These repairs must be done as quickly as possible, preferably when a collections manager is determining the soundness of the house. In many cases, repairs can be done simply by replacing a loose shingle or board. For less extensive work, such as holes caused by birds, or splits between house slats or around windows, the area with the hole can be covered with wire mesh to form a protective barrier against pests. Wire mesh can be purchased at most home improvement stores for approximately \$40 per 100 feet.<sup>83</sup>

Once mesh has been purchased, it will serve other important purposes in sealing the exterior of a historic building from pests. Rodents will enter a building through any open pipes, holes, or drains. Use mesh to create a seal over any openings from the exterior to the interior of the building, including the top and lower openings of gutters, small holes, ducts and internal pipes, sewers and drains, or ventilation systems.<sup>84</sup> All

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<sup>83</sup> [www.homedepot.com](http://www.homedepot.com).

<sup>84</sup> Fisher, 91.

doors should fit as tightly as possible into doorframes. A historic contractor can build up a door threshold if necessary, but a cheaper, albeit temporary solution, is to install a metal kick plate (about \$25<sup>85</sup>) or wrap mesh around the bottom of a door. A kick plate is a flat piece of metal that covers and protects the wood on the bottom quarter of a door to prevent damage when the door is opened kicked open rather than being pulled or pushed open with hands.

Cover any access holes in the roof with mesh as well, making sure to seal off any bird holes and destroy all nests.<sup>86</sup> Deer-Off can be purchased at any Home and Garden store for approximately \$17.<sup>87</sup> It contains carnivorous animal urine and will discourage birds from nesting when sprayed on windowsills. It must be reapplied after rain. However, as birds only nest in the spring, it is not a concern for a long period of time.

Third, it is very important to clean the gutters of a building and to keep them clear. Debris that collects in gutters serves as a home for insects, thereby attracting birds, other insects, and rodents to this part of the house, which can allow for access to the interior of the building. Gutters should be cleaned once initially in the first year of implementing an IPM, and then mesh should be laid over the top of the gutter. This way, gutters can simply be flushed for cleanliness in the fall and spring of each year.<sup>88</sup>

The next step done to the house itself is sealing all that windows that will not need to be opened. All non-functional windows should be caulked closed around their exterior, and if necessary, around individualized panes of glass. If this is not possible because the windows are functioning, then the insides of the windows should be sealed as tightly as

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<sup>85</sup> "KickPlates.net Products," n.d., <<http://www.kickplates.net>> (17 March 2007).

<sup>86</sup> *Biological Infestations*, 5.

<sup>87</sup> "Deer-Off," n.d., <<http://www.biconet.com/critter/deeroff.html>> (17 March 2007).

<sup>88</sup> Bades, 28.

possible whenever they are not in use. Place sticky traps in front of these windows in order to trap pests and monitor for an infestation. As caulk should have already been purchased for the historic site, this remedy will not incur any additional costs.

The last, and perhaps most effective step in creating an initial barrier against pest, is laying down diatomaceous earth, a completely natural insecticide. Diatomaceous earth comes from a siliceous sedimentary mineral compound which contains the microscopic skeletal remains of unicellular algae-like plants called diatoms. When diatoms are crushed, a fine white powder is produced, the particles of which resemble broken glass. Insects have a waxy outer shell covering their bodies. When they attempt to crawl over diatomaceous earth, this shell is penetrated, causing the insect to dehydrate, which leads to death. Diatomaceous earth is deadly to any insect, but completely harmless to animals, fish, fowl, and humans. A five-pound bag can be purchased for as low as \$20 and can treat up to 2,000 square feet.<sup>89</sup> This product must be applied after every rainstorm, but is clearly worth the investment. Sprinkle the powder around the exteriors of buildings housing outdoor collections and around outdoor objects themselves.

At this point, Year One of an IPM has been implemented. With an initial barrier created and the majority of current pest issues treated, the standard of care of a historic site's collections has been raised. The total estimated cost of these changes, assuming a historic contractor did not have to be hired: about \$400 (accounting for multiple mousetraps, pheromone traps, and shingles). Even at a historic site as financially strapped as Site A, this is half their current collections budget. Therefore, steps can be taken to implement an IPM while still having money left over for other collections' needs.

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<sup>89</sup> "What is Diatomaceous Earth?" n.d., <<http://www.diatomaceous-earth.net>> (19 March 2007).

***Step Three: Protect Objects by Their Media (Year One for High-Risk Objects, Year Two for Low-Risk Objects)***

In general, outdoor collections can be sorted into three media: stone, wood, and metal. Each object should be treated for problems and then sealed, usually in a light wax coating, to treat prior pest damage (if any exists) and prevent any pest damage in the future.

*Wooden Objects*

Fluctuating temperatures and humidity levels present the single greatest risk to wooden objects for they may cause warping or splitting. The second greatest risks to wooden objects are insects and fungi. For outdoor collections, there is nothing a collections manager can do about fluctuating temperatures and humidity levels other than hope that seasonal changes occur gradually. As the goal of an IPM is to raise the standard of care that outdoor collections receive, and this cannot be accomplished by stabilizing the temperature, the collections themselves must be protected on an individualized basis against pest attack. This is a two-step process. First, any insect or fungus damage must be treated, and then wooden objects must be sealed to protect them from future damage.

The vast majority of wooden objects kept in outdoor collections are bare-wood, meaning they are not painted or stained. The recommended treatments that follow are for bare-wood objects only. If an item has a layer of stain or paint, it can be treated and

sealed by reapplying a layer of paint or stain to the abraded areas. A small can of paint or stain can be purchased for under \$10.<sup>90</sup>

If a bare-wood object is suffering from pest damage, there is a wide range of treatments that a collections manager can choose from, however, it is important to keep in mind that all are toxic to humans and should be used only while wearing neoprene gloves, a product that all sites should have readily available. If not, these plastic gloves can be purchased from catalogues or online from museum supplies vendors such as Gaylord, for about \$9 a box.<sup>91</sup> The most effective, and cost-effective, of these strategies is to seal the object in an airtight container, such as a plastic zip-lock bag, with an insecticide strip containing moth crystals. This item may be purchased online for about \$8.<sup>92</sup> Expose the object for one week. Let the piece stand for two weeks, then repeat the treatment in order to kill any newly hatched insects.<sup>93</sup>

For fungus, the best solution is often to remove the damaged section of wood before it contaminates the rest of the object. If this is not an option, fungicides can be applied to the wood surface using a clean cotton cloth. The best fungicide is petroleum solvent with pentachlorophenol or copper naphthenate in a 'water-white' grade. This substance is toxic and highly flammable, and should therefore only be applied while wearing neoprene gloves.<sup>94</sup> Because of this, it is difficult to purchase and often expensive. A better option is to clean the object and place a wax seal around it to prevent further spreading of the fungus.

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<sup>90</sup> [www.homedepot.com](http://www.homedepot.com).

<sup>91</sup> Gaylord, *Your Trusted Sources* (2007), 251.

<sup>92</sup> "Search Engine," n.d., <[www.acehardware.com](http://www.acehardware.com)> (18 March 2007).

<sup>93</sup> A. Bruce MacLeish, *The Care of Antiques and Historical Collections* (London: AltaMira Press, 1995), 112.

<sup>94</sup> *Ibid*, 114.

After treatment has occurred, the next step to protect wooden objects is to seal them against the elements and pest infestation with a wax covering. A cost-effective and readily available wax, such as Renaissance Wax, can be purchased for under \$27 in many museum product catalogues.<sup>95</sup> Using a woolen cloth, chamois, or sheepskin, apply a thin layer of wax to the surface and then buff thoroughly. Never use liquid-self polishing waxes, as they will leave a milky surface on the wood. The layer of wax will seal the wooden object from pest attack and lessen the impact of temperature and humidity, protecting the object and raising the level of care it is receiving. After sealing, the best way to care for wooden objects is cleanliness (dusting with a clean rag is the best regular care for wood), ventilation, and periodic inspection.<sup>96</sup>

### *Metal Objects*

The type of metal an object is composed of will determine its care. As historic sites do not typically store precious metals, such as gold and silver outdoors, the care of more basic metals, such as iron, copper and copper alloys, tin, pewter, and lead will be focused on in this section. These metals are far more likely to make up the metal objects, such as agricultural equipment, that are stored outside. Iron will most likely be the metal most commonly found in outdoor collections.

The main problem affecting iron is rust, which is caused by the metal's exposure to moist air. Although generally not susceptible to insects, rodent urine, feces, and body oils can tarnish or rust objects. Before sealing an iron object, any rust must be cleaned off the surface. For light rust, rub the corroded area with bronze wool (available at Home and

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<sup>95</sup> Gaylord, 248.

<sup>96</sup> MacLeish, 122.

Garden centers for approximately \$5).<sup>97</sup> This process will remove rust, but not desired patinas. Heavily rusted artifacts must be treated by a conservator. Once an object has been cleaned of rust and other surface dirt and accretions, it is vulnerable to the formation of new rust and corrosion. A protective coat should be added immediately. Renaissance Wax or beeswax can be applied, making sure to cover the entire surface of the object. Using a woolen cloth, chamois, or sheepskin, apply a thin layer of wax to the surface of the object, and then buff thoroughly. This will seal iron objects from future pest damage and lessen the impact of the weather.<sup>98</sup> After sealing, protect iron objects through regularly dusting and inspecting.

Copper and its alloys develop a dull red or brown film when exposed to the air or acidity, such as rodent feces, urine, and body oils. In order to clean oxidation off the surface of copper objects prior to sealing them, a homemade brass-and-copper polish is better than any product on the market because it removes less metal from the surface of an object during cleaning. Combine two parts rubbing alcohol (a standard product in historic sites collections' care), two parts distilled water, and enough precipitated chalk to make a thick paste. Precipitated chalk is available through dental supply stores, jewelry stores, and online for about \$8 per pound.<sup>99</sup> Apply a thin layer of polish to the surface of the copper object, rub lightly, and then buff off completely with a clean cloth, paying special attention to removing the polish from any cracks, undercuts, or carvings. When the surface is completely cleaned, the object can be sealed with Renaissance Wax, using

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<sup>97</sup> [www.acehardware.com](http://www.acehardware.com).

<sup>98</sup> MacLeish, 143-5.

<sup>99</sup> "Daniel Smith Precipitated Chalk, 1 lb. Package," n.d.,  
<<http://www.danielsmith.com/products.asp?SKU=284900025>> (18 March 2007).

the same application techniques as for iron objects. Heavily oxidized copper should be cleaned by a conservator.<sup>100</sup>

Tin, pewter, and lead are the last metals that could possibly be a part of a historic sites outdoor collections, although it is unlikely. Iron and copper are far more likely to make up a majority of the metal objects stored outside. Besides pewter, which forms a protective patina that does not need to be removed and can be easily sealed over, none of these metals develop a harmful corrosion on their surface due to expose to the elements. They are, however, sensitive to and can be damaged by the acidity created by rodents. Apply Renaissance Wax using the same techniques as described for iron objects.<sup>101</sup>

After all metal object have been sealed, cleanliness and observation are a collections managers greatest assets in keeping these items safe and well cared for. The wax will prevent further or future pest damage as well as providing a buffer against changing temperatures and humidity levels. At a relatively small cost, about \$40, if more Renaissance Wax needs to be purchased, the metal objects now receive a higher standard of care.

### *Stone Objects*

Stone is the least susceptible to pest problems. Apart from mold growth, which can be rubbed off with a soft bristle brush and a combination of one part distilled water and one part alcohol, insects and rodents do not harm stone. Remove any bird droppings with a soft bristle brush and distilled water. Do not apply a coating of any kind to stone

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<sup>100</sup> MacLeish, 153.

<sup>101</sup> Marjoie Shelley, The Care and Handling of Art Objects: Practices in the Metropolitan Museum of Art (New York: The Metropolitan Museum of Art Press, 1987), 78-9.

objects because stone is a porous media and will absorb the coating.<sup>102</sup> This will destroy the object.

Year Two of an IPM has been implemented. An initial barrier has been created and maintained. The individual objects have been treated, protected, and sealed from pest attack. The cost of the new IPM methods for Year Two has only been \$84. As the outside of the historic buildings have been sealed, as well as the objects, the standard of care of the outdoor collections has been raised. The cost of collections' care has dropped substantially, even from Year One. An outdoor IPM has clearly produced results, while leaving additional money for indoor collections' care, if need be.

#### ***Step Four: Evaluate and Plan for the Future (Year Two and Beyond)***

After creating an initial barrier and sealing all outdoor collection objects, a collections manager must take steps to ensure that the IPM will be followed effectively in the future. First, a regular cleaning and inspection schedule must be established. Once every two weeks (it is not advisable to go longer), a member of the collections staff should clean, dust, or lightly vacuum the outdoor collections and their storage areas.<sup>103</sup>

During these cleaning times, the collections manager should search for any signs of a pest infestation, such as animal prints, feces, frass, or full sticky traps. If pest activity is present, determine how the problem can be treated before it becomes an infestation. Ask, where is this occurring, in a localized area or the whole building? How large does the problem seem to be, is it isolated or an infestation? Can this area be sealed off

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<sup>102</sup> Arthur W. Schultz, *Caring for Your Collections* (New York: Harry N. Abrams, Inc., 1992), 126.

<sup>103</sup> Most historic sites have a museum-quality vacuum. The objects should be vacuumed on the lowest suction level using the brush attachment. If a vacuum is not available, dusting and general cleanliness are acceptable substitutes.

externally or have pests already breached the interior of the building? Is another treatment necessary? Change your cleaning strategies accordingly. The IPM is flexible and effective. In the case of new pest activity, a collections manager can lay more traps, re-seal exterior or interiors, and clean and inspect affected areas of the collection more frequently until it looks as if the infestation has stopped.

If the cleaning of outdoor collections takes place every two weeks, involve other non-collections staff members to inspect the objects once a week and to look for signs of a pest infestation, such as prints, feces, nesting materials, frass. Train the entire staff of the historic site about what pest infestation looks like so anyone who spots a potential problem can report it to the collections staff immediately.

Create a logbook of the buildings and the objects in them so staff members can write down problems, if any, that they saw. When needed, lay new rodent and insect traps. Record all pests found in traps. Rely on professional literature and online resources to explore what kind of damage the insects or rodents caught in traps can do. The best and most recent source for this type of research is [Pest Management in Museums, Archives, and Historic Houses](#) by David Pinniger and Adrian Meyer. Pass this information along to collections and non-collections staff, so they will know what kind of damage to look for and how extensive the damage is, i.e. does the building have an infestation, or does the presence of a particular pest present an isolated incident? After it rains, lay down diatomaceous earth around all historic façades and around outdoor collections. Repeat spraying of windowsills with Deer-Off as needed.

Pay special attention to areas that were previously damaged, record these areas in the logbook and detail what was done to them, when, and how they have held up. Ask, do

they need to be repaired again? Did the repair work or are pests still coming in? If pests are coming in, how can this be fixed? Do you need to treat again? The flexibility of an IPM allows a collections manager to try a new treatment, or provide a better seal to the outside.

In order to continue to provide the very best standard of care possible for outdoor collections, an IPM must be able to change. Evaluate the strategies that make up a site's IPM continuously to make sure collections are safe. For example, if you see that there are mouse droppings in one corner of a room, change your plan by coming every day, rather than every week or every other week, to check for mice. Lay down extra mouse traps in that corner, lay down poison, check the outside of the building for an entrance, seal off any holes, remove food if any can be found. Stop checking everyday after the infestation has stopped. An IPM will allow for a flexible, better knowledge of the collection, so that if an infestation occurs, collections staff can respond immediately, control current damage, and prevent damage in the future.<sup>104</sup>

Write down the plan. An outdoor IPM should be clearly written out, leaving detailed instructions as to how to care for and how often to care for each object in the collection. Keep records of former infestations, repairs made to damaged sections of the buildings, treatments carried out, and list the warning signs of new outbreaks. This information is invaluable if a member or members of the collections staff leave, so the outdoor care continues and proper care of these collections are not forgotten.

*Has an IPM been Implemented?*

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<sup>104</sup> Grey, "Email," 1.

A collections manager or registrar should recognize and identify priorities for action in the collection. This has been done. In high-risk areas, treatment should occur immediately and then future prevention techniques should be applied. This has been done. Preventative steps can be applied to areas of the collection that were not at high risk. This has been done. The IPM procedures should be continually reviewed and improved upon in order to continue to provide an outdoor collection with the best possible standard of care. This has been done.

By the second or third year of an outdoor IPM, pests are being kept out of buildings, cleanliness and sealing objects has destroyed any conducive living environment for pests, the main pest species and the damage they cause have been recognized, problems have been assessed through inspection and trapping, the environment has been improved and appropriate treatments have been carried out, and IPM procedures have been reviewed and changed as necessary.<sup>105</sup> Additionally, by the second or third year, all staff have knowledge of what an IPM is, what it entails, and training into what kind of pest related damage to look for and subsequently report to the collections department. All these steps have been implemented cost-effectively while raising the standard of care received by the outdoor collections. An effective IPM has been implemented.

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<sup>105</sup> Pinniger, 7.

## **Chapter Five – Conclusion**

*Is an IPM truly the best option available to historic sites for the protection of their outdoor collections? If so, how does this impact the field of registration?*

Historic houses and sites seek to provide, preserve, and display art and historic artifacts and objects for the purpose of educating the public. The field of museum registration has aligned itself with such institutions to better serve these goals. Museum registrars therefore are committed to find the easiest, most cost-effective, safest, and most successful way to care for historic art and artifacts so that this mission can be carried out. The Case Studies and IPM Implementation sections of this paper have proved that the best practice approach would be to develop and implement an IPM for outdoor collections for it, simultaneously improves the standard of care for outdoor objects while lowering the cost of care.

When trying to improve the standard of care for outdoor collections, a collections manager can improve upon two things: temperature and humidity levels or damage caused by pests. It is impossible to control the temperature and humidity of items stored outdoors. If temperature-controlled buildings are unavailable because of fiscal concerns, a responsible collections manager should seek to limit and avoid damage caused to collections by pests in order to improve the collections' standard of care. The question then becomes, does an outdoor IPM protect collection effectively against pest damage and infestation?

By comparing the standard of care received by an outdoor collection with no IPM (Site A), with a site that had the beginnings of an outdoor IPM (Site B), and a site that had a working IPM (Site C), it becomes very clear that outdoor collections that are being cared for under an Integrated Pest Management system receive the highest level of care. The collection of Site C is clean, well cared for, and pest free. Meanwhile Site A is suffering from so many pest infestations that have damaged both the historic façades of

buildings on the site as well as certain historic objects, that one building has already been completely restored, thereby destroying its historic façade, and two more buildings need the same historically destructive treatment. The façades and structural systems cannot be saved and must be replaced. Because of years of ignoring pest infestations, Site A will lose some of its historic importance. Clearly having some form of pest inspection and treatment is better than not having one at all. Whether or not to implement an outdoor IPM now depends on cost. As historic sites are under funded, finding a cost-effective strategy to combat pest issues is of the utmost importance.

The active IPM at Site C has actually saved money since its implementation. Grey states that each year the cost of care went down and the standard of care went up. Prior to the implementation of an IPM, the outdoor collections received adequate care for almost double the current budget allotted to the care for the outdoor collection. After implementation, Grey believes that the collection receives “excellent” care at “a fraction of the former cost.”<sup>106</sup> To further prove that an IPM is a cost saving venture, the IPM Implementation section of this paper gives examples of exactly how much the implementation of an IPM for outdoor collections would cost.

Depending on the current pest damage sustained by a site’s buildings and collections, an IPM can be instituted for approximately \$400, half the sum that Site A is spending on a sub-standard level of collections’ care. And over time, these costs go down. The first year of an IPM is the most expensive because the most work needs to be done. In order to protect against pests in the future, treating current pest problems, sealing exteriors, and if possible, individually sealing the objects all must occur. This takes many valuable hours of staff time and a good deal of money. However, in the second year of

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<sup>106</sup> Grey, “Email,” 1.

implementing an IPM, costs drop substantially. Year Two, according to the IPM Implementation section will cost under \$100.

After the initial treatment for pest infestations, many things that had to be purchased will never have to be purchased again, such as pheromone traps or shingles. Also, many products will last beyond the span of one or two years, such as caulk or Renaissance Wax. Although a time will come when all these products need to be replaced, it is very unlikely that they will all need to be replaced at the same time. Therefore, the cost of care is lowered and the budget becomes more flexible in case there is ever an actual collections emergency, which is very unlikely due to the consistency of inspection that an IPM requires. After all, the crux to an IPM's success is vigilant observation, and that is free!

An IPM will not solve the budgetary or funding problems faced by historic houses, but it will lessen the burdens of collections' care while easily raising the standard of care that collections receive. As most historic houses or sites have a very small collections staff, the IPM strategy of including non-collections staff members to help observe the collections for signs of pest damage will relieve some of the pressure on their already thinly stretched time. This level of increased vigilance against pest attack raises the standard of care of the outdoor collections. Maintaining pest free collections lessens the cost of treatment for pest infestation, which can be quite pricey, especially over the long term. Comparatively, based on cost, an IPM is a much sounder business decision for a historic site.

Therefore, as a proven method for raising the standard of care received by outdoor collections while remaining cost-effective, an outdoor IPM should become the standard

method of caring for outdoor collections practiced by the registration field. An IPM for indoor collections is already regarded as the best standard of care that a collections manager or registrar can provide because it keeps collections safe, clean, and well-cared for.<sup>107</sup> Although temperature and humidity cannot be controlled outdoors, the pest protection principles of an IPM can be applied to outdoor collections, thus raising their standard of care. And, as the most cost-effective way to raise the level of care that outdoor objects receive, the field of registration should recognize this method as the best. In keeping with the principles and goals of the registration field, to find the easiest, cheapest, safest, and most successful way to care for a historic site or museums' collections, the outdoor IPM is clearly the answer to the question of how best to care for outdoor collections by cost-effectively keeping them pest free.

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<sup>107</sup> Buck, "Email," 1.

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