

HISTORIC TREE COLLECTIONS MANAGEMENT:

A New Vision for Old Trees

by

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A thesis submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Master of Science in Public Horticulture

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ABSTRACT

Municipalities and institutions of horticulture maintain large numbers of trees, many of which are in the process of senescing. In a botanical garden, park or arboretum, a collection of historic trees comes with the benefits of shade, beauty and a display of natural history but those benefits come with the challenges of safety, liability, aesthetics and a commitment to environmental protection. As a result, institutions of public horticulture are seeking innovative means of understanding, showcasing, and preserving their historic trees.

This research explored the details of management plans created and currently in use by experts in the field. It delved into the practical methodologies of arboriculture and into the culture of trees with the aim of revealing the most current techniques. It addressed the terminology being used for historic and ancient trees worldwide. Additionally, the research examined ways to combine strategies used in museums and architecture for living collections.

The research found that institutional priorities rule when it comes to tree care and that the issues competing for priority include safety, minimizing risk of litigation, and overall aesthetics. The research showed that visitor awareness and resources are both challenges for public gardens with historic trees. This proves the need for a written policy designed to prioritize the historic collection. Additionally the research indicated that sometimes for fear or lack of knowledge, administrations judge too harshly, cut too easily and focus too closely on one specific priority. The trend is that

institutions are reactive as opposed to proactive in the treatment of aging trees. However, with information from institutions worldwide, creative, yet simple philosophies and practical methods were revealed for prolonging the life of ancient trees and building meaningful historic tree collections.

Chapter 1

INTRODUCTION

Prior to the widespread settlement of the United States, the East Coast was covered with vast, diverse forests (Maloof, 2006). In the 17th century, approximately forty-six percent of the country was forested, as compared with approximately thirty-six percent today (USDA, 2001). While trees figured prominently in the culture of the Native Americans, the first settlers regarded the forest as a mystic, frightful place; one either to be avoided or to be conquered (Kellam de Forest, 1982). As the settlers established colonies and outposts, they began using wood as a universal building material and as their singular fuel for heating. Very soon trees became their most important natural resource (Rutkow, 2012). Whenever possible, settlers cleared the forests for agricultural purposes, and then used the wood to build towns, creating the framework for the future of industry. Some trees were spared the ax and grew to achieve giant status. As these trees aged, they functioned as meeting areas, landmarks and playgrounds (Meyer, 2001). The rural cemetery movement came of age and the urban parks were developed, these landscapes became ideal environments for ancient trees and for people (Vernon, 2011). Over time, the general public, horticulturists, arborists and like professionals have come to recognize and value these sentinels eventually inventing measurement tools that estimate tree age without damage or destruction (International Society for Arboriculture, 2013).

The tangible account of our history by historic trees has all the legitimacy and significance of the people, the place and/or the event as found in written accounts.

Trees record history in their rings, their appearance only giving us a hint of what they've seen (Wilson, 2012). Presently, there are a number of historic trees in the United States; trees that tell our story, trees as symbols, trees as reminders and as teachers (Meyer, 2001). The citizens of Cambridge, Maryland treasured their Wye Oak (thought to be nearly 500 years old) until its death in 2002 (Maryland State DNR). Hagley Museum and Library in Wilmington, Delaware still boasts an Osage orange tree (*Maclura pomifera*) thought to be 400 years old. George Washington's tulip poplars (*Liriodendron tulipifera*) at Mount Vernon continue to stand as a testament to the forward thinking character of our first president (Meyer, 2001). Some historic trees have added value to land ownership and have increased tourism in their region (Preston, 1971). As public and private gardens, museums and other institutions recognize the historical significance of their trees, questions and concerns arise about their long-term care and management, with special consideration for their relationship to people and the landscape (Darsney, K., 2012). As aging trees decline and die, their stories have to be told in new ways or they will be lost (Aniško, 2012).

Tyler Arboretum's acclaimed Painter Trees and the Pierce Collection at Longwood Gardens are both a testament to longevity, the foresight of the founders and the ecological systems in which the trees are a part. Like a collection of historic objects, trees have value beyond their purchase price; they have witnessed history and have numinous value through associations with people and events (Kellam de Forest, 1982). Culturally, trees symbolize survival simply because they remain after a devastating event (Quammen, 2012). Trees can be viewed as symbols of hope, and inspiration for endurance (Klingaman, 2000). Trees have even been likened to cathedrals because they can inspire awe and reverence. They have been called "God's

first temples” and a “Living witness” (Yznaga, 2012). Maryland’s Wye Oak has been described as having the atmosphere of “an outdoor church” (Preston, 1971).

Haverford College collects and distributes the seedlings from the Penn’s Treaty Elm, featured in the Haverford College Arboretum (Van Artsdalen, 2013). Additionally, ancient and aging trees can become valuable hosts for beneficial biological diversity (Lonsdale, 2013).

However, Longwood’s Historic Pierce’s Tree Collection has very little interpretation and is in the earliest stages of its management planning. A management plan could include a strategy for implementation of interpretation in addition to language regarding replanting, propagation and care. It should include decision protocols for prolonging the collection, or not, beyond its natural life. Propagation, distribution and or replacement are all options in a management plan for a historic tree collection. Can the trees be used to continue making an impact after they decline and die? Ken Darsney of the State of Delaware’s Division of Historic and Cultural affairs made the need for research clear, saying, “a massive amount of research has been performed by our division on the properties and structures, but very little on the trees and plant material.” This, in combination with all that has been written, creates a compelling reason to determine a way to recognize and to preserve these trees. It’s clear that a deficit of management planning strategies may trigger a cultural loss and prevent historic trees from realizing their potential contributions within public gardens. However, at this time, most public gardens lack a comprehensive, widely accepted management theory to generate a plan for their historic trees (Aniško, 2012).

It stands to reason that a collection of historic trees is not curated in the same way that a collection of inanimate museum objects would be curated. While a

collection of historic objects can “live on” in perpetuity with proper care, a collection of two hundred year-old trees will not live forever, even when well-cared for. When developing a management plan for a living collection, one must assess the purpose of the collection, and be aware of its needs (USNA Living Collections Policy, 2012). Is the collection meant to exist for centuries because of its impact on the landscape? Is it meant to explain a part of history, provide food or medicine, evoke a memory of an important person, or serve as a germplasm resource? In order to create an effective management plan for the preservation and conservation of historic trees, questions such as these and others must be addressed. There is little widespread agreement about the economics of trees and how we value them. The history of the trees and their owners is a significant consideration when devising a management strategy (Thompson, 1976), as are proper management and conservation practices, which contribute to maintaining functional habitats for animals and insects, and improving air quality (Maloof, 2005). There is reason to believe that aging trees and old growth forests provide significantly more health benefits to humans than young trees do (Maloof, 2005), so that some attention to the benefits outside of the aesthetic might be useful in the creation of management plans. With the increasing incidence of juvenile behavioral disorders over the last 30 years, research indicates that a disconnection from nature can cause developmental problems in humans. In fact, a change in our environment could affect or divert the evolution of the human race (Louv, 2005; Sullivan, 2006). Based on this evidence, the roles historic trees play far exceed the provision of simple enjoyment or an appreciation of the outdoors.

The purpose of this research was to collect both widely used and little known techniques, methods and philosophies for planning and managing historic tree

collections. The research explored collections policies, certification programs, institutional values and priorities nationally and internationally. The objective of this thesis research was to develop a framework for the establishment of a management plan for historic tree collections that can be used by any garden, regardless of size or geographic location.

Chapter 2

LITERATURE REVIEW

While there is not an abundance of literature specific to historic tree collections management in the United States, there is no shortage of documentation regarding tree management in a forested environment. Forestry took hold in the United States in the early part of the 20th century (USDA, 2001). What proved to be useful was the work of the US Forest service staff member and conservationist, Aldo Leopold. Leopold wrote and spoke widely about conservation of the nation's forests throughout the 20th century and even broached the subject of an integrated forestry and farmland conservation collaborative (Tanner, 1995). Useful connections can be drawn between the management of forests and ecology and historic plant collections. The field of practical arboriculture is well established in the United Kingdom, whether put to use for the purpose of botanical collections, urban trees or working forests (Kirkham, 2013; Rodger, 2013). There is research documenting the esteem and admiration for forests and trees throughout Germany since the middle of the 19th century. Specific trees in the German forest have been featured on hiking guides and marked as national monuments since before the turn of the 20th century (Wilson, 2012). The United Kingdom's Ancient Tree Forum recently published a handbook on historic tree management that is used throughout Europe. It addresses nomenclature, preservation, and the practical matters of tree care in addition to facts about tree ecology and the tree's role in the biodiversity (Ancient Tree Forum, 2012). In Europe, symbiotic

relationships among trees, forests, animals and insects have been well documented. This has created opportunities for partnerships between the institution representing the tree collection and those that represent the preservation of the landscape, the wildlife and sometimes the populous (Kullman, 2013). The most recent edition of the British standards for tree care includes a portion dedicated to recognizing the roles of ancient trees in the ecosystem and in the maintenance of biodiversity. The standards speak directly to the fact that human interference with trees is sometimes just that, encouraging and requiring arborists to utilize considerable attention to the needs of the tree and the surrounding natural environment before proceeding with construction or tree work (British Standards for Tree Care, 2012). While no widespread research has addressed this concern specifically for botanic gardens or arboreta in the United States, some information exists.

The histories of many American trees abound, including documents focusing on the trees at George Washington's Mount Vernon and those at many historic cemeteries in the United States (Vernon, 2011). The East Coast of the United States boasts numerous tree collections at the former estates of influential families, including but not limited to the Pierce's tree collection at Longwood Gardens and the Painter Plant Collection at the Tyler Arboretum. The United States National Arboretum in Washington, D.C. boasts a collection of dawn redwood (*Metasequoia glyptostroboides*) trees grown from seeds that were brought back from China in the 1940's. Once thought to be extinct, the seeds were found and distributed throughout the world to assure that they would never be in danger of extinction again. Aside from preserving this species, the 70-year old collection provides an opportunity for visitors to walk through a facsimile of a prehistoric forest (FONA, 2001).

In addition to these collections, there are noteworthy individual tree specimens that help tell the story of America. “The President,” a sequoia believed to be over 1000 years old, has been well documented in Sequoia National Park (Quammen, 2012). The Angel Oak in South Carolina has had a loyal following for decades. Recently, a group of more than 10,000 corporations, municipalities and individuals raised more 3.6 million dollars to purchase the 34 acres surrounding South Carolina’s Angel Oak, to insure its’ health (Segrist, 2013). The citizens of Cambridge, Maryland treasured their Wye Oak (thought to be nearly 500 years old) until its death in 2002 (Maryland State DNR). Hagley Museum and Library in Wilmington, Delaware still maintains an Osage orange tree (*Maclura pomifera*) thought to be 400 years old. For almost every disaster or tragedy a dogged tree stands as a survivor, a reminder or a champion, namely the survivor trees at both the 911 Memorial site and at the Oklahoma City bombing site (Official websites, 2013). These trees act as symbols, as reminders and as teachers (Meyer, 2001; American Forests, 2013). Almost every state maintains a list of state champion trees, and many of them are included on The National Register of Big Trees. These are part of an ongoing conservation and awareness-raising strategy to publicize the value of these significant trees (American Forests, 2013). In the early 1930’s a contest was held to identify all the trees in the mid-Atlantic region that were likely standing when William Penn first surveyed the land. Many of those trees stand today and act as monuments, continuing to be of interest and to be cared for seemingly because of the recognition they have received (Wildman, 1931).

In addition to these practical and individual applications of tree preservation, existing literature also addresses the management of object collections and other plant collections. The collections policy for the Historic Hale Byrnes House in Delaware,

for example, references principles regarding acquisition, documentation, inventory and care (Historic Hale Byrnes House Collections Policy, 2009). In a less typical collections policy, the Alutiiq Museum follows a philosophy that includes identifying and caring for the original spirit of the object (Haakason and Stefian, 2004). In addition to what is known about object collections, there are connections between the preservation of historic architecture and historic tree preservation. The AAM (American Alliance for Museums) has policies to guide the development of an applicable management plan for historic architectural and object preservation. These policies are relevant when considering the creation of the management plan for a historic living collection.

Heritage gardens and new arboretum start-ups often include aging trees and at least a cursory discussion regarding their management (Spraker, 1975; Brown, 1990). The origins of Longwood Gardens can be traced to the initial establishment of an arboretum by the Peirce family, without which any discussion regarding historic tree management at Longwood might not exist.

Over the past decade, professionals in the United States have discussed the implementation of long-term management plans for historic trees. As aging trees decline and die, their stories have to be told in new ways or they will be lost (Aniško, 2012). As public and private gardens, museums and other institutions begin to recognize the historical significance of their trees, questions and concerns arise about their long-term care and management, with special consideration for their relationship to people and the landscape (Darsney, K., 2012).

There is a noticeable lack of widely excepted terminology surrounding historic trees in the U.S. Additionally, there is a lack of consensus about how to best care for

trees that have reached historic status. Outside of the National Parks, there is no agreement between states or local municipalities about how to recognize or preserve significant specimens. Even between institutions of horticulture there is a lack of consistency in management styles. Furthermore, few agree about how to prioritize the related concerns surrounding historic trees, mainly preservation, safety, conservation, and awareness in the existing management plans.

In many cases, there is a lack of designating signage or any certification system to clearly communicate tree status, even though certifying agencies in other fields exist. LEED and the Green Building Certification Institute represent a field where institutions are certified by meeting specific requirements that are then followed by continued maintenance after receiving the initial award. The green management style is helpful to the natural environment and to the municipality where the institution is located. The certificate raises awareness for the institution, creating awareness and other various benefits (LEED website, 2013). The Sustainable Sites Initiative program also provides professional credentialing and certification. “It is an interdisciplinary effort to create voluntary national guidelines and performance benchmarks for sustainable land design, construction and maintenance practices” (Sustainable Sites Website, 2013). The International Living Future Institute hosts an innovative competition called the Living Building Challenge. The competition encourages creative design in favor of a greener future where “the built environment can actually thrive in partnership with the ecosystems it inhabits (ILFI, 2013). The National Parks System certifies landscapes as “historic” and maintains the database for the National Registry of Historic Places. (NPS website, 2013). While architecture is recognized and often preserved, there is a clear lack of recognition for trees or tree collections as

official landmarks or protected objects. This is being done at the Tree Council in the United Kingdom. The purpose of their Green Monuments campaign is “to gain special protected status for trees of great historical, cultural or ecological significance.” They are calling these “Heritage Trees” (Tree Council Website, 2013). The UK has recently updated its regulations to reflect this priority with its Tree Preservation Orders (UK Planning Portal Website, 2013).

When comparing the ISA (International Society of Arboriculture) standards with the British and German standards for Arboriculture, the standards themselves differ in sheer number of paragraphs dedicated to the discussion of the ecological importance of trees in the British standards compared to the ANSI A300 Tree Care Standard or the German (ZTV Baumpflege) standards, although the German standards do reference the Ancient tree forum’s recommendations.

Research shows wide and varied literature on the subject of general collections management and environmental stewardship, most times separately and more so in European sources than in the United States. Yet there is still a lack of comprehensive, integrated plans for historic living tree collections at botanic gardens and arboreta.

Chapter 3

MATERIALS AND METHODS

Data was collected and analyzed using both qualitative and quantitative methodology following consultation with the College of Agriculture and Natural Resources Statistical Analysis Lab. All survey, interview, and case study questions were submitted for prior review to the University of Delaware Human Subjects Review Board.

Initial research was conducted to collect names and contact information for botanical gardens, arboreta, private estates and other public horticulture institutions that would be included in this research. Institutions were purposely chosen because they are associated with historic trees or historic landscapes. This included historic house museums, estates, gardens, botanic gardens, arboreta, city parks and recreation departments, historic trusts, and conservation organizations. Two surveys were distributed. The first, general survey, aimed to reveal a broad overview of management styles at national and international institutions. The survey touched on the definition of “historic” and how it is applied to trees and tree collections. Additionally, its purpose was to address the existence of management plans, tree removal, tree planting and propagation efforts. The survey gathered data on relevant fundamental questions and helped to identify case study participants. Because Survey I was distributed to a wide variety of institutions, questions were designed to group participants based on their answers. Skip logic was utilized to display questions to participants who answered one way or another. It was thought that this grouping

would allow for a more thorough comparison and understanding of how institutions act and why. The initial division was done to separate the participants who had historic trees at their institutions from those who did not. A set of questions was developed specifically for those institutions that did not have historic trees. The purpose of this was two-fold. The first purpose was that it was believed that those institutions would still have insight to offer on the subject of historic trees. The second purpose was to allow institutions to self-select, deciding whether or not they consider their trees historic. This self-selection process was intended to be informative because it is as yet unclear how institutions define historic trees. Because one of the purposes of this research is to determine what defines a historic tree it was useful to discover which institutions believe they have historic trees and which institutions do not.

An attempt was made to discover whether or not opinion and awareness of collections management vary across the institution. For instance, would a member of the education department answer differently than an executive or a horticulturist at any given institution. However, this survey was unable to capture that information because most often the survey was filtered through the institution and eventually answered by the curator or tree management staff member, even when it was originally sent to another department..

Survey I was distributed to 580 individuals at 466 institutions; 251 surveys were started and 194 were completed. Of the 194 completed surveys, 129 recipients agreed to participate in additional research, representing 15 countries and 30 US states.

The second survey was distributed only to the 129 respondents who indicated a willingness to participate. The questions were developed to reveal greater details about existing management plans, while looking closely at institutional propagation efforts. Of the 129 recipients, 88 surveys were started and 76 were completed.

Survey I (Appendix A)

The broad nature of the first survey was intentionally designed to identify those institutions having historic trees, as well as determine how many of them had management plans and/or interest in management plans. More specifically the goal of the survey was to discover the general methodologies and philosophies being utilized for long term planning at institutions of horticulture concerning historic trees. It was distributed by email through Qualtrix survey software, which also analyzed the responses

Survey II (Appendix B)

Survey II was sent only to those respondents of Survey I who responded “yes” to Question 50: Would you be willing to participate in more research? In doing so, the respondent shared their email address for future contact. This second survey sought to determine why institutions chose to participate or not in long term planning. Designed to reveal the current values and priorities of the institutions relative to historic trees, Survey II aimed to capture the necessary details for the creation of a long-term management plan.

A few questions of redundancy were introduced in the beginning of Survey II to confirm the results from Survey I. The second survey attempted to determine a number of outcomes. First the survey looked at breadth and depth of collections policies and the existing historic tree management plans. Next, Survey II looks at

propagation and storage of historic genetic material and the possibility of partnerships to achieve this end. Finally, the survey attempts to gain a consensus for the popular terminology surrounding historic trees and to determine the reasons historic trees are important.

Case Studies

The first round of case studies was chosen based on the following criteria:

- Must have a management plan
- Must have trees older than 100 years
- Must have 20 or more historic trees
- Must be willing to participate in more research

Among all the institutions that met the criteria, the Royal Botanic Gardens Kew, and the Royal Parks in London, England were chosen along with Bernrieder Eichen Park in Bavaria, Germany. The age of their trees and the extensive nature of their plans put them ahead of the rest. Kew is relevant for its highly manicured display gardens; the Royal Parks to urban green spaces; and Bernried relevant for its more rural arboreta. All provided perspectives for gardens facing issues of funding, partnerships, mission and succession planning. Personal visits were made to all sites. Questions were developed to probe more deeply into the institution's system of management, funding and long-term planning.

The close of the first survey led to a more critical selection to identify the second set of case studies. This included an additional focus on propagation and stored genetic material. The purpose of choosing North American case studies was to set up a comparison with the European case studies. The second set of case studies was selected based on the following criteria:

- Willingness to participate
- Stored genetic material
- Trees over 100 years in age
- North American Institution

The second set of case studies represented North America and included Vizcaya, an historic estate in Miami, Florida; Longwood Gardens, a display garden in Kennett Square, Pennsylvania; and New York City Department of Parks and Recreation in New York City, New York. Personal visits were made to all three institutions. Meetings with the staff members specific to the historic trees and propagation efforts were arranged. Interview questions were developed based on the individual institution's answers to both surveys. Photographs were taken at each site and various materials were collected for better understanding of the site including brochures, maps and management plans when available.

Additional visits were made to a number of institutions as a result of recommendations and on account of their close proximity and association with historic landscapes. The purpose of their inclusion: to add examples and to widen the perspective of the research. They included the Crown Estate and the Chelsea Physic Garden in London, England, the Munich Botanic Garden in Munich, Germany, the Ivanacker Eichen Park, in Ivanacker, Germany, The Mount Auburn Cemetery and The Arnold Arboretum in Boston, Massachusetts, The Tyler Arboretum in Media, Pennsylvania, and the Morris Arboretum of the University of Pennsylvania in Philadelphia, Pennsylvania. These institutions were visited and photographs were taken. Relevant maps and brochures were collected and informal interviews were conducted with available staff.

Additional research explored the existing certification programs in use by historic sites and other types of collections. The purpose of this exploration was to discover whether or not the creation of a certification process would be effective in identifying and protecting trees or tree collections.

Chapter 4

RESULTS

For clarity, in this research, the word “historic” referred to any tree that might otherwise be known as a heritage tree, an ancient tree, a witness tree, or a champion tree. It also refers to any tree that is significant because it is old, large, planted by a historical figure, memorable or relevant for any reason at all.

Survey I

Originally sent to 580 individuals from 466 institutions, 251 surveys were started and 194 were completed. The most relevant questions and responses from Survey I are included herein but Survey I in its entirety is Appendix A.

Question 1 in Survey I shows the percentage of institutions that indicate they have historic trees on their property (Table 1).

Table 4.1 Responses to question 1 on Survey I, “As assessed by your own definition, does your institution have any trees that are historic or significant?”

Response	Number of Respondents	% of Respondents
Yes	195	85%
No	34	15%
Total	229	100%

The next set of questions, (Tables 2-6), was directed to the fifteen percent who answered “no” to question 1.

Table 4.2 Responses to question 2 from Survey I, “Do you think it’s important for historic trees in public places to be labeled or designated in some way?”

Response	Number of Respondents	% of Respondents
Yes	25	100%
No	0	0%
Total	25	100%

Table 4.3 Responses to question number 3 from Survey I, “How should historic trees be labeled or designated?” Respondents could select more than one choice.

Response	Number of Respondents	% of Respondents
Designating signage on the tree	19	76%
Language on an institutional map	9	36%
Story telling by docents	10	40%
Other	6	24%
Total	25	
Other		
Sign or label near tree; iPhone/hand held apps; Identified by a cell tour perhaps or other high tech to provide additional information; Combination of signage and story telling; Historic tree website		

Table 4.4 Responses to question number 4 from Survey I, “What do you believe are the greatest benefits of historic trees?” Respondents could select more than one choice.

Response	Number of Respondents	% of Respondents
Understanding of place	21	84%
Understanding of self	5	20%
Appreciation of nature	19	76%
Physical health benefits	2	8%
Increased learning about trees	16	64%
Creation of value for neighborhood or park	16	64%
Other	4	16%
Total Responses	25	
Other		
Aesthetics; Building a sense of wonder; Understanding/appreciation of history of site; Ecological habitat		

Table 4.5 Responses to question number 5 from Survey I, “How would you define the word historic?” Respondents could select more than one choice.

Response	Number of Respondents	% of Respondents
A significant figure in history planted this tree.	13	52%
It contributes to a story about a significant historical figure.	16	64%
It was part of a significant historical event on the property.	18	72%
Its exceptional age for the species.	23	92%
Its appearance or habit sets it apart from other like species.	8	32%
It is rare and/or endangered.	11	44%
Other	2	8%
Total Responses	25	
Other		
It’s part of historic landscape; It’s usually a combination of the above, but age is, in my opinion, the most significant factor		

Table 4.6 Responses to question number 6 from Survey I asked respondents if they could recall a situation when a tree had a personal impact on them.

Response	Number of Respondents	% of Respondents
Yes	17	68%
No	8	32%
Total	25	100%

Of the 17 respondents who selected “yes” to question six, all took the time to write their stories. Here is an excerpt from one of them.

“...An ancient Oak [stood] next to a small road, [it] was hollow and had many fractures. Several of the hollowed and dissociated tree parts were still growing as individual parts, where [once] they had been a single stem. The parts were still vital... I was intrigued that a once fragmented and apparently senescent tree could continue to survive beyond anyone's imagination... **A tree in decline does not mean the end of the tree, but can be a renewal and re-imagination of itself.**” (Appendix A)

The next set of questions, Tables 7 and 8, was directed at those respondents who selected “yes” to question number one, “Do you have historic trees on your property?” 85% of the 194 participants reported having historic trees at their institutions. Question 8 was only displayed for those 85%. Their responses are in Table 7. Those who answered “no” to question 8, 66%, moved to question 9 (Table 8).

Table 4.7 Responses to question 8 from Survey I, “Does your institution have a written policy or management care plan for historic trees?”

Response	Number of Respondents	% of Respondents
Yes	60	34%
No	117	66%
Total	177	100%

Table 4.8 Responses to question 9 from Survey I, “Would your institution benefit from having a written long-term tree care management plan?”

Response	Number of Respondents	% of Respondents
Yes	104	90%
No	11	10%
Total	115	100%

The next set of tables (9-11) look at institutional definitions of “historic.”

Table 4.9 Responses to question 10 from Survey I, “What are your criteria for a tree to be identified as historic or significant at your institution?”
Respondents could select more than one choice.

Response	Number of Respondents	% of Respondents
A significant figure in history planted this tree.	83	47%
It contributes to a story about a significant historical figure.	86	48%
Its exceptional age for the species.	127	71%
Its appearance or habit sets it apart from other like species.	94	53%
It is rare and/or endangered.	74	42%
It was part of a significant historical event on the property.	84	47%
Other	43	24%
Total Responses	178	

In question 10 (Table 9), respondents were instructed to choose all relevant answers. Forty-one of the 43 participants who selected the “Other” category wrote comments. Fifteen comments referred to age, size or state champion status. Thirteen

comments referred to family or landscape history, only 3 referred to biodiversity, and one referred to the tree’s mythical status as a local legend. Remarkably, two participants commented that they had no criteria but that their institutions did have trees that they consider historic. One participant mentioned the criteria by the Ancient Tree Forum’s publications out of the United Kingdom.

Table 4.10 Responses to question number 12 on survey I, “What metrics do you use to measure the value of an historic tree?” Respondents could select more than one choice.

Response	Number of Respondents	% of Respondents
Tree appraisal value	47	27%
Environmental/human physical health value	69	40%
Psychological health value	42	24%
Aesthetic value	129	74%
Significance of place	148	85%
Other	30	17%
Total Responses	174	

Of the 30 who selected the “Other” category, 27 commented. These comments covered various topics. Five participants mentioned the value of biodiversity. Cultural significance was mentioned seven times. Notably, four responses said that the value of trees is not measurable and that they do not associate a monetary value with their trees.

Table 4.11 Responses to question number 13, “Using your institution’s definition of historic, how many historic trees are on your institution's property?”

Response	Number of Respondents	% of Respondents
One featured tree	10	6%
More than one historic tree or an entire collection of historic trees	167	94%
Total	177	100%

The next set of questions was displayed only to the institutions that reported having one featured tree. Generally those institutions with only one historic tree, also reported not having a management plan. There was only one case of overlap between those institutions reportedly having only one historic tree and also having a management plan. Ten institutions reported to have only one featured tree. Fifty percent of those institutions’ tree is between 150 and 200 years old. Institutions with only one tree were split almost 50/50 about whether or not identifying interpretative material is utilized. Only one institution reported using lightening protection for the tree and none of the participants reported using protective fencing for the tree. None of the institutions reported that their tree was a liability, seven institutions reported that their tree is considered an asset and two institutions reported that their tree is both an asset and a liability. One respondent wrote a comment about their institution’s tree:

The tree is actually quite hazardous in that it is not in very good health and close to pedestrian walkways, however, many of our patrons would be devastated if it were removed.

Responses were split regarding whether or not the institutions would replant the tree, should it need to be removed. 56% of respondents reported that their institutions would display signage explaining the trees’ absence if death occurred.

When asked about the types of objects they would make from the tree's wood, the most popular answers were, "Provide it to artists to create objects for display," and, "Make mulch." Five individuals commented and those answers can be seen in Appendix A. Eighty percent of respondents reported that they do not collect any type of genetic material from the tree.

Those institutions who selected "More than one historic tree or an entire collection of historic trees," for question 13 were the set for whom the rest of the questions in Survey I were focused. Fifty percent of those respondents work at an institution with 150 acres or more. The other 50% were divided among smaller institutions. Of the 162 participants who completed the survey, 84% reported that they were willing to participate in more research. The following data is divided by subject matter and includes answers from this group.

The following data outlines the responses to questions concerning the age of trees at the participating institutions. 49% said that they had 20 or more historic trees. 46% of that same group reported that their trees date to the 1800's.

The next set of data focused on details about tree collections. Fifty-seven percent of those polled said they do not consider their group of historic trees an official collection. Eleven percent was unsure. When asked whether or not their institutions had used the wood from fallen historic trees to make objects, the set was nearly split, 48% said yes and 52% said no. The 48% who said "yes," shared vast and various items. 41% commented. Bowls were made most often at 42%, only slightly ahead of furniture at 39%. Sixty-three percent of institutions display the objects. Only 31% considered those objects a part of the collection. The complete survey can be seen in Appendix A.

The subsequent data focuses on interpretation in the tree collection. Seventy-five percent of this group said that they do not have special designating signage for the historic trees. Of the 25% who do have designating signage, the most popular method is a sign on the tree and second position is a map explaining where the historic trees are located. The institutions were questioned about the methods in use for telling the history of the trees. This garnered a wide variety of answers from the use of signs and plaques to photographs and hand held technological devices. A map or a brochure was the most popular choice at 54%, where n=79. Institutions were asked whether or not they participate in succession planting, meaning the institution plants trees with the intention that one day they will become historic. 68% of respondents responded that they do indeed do succession tree planting, however 63% of that group reported that they do not interpret these trees in anyway. The complete survey can be seen in Appendix A.

Questions number 36 and 37 addressed genetic material. 63% of respondents stated that their institutions do not collect or store vegetative stock or genetic material of their historic trees. 61% of those who collect genetic material consider that material a part of the tree collection. Those institutions that do collect genetic material were asked whether they replant and if they do replant, do they consider the new specimen the same tree.

Table 4.12 Responses to question 39 of Survey I, “If your institution used the stored genetic material to propagate and replant a historic tree, (for interpretation purposes) would you consider it to be the same tree?”

Response	Number of Respondents	% of Respondents
Yes	10	22%
No	29	63%
Not sure	7	15%
Total	46	100%

Questions 40, 41 and 42 asked participants to indicate the motivations for taking down an historic tree. When polled about acceptable reasons to take down a tree, respondents most often chose “decline in tree’s health” and “liability (danger to visitors or staff).” Respondents offered many alternatives to cutting down a tree i.e. tree surgery and fencing. Eighty-one percent of respondents said that aesthetics alone is not reason to take down a tree, although 19% said aesthetics alone were enough to cut down an historic tree where n=166. Ninety-six percent of respondents said that the negative impacts of pedestrian traffic were not reason enough to take out a tree. Only about half (44% yes/55% no) of respondents have an ISA certified arborist on staff, where n=164.

A cross tabulation was created based on staff size using the questions in Survey I. The following results show the way institutions of different sizes measured up to each other regarding the management of their historic tree collections, allowing us to compare the behavior of institutions of varying sizes. These cross tabulations are displayed in Figures 1-8.

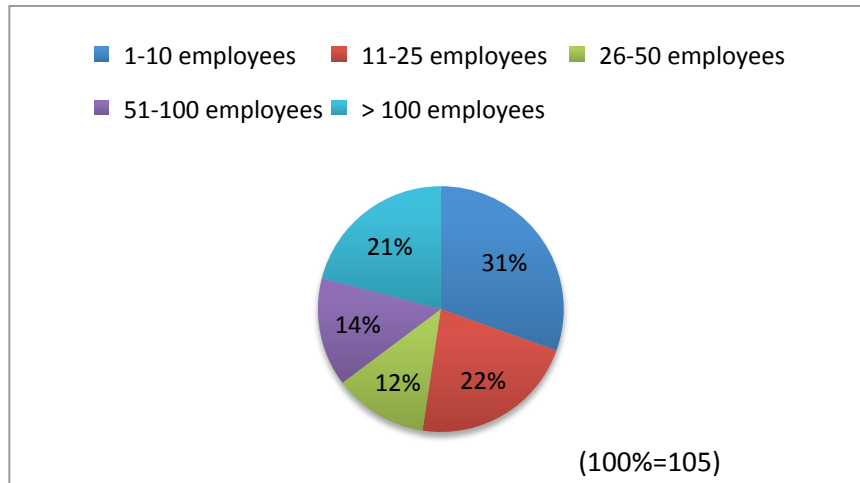


Figure 4.1 Institutions reporting they do not utilize a management plan. Staff size is delineated by color.

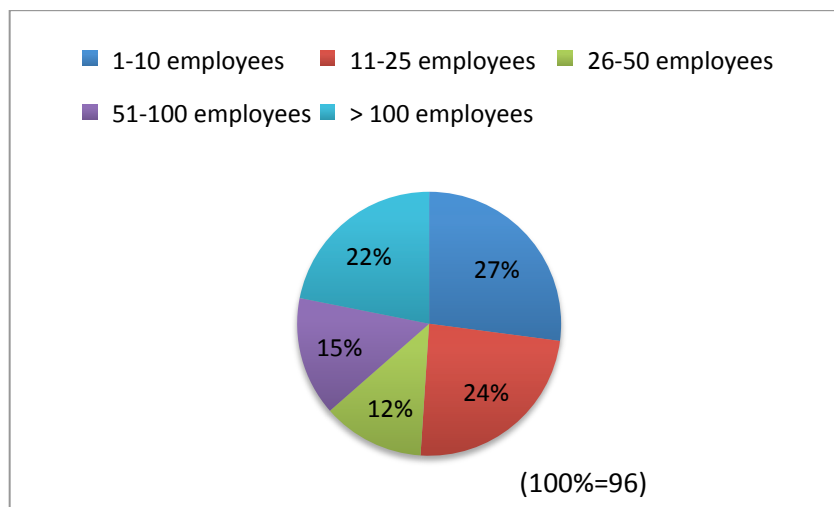


Figure 4.2 Institutions reporting that they need a plan. Staff size is delineated by color.

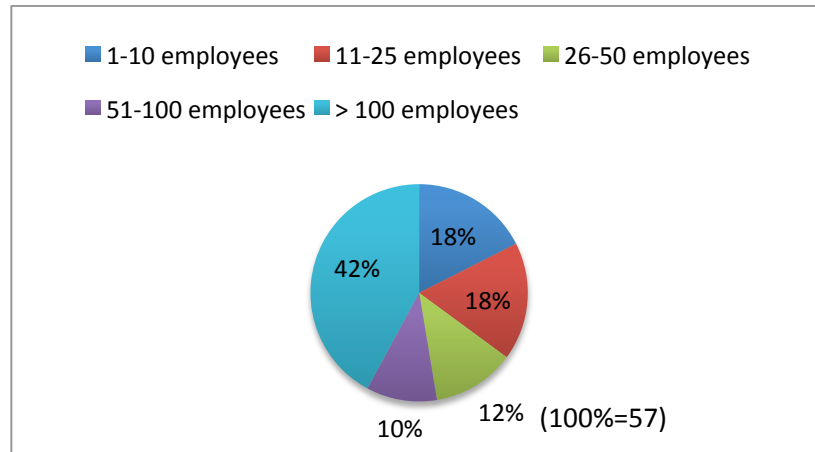


Figure 4.3 Gardens utilizing a management plan. Staff size is delineated by color.

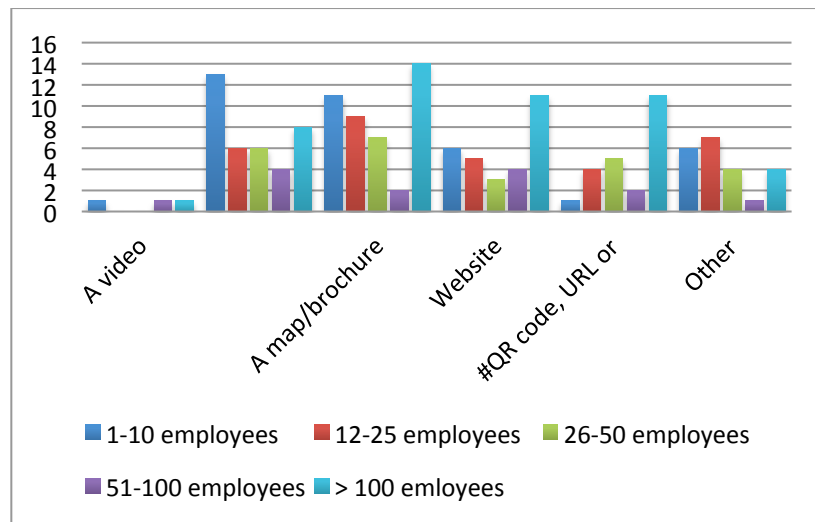


Figure 4.4 Types of interpretation used by gardens. Staff size is delineated by color.

Note that the two shades of blue represent the institutions with the smallest and the largest staff numbers. And yet, those with the most employees and those with the

least employees utilize the highest numbers of docent tours, maps/brochures and website explanations.

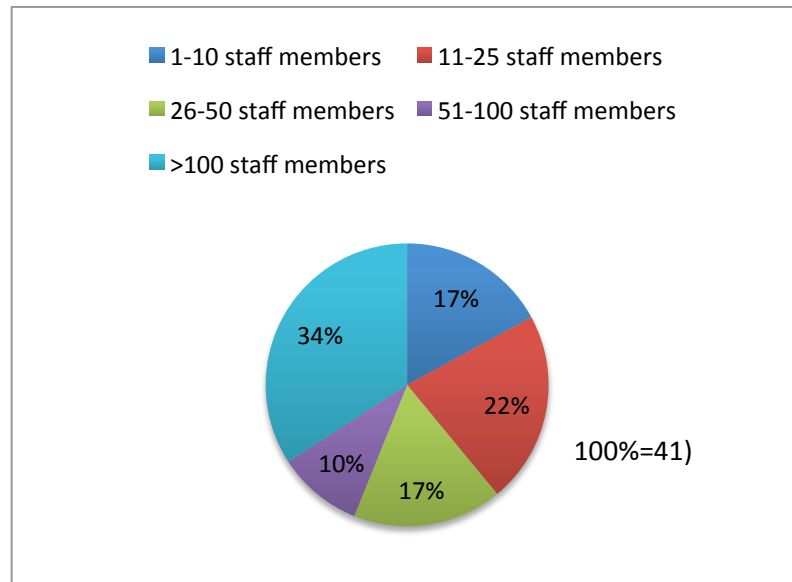


Figure 4.5 Gardens that label the historic trees differently than they label the rest of their tree collection. Staff size is delineated by color.

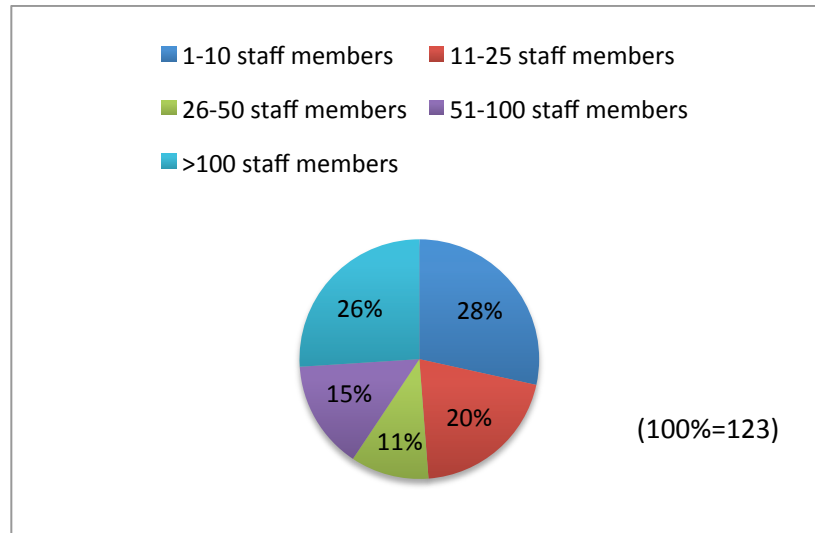


Figure 4.6 Institutions reporting that they do not label their historic trees in a different manner than their other trees. Staff size is delineated by color.

The research is inconclusive in showing whether or not staff size determines ability or interest in using designating signage to set the historic trees apart from the other trees.

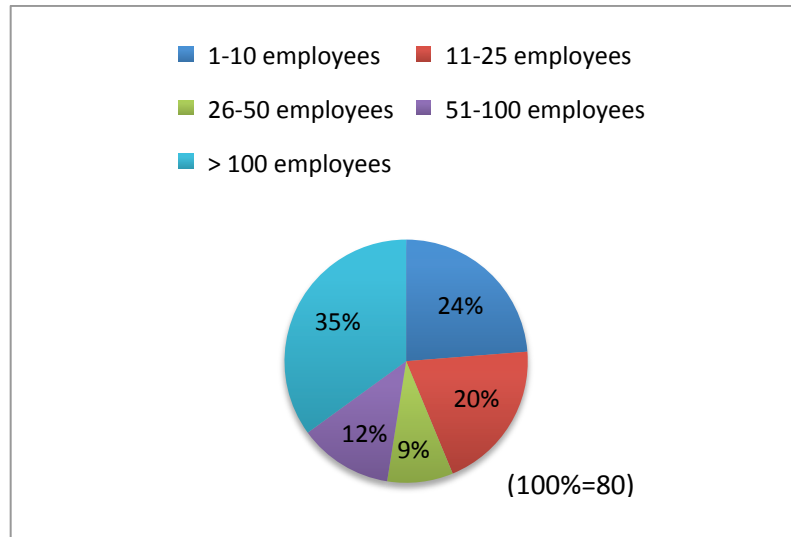


Figure 4.7 Institutions reporting that they have used wood from fallen historic trees to make objects. Staff size is delineated by color.

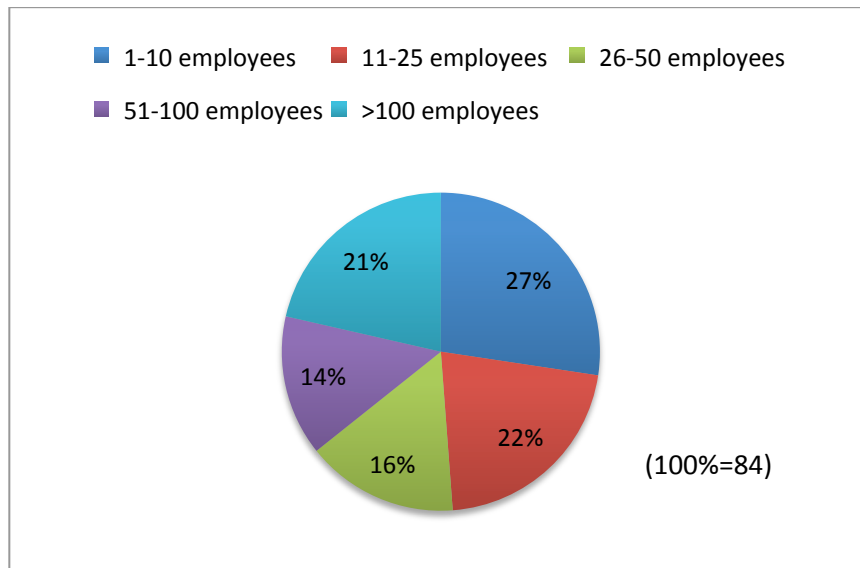


Figure 4.8 Institutions reporting that they have not used wood from fallen historic trees to create objects. Staff size is delineated by color.

Survey II

Survey II was distributed only to those 129 institutions that agreed to participate in more research following Survey I. The criteria for being included in the Survey II was answering “yes” to the question about having historic trees, answering “yes” to having a collection of trees and answering “yes” to the question inviting the respondent to participate in more research. This survey included institutions with and without management plans. Eighty-nine institutions participated in Survey II and 76 completed it. The first ten questions addressed how historic trees are organized within the institution. The survey began by clarifying how many of the institutions utilize a management plan specific to their historic tree collections.

Table 4.13 Responses to question number 1 from Survey II, “Do you have a management plan specific to your historic trees?”

Response	Number of Respondents	% of Respondents
Yes	34	41%
No	49	59%
Total	83	100%

Because it is well known that many institutions collect plants by genus and not age or special stature, question two addressed those institutions that answered “no” to

question one. Question two asks whether the historic trees are included in another collection. Overwhelming the answer was no. Seventy-one percent of respondents answered, “no” and 29% answered, “yes,” where n=49. Question three was directed only to the 29% who said that their historic trees were grouped into another collection. Of those fourteen respondents, only four reported to have a management plan specific to the tree collection within which the historic trees are grouped. Further, those four institutions were asked to state whether or not the tree plans included maintenance techniques specific to the historic trees. Two institutions reported “yes” and two reported “no.”

The next questions were directed toward the 41% of participants who responded “yes” to having a management plan for their historic trees in question 1 of Survey II.

Table 4.14 Responses to question number 5 from Survey II, “Is the management plan for the historic trees a part of an institutional collections policy?”

Response	Number of Respondents	% of Respondents
Yes	15	44%
No	19	56%
Total	34	100%

Participants whose management plan is a part of their institutional collections policy were asked to describe that collections policy. Eighteen institutions responded to this question and 61% of those said, “We have practical management plans for

historic trees, but no long term collections policy.” The next question, (Table 4.15) brings to light one feature of the existing plans.

Table 4.15 Responses to question number 7 from Survey II, “Does your management plan include a tree assessment?”

Response	Number of Respondents	% of Respondents
Yes	26	81%
No	6	19%
Total	32	100%

Institutions reported most often (52% of the time) that a Certified Arborist completed the tree assessment, although Consulting arborist and member of horticulture staff were also selected. Tables 16-18 outline the depth and inclusiveness of the management plans.

Table 4.16 Responses for question number 9 of Survey II, “Does the management plan for the historic trees include a Risk Management Assessment?”

Response	Number of Respondents	% of Respondents
Yes	24	75%
No	8	25%
Total	32	100%

Table 4.17 Responses for question number 10 from Survey II, “Does the Management plan for the historic trees include a maintenance schedule?”

Response	Number of Respondents	% of Respondents
Yes	24	75%
No	8	25%
Total	32	100%

Table 4.18 Responses to question number 11 from Survey II,” Is the maintenance schedule for the historic trees adhered to regularly?

Response	Number of Respondents	% of Respondents
Yes, there is a budget allocation for the maintenance of the historic trees.	14	58%
The maintenance schedule is followed when there are resources available.	10	42%
No, we are aware of the maintenance needs but we don't have the resources at this time.	0	0%
Total	24	100%

Tables 19 and 20 display the responses to questions about signage and replanting. Please note that the responses are nearly identical.

Table 4.19 Responses to question number 12 from Survey II, “When a tree fails, does the management plan require replanting to keep the original design intent?”

Response	Number of Respondents	% of Respondents
Yes	17	55%
No	14	45%
Total	31	100%

Table 4.20 Responses to question number 13 from Survey II, “Does the management plan for the historic collection include recommendations and requirements regarding signage and interpretive material regarding the identification and story of the trees?”

Response	Number of Respondents	% of Respondents
Yes	17	55%
No	14	45%
Total	31	100%

The text responses regarding job title of the author of the management plan varied widely across institutions with responses including Certified Foresters, Executive directors and other staff. One hundred percent of respondents indicated that the management plan is a flexible document and 90% said that the management plan is based on the institutions’ mission philosophy where n=31.

Tables 21, 22, 23, 24 and 25 are focused on genetic material, storage and propagation.

Table 4.21 Responses to question number 17 of Survey II, “Do you save genetic material from your historic trees? (For example: cuttings, seeds, tissue culture, seedlings, saplings, and/or scions)

Response	Number of Respondents	% of Respondents
Yes	29	36%
No	52	64%
Total	81	100%

Questions 18 and 19 were displayed only to those institutions that selected “no” as their answer for question number 17.

Table 4.22 Displays the issues preventing institutions from collecting and storing genetic material.

Response	Number of Respondents	% of Respondents
Lack of space	7	14%
Lack of human resources	15	30%
Lack of funding	7	14%
Lack of interest	12	24%
Lack of knowledge	9	18%
Total	50	100%

Table 4.23 Responses to question number 19 from Survey II, “If you had a partner to help with the propagation efforts or to help with the storage efforts would you maintain a collection of genetic material from your historic trees?”

Response	Number of Respondents	% of Respondents
Yes	32	65%
No	17	35%
Total	49	100%

For those institutions that selected “yes” for question 17, “Do you save genetic material from your historic trees? (For example: cuttings, seeds, tissue culture, seedlings, saplings, and/or scions),” nine more questions were displayed. These questions specifically addressed the type of genetic material being saved and in what types of environments the material is being stored and whether or not funding or partnerships are employed to achieve these tasks.

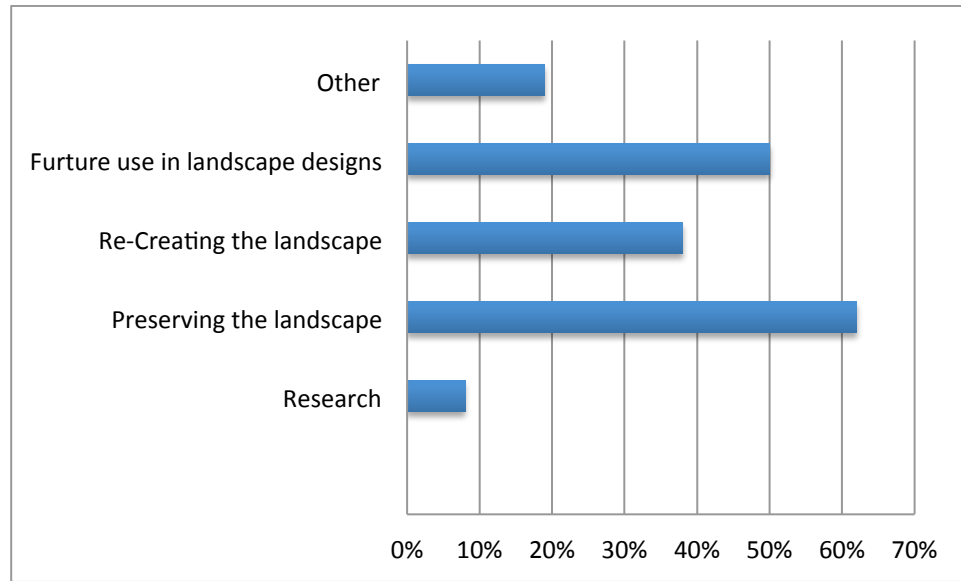


Figure 4.9 Responses to question 23 from Survey II, “Why do you save this genetic material?”

When asked about the reasons for saving genetic material, nearly twenty percent of respondents selected the “Other” category. Four respondents wrote answers similar to “preservation of historic lineages.” But another typed, “possibility for gifts and dissemination.” This answer, while a slight outlier, indicates an opportunity for historic tree collections to engage with the public or nearby institutions, increasing the base of support. What is indicated by the survey comments regarding propagation successes and failures indicates an opportunity for partnership in propagation efforts, in the sharing and collaboration of methodologies, possibly genetic material and resources (i.e. space).

Table 4.24 Responses to question number 22 from Survey II, “Where do you store the collected genetic material?”

Response	Number of Respondents	% of Respondents
On the premises	16	64%
At an auxiliary site	3	12%
At a partner's site	5	20%
Other	1	4%
Total	25	100%

Table 4.25 Responses to question number 27 from Survey II, “Do you partner with any person or institution to maintain your genetic material?”

Response	Number of Respondents	% of Respondents
Yes	8	31%
No	18	69%
Total	26	100%

The comments show that institutions partner with a variety of organizations to achieve their propagation ends, namely private bodies, societies for historical protection, tree nurseries, seed banks, and other botanic gardens. Not one institution has successfully propagated all their historic trees. (Appendix B).

The final set of questions in Survey II addressed the common language surrounding historic trees, the significance of historic trees and the extent of the use of mapping in historic tree collections. The first questions in this section were designed

to discover definitions for *Ancient Tree*, *Veteran Tree*, *Historic Tree*, and *Heritage Tree*. An overwhelming 88% of respondents, where n=75, defined an *Ancient tree* as:

A tree that has lived to be an exceptional age for the species and contributes to bio-diversity because of the insets and animals that have made their homes in it or rely on it for life.

65% of respondents, where n=76, indicated that a *Historic tree* is defined as:

Having been planted by someone significant or associated with a significant story from the past or present.

Answers did not show consensus regarding the terms “Heritage” and “Veteran.” Participants were asked if they were aware of the ancient tree resources published in the United Kingdom. 20% answered yes where n=76 and 80% reported they had not heard of these resources. (Appendix B).

The data showed that 84% of respondents have mapping software of some kind and have used it to map their historic tree collections. However 73% of the institutions that have mapped their trees do not have a system that allows the map to be accessed by the public. The last question attempted to ascertain the motive for protecting and preserving historic trees. As in Survey I, “Significance of place” led as the most important reason to protect and preserve historic trees. The second survey in its entirety can be seen in Appendix B.

Table 4.26 Responses to question number 39 of Survey II, “In your opinion, which of the following is the most important reason to protect and preserve historic trees?”

Response	Number of Respondents	% of Respondents
Biodiversity	13	17%

Significance of place	35	46%
Landscape preservation	24	32%
Species rarity	1	1%
Champion status	3	4%
Total	76	100%

European Case Study Descriptions

Royal Botanic Gardens Kew (RBG Kew)

The RBG Kew was featured in a 2004 BBC television series, which brought their comprehensive tree management program to the attention of horticulturists and arborists internationally.

Kew's arboretum is approximately 300 acres and holds over 14,000 trees, ranging in age from two years to more than 300 years old. Kew prides itself on maintaining one of the most comprehensive temperate tree collections in the world that is valuable for both education and biological conservation. The arboretum also contains more than 300 tree champions, as recognized by Britain's TROBI (Tree Register of the British Isles); it holds the title of a Grade 1 listed historic landscape, and was named a UNESCO World Heritage Site in 2003.

Mission

To inspire and deliver science-based plant conservation worldwide, enhancing the quality of life.

Collection

Kew's arboretum dates back to the early 1700's and five of the original trees, believed to have been planted in 1762, still stand. Colloquially they are called the "Old Lions," a name given to Kew's longest surviving trees. The "Old Lions" including *Ginkgo biloba*, (Maidenhair tree) *Styphnolobium japonicum* (pagoda tree),

Platanus orientalis (oriental plane), *Robinia pseudoacacia*, (*black locust*) and *Zelkova carpinifolia* (Caucasian elm.) In addition to being the centerpieces of a living tree museum, Kew's "Old Lions" could be an exhibit titled, "Journey through the history of known tree management techniques."

Kew continually plants new trees in the hopes that one day they will all become ancient. Kew's staff is constantly adding new material to not only increase the breadth of the collection but also continually increase the scientific value of the arboretum.

Management Plan

The Tree Management Plan was implemented in 2001, written and updated by Tony Kirkham, Head of the Arboretum. Up to that time, tree work had been ad-hoc. The plan was developed for legal compliance and liability reasons, to be sure that Kew was a safe place, and to begin a proactive approach to preserving the country's natural treasures.

The general reputation of arborists is that they like to be cutting, but most of the work that needs doing is underground. What we see above ground is purely a symptom of the problem below the ground. So, our tree management program targets roots as well as the top by trying to prevent dead wood (Kirkham, 2013).

Since 2006, Kew's arboretum has been working through a 10-year schedule for arboriculture activities. It is a fluid document that can be updated but not reduced in any form. Kew utilizes both ISA and British standards, and they conform to the requirements of maintaining an UNESCO World Heritage Site and Kew's established Conservation Management Plan.

Kew's tree collection is layered with safety precautions. Every six months there is a Visual Tree Assessment for all 14,000 trees at which time each tree is awarded a score between three, being the healthiest and 12, meaning the tree is in critical condition. Then, Kew uses TRAMS software (Tree Risk Assessment Management Schedule) to alert the arboriculture team about any changes in health over the past six months. This helps to prioritize each tree's needs. Kew utilizes tomography to determine what is going on inside the tree, and histograms to determine whether or not a tree needs to be removed.

Kew experienced a fatality as a result of a falling limb. An aging Cedar dropped limb unexpectedly. Kew was in the most fortunate situation when this tragedy occurred because the institution already had a management plan in place. The plan allowed Kew to show beyond a shadow of a doubt that they had not been negligent. They had documentation to prove that the tree had been accessed numerous times and that it was sound based on all known arboricultural standards. This minimized the legal battle and saved Kew's reputation in the community.

Interpretation

All of Kew's "Old Lions" have signage to explain their history and value in the collection. There is a map featuring significant, ancient and historic trees at Kew. The gift shop and the website sell a picture book entitled Kew's Big Trees.

Practical methodology

Kew retains a skilled arboricultural staff, to insure that all trees remain healthy. Kew's staff pioneers plant health techniques while maintaining an extensive database.

Budget constraints have reduced the arboriculture staff from ten down to five members in the last decade.

Nearly 500 trees were lost in severe storms in 1987 and 1990. One benefit that came from the 1987 storm was that the wind picked up one of Kew's "Old Lions" by its roots and it dropped down in the same spot, where it subsequently continued to grow. As a result, Kew discovered the valuable power of aeration. Since 1998, Kew has incorporated an active de-compaction program, which involves proactive aeration of the roots, along with heavy mulching. The mulch not only combats and prevents foot traffic around the roots, it prevents compaction on account of mowing vehicles and it prevents competitive growth, keeping the tree from competing for water and soil nutrients with other plants. Kew also injects beneficial mycorrhizal fungi and bacteria into the decompacted soil and root zone.

Kew has also incrementally introduced a look more familiar for meadows than formal gardens, with grasses that are in close vicinity to many trees, ancient or otherwise. They have implemented this new look incrementally so that the education and interpretative staff have time to get the message to the visitors. Kew has stopped mowing as often or as vastly on the property. They do continue to maintain historic vistas and this requires specific pruning of the historic avenues.

Kew utilizes a number of specific techniques when making decisions about mitigating problems with ancient trees. First and foremost, Kew has begun spreading a heavy layer of very soft mulch underneath all the ancient trees. The mulch is very difficult to walk on, acting as a natural deterrent to visitors without involving any signage at all. Additionally, Kew adds a path of hard march that leads visitors to a sign about the tree. For a good 30 minutes I watched visitors follow the path that Kew

had created for them, staying out off the roots and away from the drip line without any direction or signage at all. A number of years ago, Kew's oldest ginkgo began to show signs of stress as a result of being placed so close to a paved road. To mitigate this problem, the staff broke up the pavement, aerated and filled the path with more breathable gravel. The tree has shown signs of improvement since.

Kew utilizes retrenchment pruning.

Retrenchment pruning is a technique that imitates the natural process of aging. Crown retrenchment is used to describe the way in which peripheral dieback occurs as the tree redirects energy and growth to the formation of a consolidated lower region of the crown. Crown retrenchment pruning is used to extend tree viability, both in terms of vitality and stability, whilst retaining habitat features associated with aging. Retrenchment pruning is a technique that can be used to reduce the potential for a fully mature, late-mature or ancient tree to collapse or 'fall apart' under its own weight due to excessive end weight on long or weakly attached limbs (Fay, 2003).

This is effective for trees that show signs of fungal decay, general decline or trees that have reached an ancient age. While the tree can go on living for 300 or so years in this phase, it has reached its final stage.

When retrenchment pruning is employed, Kew assesses whether the tree is near any target areas, meaning benches, tables, paths, signage or general gathering areas. If so, targets are shifted until the tree is deemed safe again, meaning there is no known risk of the tree dropping branches. Often the tree shows arborists how big it ought to be by sprouting a new crown underneath the tallest portions of the original crown. Retrenchment should be done incrementally to mimic nature's timing, giving the tree the best chance for full recovery and a thriving final phase. Wind load stress is taken into account as well with retrenchment pruning

Kew is also getting away from bracing by removing old braces on trees where it has become redundant as a result of endweight reduction. For many trees, the point of the bracing has actually become a point of stress. In this case, reaction growth happens at the point where the brace is attached instead of the point of branch attachment where it would be more useful. Only when a tree is suffering from a defect like a Compression Fork does Kew consider installing a dynamic tree support system (like a Cobra system). In this case they would install a three way dynamic system. This helps to mitigate stress, like wind load, on the defect.

Some of the “Old Lions” display old-fashioned tree care methods. The pagoda tree (*Styphnolobium japonicum*), in particular displays an interesting, almost artistic, conversation piece. The tree used to be much larger, but little by little it has declined and become smaller. Long ago a brick wall was put in place to support the parts of the tree that remained. What remains of the tree is a small part of the main stem. The remaining portion is not small by any means, except by comparison to its original size. It continues to grow nearly horizontally and is a somewhat sculptural element in the collection.

Kew defines a Heritage tree as a tree of some age with a story to tell. It’s either been planted by someone important like the Queen, or is significant because of its age. All Kew’s vistas are Heritage Landscapes for the same reasons. But Kirkham made it clear that age alone is not enough to be termed a “Heritage Tree.”

Collaborations and Partnerships

In addition to being a typical arboretum, Kew utilizes creative means for continuing its collection after a tree has declines. One way of doing so is to host

artists who carve trees into large standing sculptures. Trees that have been cut down, especially if they are rare specimens, are used for various purposes by the Economic Botany section of Royal Botanic Gardens Kew. One such promotion allows a Wood Carving Society to cut a fallen tree into small pieces. Each member of the society will carve something and all the pieces will be shown together in a display.

When a tree has to be felled, Kew uses the trees in the Natural Lands area to make charcoal. They then give some of the charcoal to the Orchid Department and sell the rest. Part of Kew's mission is to use the natural lands to show people how a forest works and as a rule nothing comes out of the natural areas unless it's an end product.

Trees come from nature, and woodlands, trees eat themselves, producing their own organic matter, drop leaves, branches, fruit, you know the micro organisms and fungi break that down and give it back to the tree (Kirkham, 2013).

Funding

According to Kew's website, Kew is a non-departmental public body with exempt charitable status under the National Heritage Act 1983. This status comes with statutory obligations including plant research and the dissemination of the findings in addition to the maintenance of reference collections, education, quarantine and the observation of international laws like The Convention on Biological Diversity (CBD) and The Conventional on International Trade and Endangered species (CITES). The government of the United Kingdom takes on the primary responsibility of assuring that Kew has the resources available to meet these statutory obligations.

A substantial portion of the annual funding is received from the Department of Environment, Food and Rural Affairs (DEFRA). The remainder of the budget is supported by admission, catering, RBG Kew Enterprises, the activities of the Foundation and Friends of the RBG Kew, in combination with grants and donations from individuals and organizations.

Challenges

One of Kew's greatest challenges is soil compaction from the pedestrian traffic of the 1.5 million visitors per year. Kirkham says,

We want people to walk up and touch trees, get close because I think people value them more, but we have to be able to combat compaction (Kirkham, 2013).

He goes on to talk about what the public expects in the way of botanical gardens, display gardens are arboreta and the challenges institutions face to both please the visitor and to shift the visitor's expectations to an understanding about how trees survive in grassy areas.

Future

Kew's future will be dependent on budget and on climate change. As the "Old Lions" senesce, new heritage trees will take their place and their stories will remain as a part of Kew's historical mythology.

The Royal Parks (TRP)

Parcels of royal hunting grounds were gifted to the city of London in order to create the parks for the public. These include Hyde Park, Richmond Park, The Regent's Park, Kensington Gardens, Greenwich Park, St. James's Park, Bushy Park, Green Park and the Brompton Cemetery. TRP strives to provide a balance between conservation and public use while they see themselves as overall custodians of the landscape.

Mission

The mission of the Royal Parks includes safety and enjoyment for visitors, conservation and sustainability for future generations. Their website states,

In previous decades dead or rotting wood would have been 'tidied away,' removing this important habitat. These days, we are very aware of the need to retain undisturbed standing and lying dead wood as part of the woodland ecosystem.

Collection

The nine royal parks comprise approximately 5000 acres of woodland, grassland, formal and informal public areas. The oldest trees are in Richmond park and are lauded for their great historic and ecological importance.

Management Plan

TRP enjoys a variety of official designations including that of a Habitat Conservation Zone. With this designation comes the statutory obligation to protect the

habitats. In the more natural landscapes, fallen trees are left as dead wood. In more central parks, a lump of an old tree is converted into a bench.

Each park has its own management plan based on its usage and location. However, the general tree strategy is contained in an overall park management plan because, according to TRP's Arboriculture Officer, "it is time consuming and expensive to create an individual strategy for every park" (Rodger, 2013). The tree strategy is reviewed every five years. TRPs also include enclosed forests and deer parks that are closed to the public. These areas have a separate management plan because they have a separate purpose. The ground maintenance (i.e. lawn mowing) for all eight parks is contracted to a private firm.

The arboriculture maintenance is contracted out to approximately five different firms. The assignment and the costs are dependent on the specifics of the work that needs to be completed. They even have an agreed upon hourly rate for special tree works that require a team. The price per hour ranges between 20 and 500 British Pounds.

All the tree surveys and risk assessment work across all eight of the parks are carried out by the arboricultural officers and staff of TRP. Special external consultants are used to write the Veteran Tree Management Plans (VTMP's) for each individual tree, that work collaboratively with the risk assessments, and the requirements of the National Nature Reserve, and Site of Special Scientific Interest status. The updating of the management plan is dependent on the tree's risk zone, but is completed annually or bi-annually, while the Management Operations Plans are updated yearly.

The philosophy at TRP is based on a balance of risk assessment and conservation. They check the risks and then leave the dead wood whenever they can.

They see themselves as stewards of the great trees and the historic landscapes. But they also see themselves as aids in the transition of an evolving landscape.

The current plan was created in collaboration with the arboricultural unit, the landscape, ecological and management consultants. To make official changes in the plan, the arboricultural unit is required to consult with the Park manager and the Assistant Park Manager, however the Arboricultural Unit has grown over the last seven years so that they are now a respected entity with influence and autonomy. They don't have to wait for permission anymore, which has allowed them to thrive. The Arboricultural Unit now heads up strategy, decision-making, planning, health and safety and future management planning on account of their good decisions and good record.

Interpretation

There are no labels in the informal landscapes although everything is mapped. There are leaflets available at some of the gates. The cultural/historic trees have interpretation. These trees are historic because they were planted by or in honor of a person of significance.

Practical Methodology

The tree maintenance plan allows as little cutting as possible because the Royal Parks see themselves as custodians of a medieval landscape. The Royal Parks utilizes numerous and varying methods for dealing with aging and ancient trees.

The use of meadow grasses that go virtually unmown can be seen in some form in all of the Royal Parks.

Another management technique is to let the brush underneath the individual trees grow around it like it would in a real thicket. In doing so, no one can get underneath the tree for picnics, climbing or branch swinging. This lowers liability, preserves the tree and allows for native habitat to be established. The thicket keeps visitors from being injured by falling limbs and keeps the tree from being injured by people.

For trees in their mid life phase, growing in the more manicured areas of the parks, a short meadow grass is planted and allowed to grow to its full height creating what the Royal Parks call a “Halo effect.” This grass is not mowed within a 15 or 20 meters of the trees. This is pleasing to the eye and lowers the impact of foot traffic near the base of the trees. This began as a result of budget cuts. When the budget was cut, the frequency of mowing in TRP was cut as well. When mowing ceased, TRP staff members were able to leave dead wood underneath the trees. This act raised the ecological value of the parks.

If the tree has a large canker or hole sometimes a basket or another piece of wood is placed inside to block access. Small rodents, birds and insects can still utilize the tree for its natural purposes but the humans are unable to get inside the tree, either for shelter or for destructive purposes.

For their ancient trees, TRP utilize in-obtrusive fencing. The fencing varies in material depending upon the tree and the location. A heritage tree planted by or for a queen might have a cast iron fence around it. An ancient tree in a highly trafficked area of a park might have a split rail fence. There are no signs that indicate, with words, that visitors shouldn't go through the fence. The Royal parks simply create deterrents to doing so. In this way the trees are protected and the people are protected.

Many of the Royal Parks' ancient trees are remnants of old working forests. Therefore they were pollarded hundreds of years ago. Their short stature allows for them to be at much less risk for storm damage and thus they have lived much longer than their taller siblings. Tree species that respond best to pollarding at the Royal Parks are Oaks, Sweet Chestnuts, Lime, Willow and Hornbeam. However, trees that were pollarded over 100 years ago cannot be re-pollarded or it will most likely cause their death. The Royal Parks instead uses "Retrenchment pruning." This technique is used in an attempt to mimic the tree's natural process. The Royal Parks Once trees get past maturity they shrink their own canopy to lessen the root to shoot distances. Arborists can mimic this natural phenomenon by gradually reducing the crown, stimulating a new canopy below and allow the tree to live on in perpetuity.

According to TRP's staff the following are working definitions for the terms surrounding historic and aging trees.

Veteran Tree/Ancient Tree: These terms refer to age. "Veteran" is sometimes a term based on life expectancy, for example: an old beech is much younger than an old oak.

Historic/Heritage Trees: These terms refer to a cultural reference. For example, a member of the British Royal family planted the tree.

TRP's staff referred numerous times to the publications produced by the Tree Council and the Ancient Tree Forum. Namely their most recent publication, Ancient and other veteran trees: further guidance on management.

Collaborations and Partnerships

The Royal parks partnered with the Woodland Trust to complete a mapping project. The maps from the Victorian Era show trees in Richmond Park as significantly large 250 years ago.

Funding

The Royal Parks are government funded. They recently underwent a 25% budget loss and there are now hosting ticketed events on parkland to make up the difference. This has been beneficial in raising awareness of the parks and bringing visitors who might not otherwise visit, but it has put a strain on the turf areas.

Challenges

There is a new strain on the parks' turf areas as a result of the events. However this strain is inspiring TRP to look at turf alternatives.

Future

The Royal Parks will continue to carry out its mission. Because the staff recognizes that they must strike balance between their role as stewards of a medieval landscape with managers of the landscape's evolution, they are thoughtful, observant and creative in their decision making. Changes will be dependent on budget.

Bernried Oak Park

Bernried is an informal, rural park in southeastern Bavaria, Germany. It sits along the edge of the Starnberger Lake. The last owner, Wilhelmina Busch-Woods, created a public foundation under civil law when she donated the land to the state, under the condition that it remained in its original condition in perpetuity. It is an English style landscape park designed by Carl Effner in the early part of the 19th century. The landscape still looks much like it did then. Wilhelmina and her husband purchased the land and the surrounding lands slowly over a period of about 30 years, collecting the pieces that now make Bernrieder Eichen Park along with eight other notable areas along the shore of the lake. All of these areas are protected.

Mission

The mission of the park and the collection is to provide for the preservation of the land and to promote the work of the Biodiversity Action Plan (BAP). The park also has a responsibility to maintain the vistas originally designed as “windows” to the lake.

Collection

A portion of the park is used for agriculture, mainly a herd of cattle. The grass is only mowed twice per year and is used for the herd. The grasses and small plants that grow near the trees are chosen for their innate meadow qualities. They discourage foot traffic. There are specific pedestrian paths and trails that span the entire park. The park itself is made up of about 80 hectares that are free and open to the public 365 days per year. The collection is comprised of numerous trees that stood at the time of

the death of Wilhelmina Busch-Woods. They are now in decline. The collection also includes all the trees planted as replacements for the originals.

Management Plan

The management plan for the trees at Bernrieder Eichen Park was created during early 2000. A variety of institutions and organizations contributed to the writing of the plan. The curator, Mr. Karl-Otto Kullman, is able to change the plan when necessary. In 2006 the New German Standards for Tree Care “ZTV Baumpflege” were released. Bernried’s arborist continues to use these standards when making decisions about how and whether to brace an aging tree. Along with the ZTV standards, Bernried must abide by local Bavarian law regarding the protection of dead wood and its contribution to the ecological systems surrounding the Starnberger Lake. Bernried relies heavily on the standards set forth by the Ancient Tree Forum’s publications.

When Wilhelmina Busch-Woods, created the foundation before her death, it was her intention that the landscape should remain as it was originally designed. Furthermore, according to Bernried’s curator, Wilhelmina and her husband purchased the land to be sure that the landscape remained unchanged. For the staff at Bernried, this means keeping the vistas open, and keeping the trees where they were planted so that the public can enjoy the landscape. In order to achieve this, there is a young oak planted in the near vicinity of every ancient oak. The oak species is not always the exact species planted. There is a landscape architect on staff who decides which species should be planted and where. This “baby” tree is planted to take the place of the original once it goes. However, Bavarian law prevents the removal of dead wood

so the original tree will be allowed to decline and eventually pass away at its natural pace. Its wood will be left to become home for insects, birds, mosses, lichens etc. Because Bernried's mission is concerned with bio-diversity, there is hardly ever a reason to cut down an ancient tree. Benches are moved if it is determined that it is no longer safe. In the case of one tree we saw, a bench was moved. The questionable limb was allowed to fall at its' own pace and eventually the bench was replaced in the same general area. Even when it is determined that a tree needs to be cut for safety purposes, which is very infrequent, the dead wood is left at the site.

Interpretation

The collection is interpreted mostly for the sake of engaging visitors and making them aware of the biodiversity action plan at Bernried. The interpretation is made possible through local and national partnerships.

Collaboration and Partnerships

The Wilhelmina Busch-Woods Foundation is a one of five institutions contributing to the Bavarian network-nature project, "Bernried Lead: Giant trees, natural heritage and biodiversity at Lake Starnberg."

Bernried benefits from a number of generous donors in addition to partnering with other non-profit organizations to accomplish its work including: the Conservation Fund and the Lower and Higher Conservation Authority.

Funding

The original endowment for Bernried was the land itself. In the 1970's an additional endowment was begun in the amount of approximately 100,000 German Marks. This second endowment was created to fund the salaries of the three caretakers of the property. Bernried has four full-time employees. Three of those employees are funded by the endowment and one (the landscape architect) is funded by a separate grant.

Bernried maintains numerous benches for optimum viewing of the Starnberger Lake. Donors pay for the benches. Most often the donation is made by the family of someone who visited Bernried and enjoyed the view from the very spot where the bench is now placed.

Bernried is utilizing private donations more and more. It was the most recent donation that allowed for the execution of a tree assessment, risk assessment and the creation of an individual preservation plan for 104 of Bernried's oldest oaks. On their website they discuss their interest in a management plan which will cover all the trees, not just the oldest ones. For this they are looking for more individual or corporate donations.

Challenges

There is one structure on the land that was not included in the original endowment. This has proven to be an ongoing issue for Bernried as they are unable to control the usage of this structure. Often it is used for large private dining events and this causes a disturbance to the landscape. Additionally, lack of funds make it difficult for Bernried to grow its staff and add to its programs.

Future

Bernried intends to carry-on in a similar fashion as it has for the last 100 years.

Various opportunities have been identified for future partnerships.

North American Case Study Descriptions

The North American case studies occurred after Survey II was distributed. These sites had a similar focus to the European case studies with the additional exploration of their propagation programs.

Longwood Gardens

Longwood Gardens is a display garden located in Kennett Square, Pennsylvania. Kennett Square is nestled in Chester County and is a suburb of Philadelphia. Pierre S. du Pont, who bought the land in order to save an aging arboretum from being milled, founded Longwood Gardens in 1906. As a result of du Pont's decision to purchase the land, Longwood Gardens now boasts one of the largest collections of aging and historic trees on the East Coast of the United States, with 138 trees, that date to the mid-nineteenth century.

Longwood has approximately 160 full time employees and covers a total land area of approximately 1100 acres.

Institutional Mission

Longwood Gardens is the living legacy of Pierre S. du Pont, inspiring people through excellence in garden design, horticulture, education, and the arts.

Collection's mission

According to the curator of the collection,

The vision for the Peirce's Tree Collection is to preserve a space in time when gentleman farmers and industry got to the point where they were able to have a pastime. This was a time when new machinery and technology eliminated the need for labor. Then people had time to focus on other things. As a result there was a rise in the number of gentleman farmers and arboreta. One of the long-term goals is to have the Peirce's collection represented as it always was. Some part of the collection will remain to represent the story of the original era (Wade, 2014).

It is the intention of the curator that the Peirce collection lives on in perpetuity, even in an imitation sense, after all the original trees are gone.

Collection

The historic tree collection at Longwood Gardens was planted by Joshua and Samuel Peirce, two Quaker brothers, in the late 18th Century. Its purpose then was scientific observation, as botany was one of the few leisure activities acceptable for a Quaker gentleman. The collection became a beloved recreational spot in southeastern Pennsylvania called, “Peirce’s Park.” The arboretum fell into disrepair after 1880, changing hands a few times before Pierre S. Du Pont purchased the land.

A survey of the small core area of the arboretum was completed in 1916. What was outside of that was believed to be fields, farmland, and woodland. In the original historic core, approximately 674 trees were documented in approximately 70 different taxa. Trees have been lost at a rate of about six per year since then. Today 138 of those original trees still stand, representing approximately 23 taxa. The oldest of those are ginkgo, hemlock and magnolia.

Longwood’s tree collection is managed by the Horticulture Department. The work is carried out by the Horticulture Department Head, the Grounds Division leader, the Senior Arborist and the Arborist Crew, five of whom are ISA certified arborists. There is one curator of the collection who reports to the Grounds Division Leader and works collaboratively with the Horticulture Department. There are at least ten gardeners who deal with the Peirce’s Tree Collection in one way or another. There is a Tree Review Committee at Longwood dedicated to deciding when a tree needs to be removed. The committee is made up of the following staff: Horticulture Department

Head, Curator, Grounds Division leader, Integrated Pest Manager, and Section gardener from the section where the tree is located.

The curator is a new addition to this collection. The purpose is to make recommendations for how the collection is used whether it is for programming, education or science. The curator is also the overseer of the collection. He is responsible for keeping work between sections of the garden focused and consistent where the collection is concerned. Historically, Longwood Gardens has been a display garden. As a result, aesthetics is paramount, and tree preservation has not been the first priority. In the past, if a Peirce tree became aesthetically unpleasing and keeping it would conflict with a pedestrian path, the tree would go. However, with the onset of a new collections policy, there might be more friction before making a decision to take out a tree. In the future there maybe more creative means to dealing with aging trees other than cutting them down.

Management Plan

Longwood utilizes a tree management plan for their entire tree collection. This document was created by the Senior arborist and approved by the Horticulture Committee of the Board of Directors. The Horticulture Department is responsible for implementing the plan. It is reviewed annually and revised as needed by the Horticulture Department Head, the Grounds Division Lead, the Senior Arborists and the Arborist Crew. However, at this time, it does not include a plan specific to the Historic Peirce Collection. The current plan does include a subset of specific requirements for certain trees, vistas, allees and species regarding pruning and other care methods. Since 2004 records have been meticulously kept regarding each

individual tree. Before that time, there were no written records when trees were removed. Many stories of Longwood's greatest trees were passed down by word of mouth alone. Some of these stories died or got lost when the employees were no longer present to tell them. There are archival copies of map atlases, but they are difficult to access and use. Longwood believes that meticulous record keeping will allow them to make better decisions in the future and give them a database for telling the stories about the trees in Peirce collection.

A management plan specific to the historic Peirce collection was recently written by the curator and is in the process of being finalized. It outlines the design goals and boundaries for the future of the collection. It is the intention of the staff and administration at Longwood to do what they need to do to preserve what is left of the original Peirce trees, keeping in mind that aging trees can sometimes take on odd appearances.

In addition, they have a tree replacement committee and are working on a specimen tree replacement plan, which has not yet been approved. In order to preserve the landscape, Longwood is doing succession plantings in many of the wooded areas.

If a Peirce tree needs to come down, sometimes the wood is marked so that whatever is made with the wood will have its provenance and legacy intact. The objects made with the wood are sold. They are not a part of the collection and they are not displayed. There is a possibility that in the future they could be used to make benches or furniture that would be used on site.

Longwood uses BG Base and BG-Map. Their program Plant Explorer provides on-line access to the information. BG-Base and BG-Map work together and

the staff uses those programs to keep detailed notes on each tree inspection. Some of the Peirce collection has been vouchered for Longwood's herbarium but not all. In the long-term plan for the collection, Longwood intends to voucher every specimen. In addition they have recently begun a Xylarium to keep a wood record of each tree (Aniško and Kister, 2014).

Interpretation

The trees in the Peirce collection are currently undergoing a labeling update. Longwood does not display signage to indicate which trees are members of the Peirce's tree collection. There are intentions to re-evaluate the signage of the Peirce's tree collection in the future. The interpretation plan is in its infancy but generally it will talk more about the collection as a whole than any individual tree.

There are approximately 15 tree tours each year, some of which are guided by the curator, and they are always sold out. They are attended by guests who are generally 50-60 years of age.

Practical Methodology

As with many gardens and arboreta in the northern half of the US, Longwood has to deal with snow and ice damage each winter. Longwood has an emergency arborist staff that does checks on specific trees immediately following a weather event. They have considered doing a trial to discover what can be done to prevent a tree from being damaged by ice or wind but nothing has been conclusive. What they do know is that certain species are more prone to failure as a result of ice, wind and snow and so they check these trees first. They take the snow off of the shrubs, especially the shrubs in the topiary garden. Longwood has noted that white pine, hemlock and lace

bark pine are at the most serious risk in a snow event and those are the first trees that Longwood checks after such an event. Sometimes this knowledge informs their planting decisions, however sometimes, in the case of an historic planting, Longwood will replant the same genus and species.

Currently Longwood does not use any type of fencing or signage to prevent visitors from getting too close to the trees. To date they have never moved a path in order to save a tree from early death, although the Grounds Division Leader says it is something they will consider in the future.

Longwood performs turf trials in order to determine the most effective turf to be grown near the trees. They are considering planting a fine Fescue to be mown to five inches to prevent soil compaction around historic trees. Additionally, they are considering soil injections of beneficial fungi and do aeration when possible. In the future Longwood intends to be more pro-active in their maintenance especially with the Peirce Collection.

The Hemlocks are infected with wooly adelgid but they are mitigating with oil spray during dormancy. The Ground Division Leader mentioned using creative alternative means to prolong the lives of trees or cure diseases. He cites a few historic cases where Longwood went to great lengths or made unorthodox attempts at fumigation and large tree replanting as mean to mitigate problems. Therefore he believes it is part of their legacy to use non-traditional methods. The philosophy of the Grounds Division Leader is,

We should do everything we can, even if we use non-traditional chemistries, to preserve our historic trees. We have the resources; we should be willing to do what we can.

Longwood utilizes a yoking brace when tree bracing is necessary. They pin directly into the tree and then the tree suffers no problem with girdling. The braces are made in Longwood's on-site shop and are large enough for the tree to grow significantly. Lightning protection is installed on every tree where it has been deemed useful. When necessary cabling is installed. Maintenance is based on ANSI A300 standards.

The current tree plan describes the maintenance schedule, outlining how often a tree should be inspected, by whom, and what level of inspection it will be. The curatorial staff at Longwood believes that hazard evaluations of trees need to be executed very carefully. Trees can come down unnecessarily if the evaluator doesn't have all the proper information. All trees cannot be evaluated by the same method and the staff is aware of this. The Curator of the Peirce Collection states,

Liability is a huge issue but there are creative methods for displaying aging trees and having a good guest experience.

Propagation

The staff is able to do all its own propagation on site and Longwood replaces trees in kind. While Longwood has been unable to propagate all the Peirce trees, approximately twenty species of historic trees are under propagation at the Longwood nursery. The nursery manager at Longwood deals with the propagation and the curator oversees the operation. In this way Longwood is able to replace a tree at an acceptable size that is genetically identical to the one that had to be taken out. It is Longwood's belief that, in this way, the Peirce Collection is being preserved.

Collaborations and Partnerships

Because Longwood has its own nursery, it is able to act as a partner to other organizations that might need help with propagation, with maintenance or with space. For example, there is a tree being stored at Longwood that is a direct descendent of the tree from Theresienstadt Concentration camp. This tree is meant for the Holocaust Memorial in Philadelphia, but it is being stored by Longwood until it can be returned to its' home when construction of memorial is complete.

In addition to typical partnerships, Longwood has invested the help of numerous experts in the field to look at various sections of Longwood. Recommendations have been made concerning competing plants at the base of the trees, compaction and the creation of larger mulch circles under historic trees. \

Funding

Pierre S. du Pont left Longwood a large endowment that covers the operating costs of all the collections. In addition to the endowment, Longwood relies on admission, events and education for the remainder of the budget items.

Challenges

The challenges for the Peirce Tree Collection include survival and continuing to be a relevant part of Longwood's institutional mission. The interpretive master plan may contribute to solving this challenge.

Future

Re-planting of the historic trees will take place on a case-by-case basis. Sometimes instead of replanting the exact tree, an 'in kind' replacement will be done from a specified list of trees that were in the original arboretum. There are many trees that Longwood intends to reintroduce to the collection. For example, an American chestnut hybrid that is blight resistant might be planted to replace the Chestnuts that were lost. The management plan will include plans to replant some of the rows in the original planting style of the arboretum. There are places in the collection that are easily lent to this type of re-creation.

Other examples of new philosophies the staff mentioned come from research completed by Oliver Rackham in the United Kingdom. In his book Ancient Woodland, Rackham states that trees receive the greatest attention from visitors when they lay on the ground. This is when people start climbing on them. Kids play interact with the tree when it is on the ground. Suddenly it's not an object you pass by, now it's something that engages you. Aside from engagement, trees that are able to lay where they've fallen sometime re-sprout creating brand new trees and adding to the landscape. The new curator hopes to discuss these types of ideas as the Peirce's tree collection moves forward. Longwood plants trees for the future with the philosophy that a tree can have a beautiful life at Longwood.

New York City Department of Parks and Recreation

The Parks department is steward of approximately 29,000 acres of land, distributed over 5000 individual parks and accounting for 14% of NYC. This includes Manhattan and the five boroughs. The parks department takes care of 650,000 street trees and the number is growing on account of Mayor Bloomberg's initiative to plant a million trees.

The Parks department has 3000 full time employees. One hundred-eighty of those employees are designated to the Central Forestry, Horticulture and Natural Resources Department. That number includes staff dedicated to horticulture administration. One employee is designated to work for Tree Trust in the Parks department.

The Parks department has a relationship with Central Park and the other parks that are not officially under their purview. They share resources when necessary.

Institutional mission

The NYC Parks and Recreation Department (Parks) has three separate entities working together to create and maintain their tree program. The Parks department itself, the Street Tree Planting project and the NYC Tree Trust. According to their website and the Director of Street Tree Planting, the mission statement of the Parks department is:

NYC Parks builds and maintains parks for the 21st century. As we do so, we keep three guiding principles in mind: increased greening, improved access to

recreation and fitness opportunities and using parks as a vehicle for community and economic development.

The mission for the Tree Planting Project is:

The NYC Department of Parks and Recreation Street Tree Planting Program enhances the quality of life for New Yorkers and connects them to the environment by planting, maintaining and protecting street trees throughout the five boroughs.

The mission for the NY Tree Trust is:

The NY Tree Trust fosters public-private partnerships in urban forestry, raises public awareness of the importance of urban forestry conservation and stewardship, promotes new technologies to enhance tree survival, advances innovative management tools, and revitalizes historically significant trees.

When asked to talk about the relevance and value of historic trees, the staff at the Parks department cited “champion status” as the most accessible story to share with the public about the great trees. A champion trees is a tree recognized for the being the largest known tree for a particular species. The Parks Department sees this as the broadest educational opportunity and believe that it opens the door to demonstrating the public the reason these trees are important.

Collection

In 1985 a campaign was begun to raise awareness of the great trees of NYC. 443 trees were nominated (Haitch, 1985) and then the Parks department went to work awarding 100 trees with the status as “Great NYC trees.” These 100 trees are spread out over the five boroughs. In addition to those 100 individual trees there are stands of trees or portions of parks that have been identified as “historic, or culturally significant.”

In 2007 Mayor Bloomberg initiated the “Million Tree” program. This raised greater awareness and affection for NYC’s trees among citizens. Planting and caring for these trees is the responsibility of the Parks department.

Management Plan

At this time, the historic tree management plan focuses on the 100 Great trees across the five boroughs. Being that the Parks department is also responsible for the numerous other trees, a new plan is being drafted to include the assessment and management of those. Ideally one third of the trees in NYC will be assessed each year. This is in response to the safety issues that arise from being charged with caring for such a large number of trees.

Interpretation

NYC’s great trees were featured in a book entitled, Great Trees of New York City: A Guide, written and photographed by Benjamin Swett. This is a supplement to the original Great Tree Walk guide published by the Parks Department in 1990. After the guidebook was published the parks department took ownership of the city’s 100 “Great Trees.” This project lay dormant until about 2000 when it was re-envisioned. Most of the information about the Great Trees and parks is contained on the website. Other than that the Parks Department currently has very little interpretation.

Practical Methodology

The Parks department currently uses all of the following practical techniques in dealing with their “Great Trees:” Structural pruning, crown reductions, mulching, soil

remediation (vertical mulching and amendments added to soil,) bracing, cabling, injections to combat Dutch Elm Disease, protective fencing, and reparative work. One notable white oak received very convincing reparative work to protect it and keep it from being vandalized. This particular oak had a relatively large opening at its base. To discourage guests from climbing inside, the Parks department filled it with concrete, had an artist sculpt it and then paint it to appear identical to the real bark. Having done this, the tree has suffered no additional health or vandalism problems.

No mandate exists to required constant design in the parks. Highly manicured, highly visible parks have more expectation for consistent design then others.

The Parks department experienced a fatality as a result of a falling tree. The fatality occurred on a breezy day in late summer. This became a highly publicized case. In the end, it showed the vulnerability of the institution because it was discovered that no management plan was in place and that no formal assessment or inspection was ever completed on the offending tree. Worse, there was a bench placed underneath the tree that the person was sitting on at the time of death. As a result community fear of trees increased and there was a call for other trees to be removed.

Propagation

Of the one hundred great trees, 50% have been cloned. The Parks department maintains a relationship with a nursery in Oregon that helps them with the propagation, cloning, growing and storage of the great trees.

Collaborations and Partnerships

The New York Tree Trust, partners with the Parks department and the City Parks Foundation. It was established in 1994. The Tree trust is funded through private donations and grants and acts as a sort of “friends” group to the Parks department’s tree programs. One employee from the parks and recreation department is designated to work for the Tree Trust.

Located in Oregon, Schnichtel’s has taken on the responsibility for growing, propagating and storing clones of NYC’s great trees. They have been successful with grafting and cutting as methods but have not utilized any tissue culture methods. Schnichtel’s has donated their services for cloning of the Great Trees. The contract states that Schnichtel’s will grow trees for Parks to a two and a half to three inch caliper. According to the terms of the contract, the trees will be paid for when they are shipped to NYC for planting.

A portion of Mayor Bloomberg’s one million trees campaign is related to community greening and is a part of the Parks department. It is a brand that has been developed to help people identify with tree planting. All work dedicated to the Million Trees is performed by the Parks department, the New York Restoration project, or private property owners who are able to register a tree once they’ve planted it.

Many key neighborhoods in NYC have had community greening management plans created for them. These are based on core plans that are entitled, “Trees for Public Health Neighborhood plans.” The Parks department established six target

neighborhoods with the greatest need for trees. These neighborhoods were chosen because they have fewer street trees than other neighborhoods and higher rates of asthma among young people.

It is believed that additional trees in these neighborhoods will reduce the pollutants that trigger respiratory disorders and contribute to healthier living standards.

All these plans can be found on the Parks website.

Funding

The Parks department is a city agency. Their operating budget is funded through taxes. They also benefit from capitally funded municipal bonds. The Parks department appraises trees for a monetary value. This facilitates the conversation about the removal of trees for building projects and/or the responsibility of to replant. There is a monetary value attached to the trees when they are removed that is paid to the parks department. Similarly, an entity is required to plant new trees to replace them.

Challenges

The main challenge for NYC Parks is human resources. There isn't nearly enough man-power designated to maintain all the parks and green spaces, especially with the onset of the Million Trees Program. Like all government institutions, the second challenge is adequate funding.

Future

The official management plan for NYC's trees has been a work in progress since the year 2000. The document is evolving and is contributed to by an organic group of invested parties, including consulting arborists. The historic nature of the trees and significant value to the community are priorities but in highly trafficked areas, safety has to be first.

The staff of the Parks department mentioned that there are numerous stories to tell. These stories connect the communities to history and to their parks. One example of this can be found in Kissena Park in Flushing. Kissena Park used to be the sight of the legendary Parson's Nursery, where many exotic plants were introduced to the US. In 1981 a park clean up occurred and original specimens left over from the nursery stock and still laid out in lines were uncovered. This includes a notable katsura (*Cercidiphyllum japonicum*) with what appears to have many trunks, but in fact, this tree is a remnant from the original nursery. These were planted in a row and eventually grew together into one tree. Various unusual street tree specimens in Flushing originated at the Parson's nursery. It is an opportunity to tell the story of the nursery and gain a better understanding of Flushing's history.

Recognizing these stories and looking for opportunities to share them is something the parks department hopes to do more of in the next decade. Two or three trees near the tennis courts and public bathrooms have been marked as historic and slated for assessment. On account of the recent fatality, the Parks department has been tasked with doing a more assessment of trees in highly visited areas. As a result, these historic trees have recently been roped off in order to keep visitors from climbing on

or around them. They will remain roped off until the assessment is complete. This is in an attempt to keep visitors safe and to keep these trees alive for another century.

In 2014 the Parks department intends to go beyond its current management style onto a more methodical assessment of each tree with the intention of methodical record keeping for posterity. By the end of 2014 Parks intends to have certified arborists review each of the Great Trees and write a management report detailing how the tree should be maintained. Additionally by the end of 2014, the Parks department intends to have developed and completed a map of all the Great Trees that will be accessible online for all. They will have initiated a fundraising campaign for the Great Tree Work and this will continue into 2015. In terms of interpretation, the Parks intends to tell a greater story about preservation and what life was like in New York City 100 or 200 years ago. Eventually Parks intends to have some of that story digitally accessible online, but that will not happen in 2014.

Vizcaya Museum and Gardens

Vizcaya is an estate, situated on the coast of the Biscayne Bay in Miami, Florida. It was envisioned and commissioned by John Deering in the two years between 1914 and 1916. The estate was designed to look as if it had been standing for centuries, but in reality it was designed using the innovative technologies and modern conveniences of the early 1900's.

The formal gardens were designed by Diego Suarez and completed in 1922. The gardens contain geometric plantings, architectural structures and sculptures. Deering decided to nestle the estate between a native mangrove shore and forest as a way to preserve these environments. This distinguished Deering as one of Miami's earliest environmentalists.

Because the estate fell into disrepair after Deering's death, many of the trees were left in benign neglect. This neglect was beneficial for the life of the trees as they were able to grow in a protected forest like environment for decades. In 1952, Deering's heirs sold the land and the estate to the county under the strict agreement that the county retained the garden and estate as a museum for public enjoyment. This agreement makes the protection of these acres on the picturesque shore of the Biscayne Bay everlasting.

Approximately 50 of the original 180 acres are open to the public. Vizcaya employs approximately 50 people, 8 of those in horticulture, including ISA certified arborists.

Mission

Vizcaya's mission is

to preserve the estate and gardens, engaging our community and its visitors in learning through the arts, history and the environment.

Collection

Vizcaya's tree program was begun seven years ago with the arrival of their first Chief Horticulturist, Ian Simpkins. Prior to that time, Vizcaya's estate home was run like a museum and the grounds were run like a park under the purview of the Miami-Dade County Parks Department. Up until that time, the design was generally maintained by the Parks department's maintenance staff. Now the tree collection is treated more like a non-living museum collection. Each plant is accessioned and mapped.

Management Plan

Periodic hurricanes throughout the 20th century destroyed some parts of the design. However, because preserving the original design is included in the mission, trees are always replanted. Prior to the onset of the current record keeping system, trees were often replanted in the same place after others senesced or were uprooted by the storms and no one kept a record, so there are some trees whose ages are unclear. One benefit to the tropical location is the ability to replant uprooted trees and have them continue growing without a problem. This lowers the number of historic trees lost. Most of the trees on the property were left alone from the time that Deering passed away in the mid-twenties until the early 2000's. Throughout that time the

museum had a collections policy for objects but there were no living collections policies.

In 2011 a cultural landscape report was completed with a \$120,000 donation from a private donor. This allowed for the creation and adoption of official policies for the living collections. The first areas to enact the new policies were the active areas for the typical reasons of safety, health and liability. The maintenance of these highly visible areas helps to sustain Vizcaya's image in perpetuity.

All the historic trees in the public areas of the garden are now accessioned and hand mapped. Vizcaya is home to 9 National champion trees and two Florida challengers. All of the champion trees are mapped by their exact coordinates. The most common trees at Vizcaya are *Ficus* and *Quercus virginiana*.

Each section plan contains specific guidelines for recognizing a tree as historic at Vizcaya and procedures for moving forward once the tree has met the criteria. These include evaluation, pruning, removal and replacement. See Appendix C for an example.

Interpretation

Currently Vizcaya does not utilize signage in their historic collection. The only designating tags are the accession tags.

Practical Methodology

The public areas of the garden are divided into sections. General guidelines are designed for each individual section. Because Vizcaya is a formal garden, there are various allees and groves of tree species that must be maintained. This allows for sections to be managed by genus and species with specifics set based on the needs of that area and specific group of trees.

There are written policies regarding pruning goals. There are treatment schedules for various pests specific to genus. There are guidelines for overall maintenance, fertilization and replacement.

Propagation

Vizcaya's propagation program is informal. They are home to two Dade County Pines, a protected species that only grows in Southern Florida. Vizcaya has two of these pines left, but one is dying. They are currently making attempts to propagate the healthy one. They have made attempts to directly capture the seeds from these pines however, so far they have been unsuccessful either because the seeds are sterile or because there are not enough staff resources to capture the seed before other predators.

While they are always looking for new sources of income, they are not considering selling historic tree stock or saplings. They don't see it as appropriate for Vizcaya or in line with its mission at this time.

Collaboration and Partnerships

Vizcaya participates in a number of local partnerships. They work with the Urban Paradise Guild to harvest seedlings of champions and grow them in Vizcaya's nursery. Million Trees Miami and the County Commissioners' Image Advisory Board intends to grow Miami's tree canopy from the current 14% to 30% in the next five years. The stock for that initiative will come from Vizcaya.

Montgomery Botanical Center in Coral Gables Florida stewards the largest cycad collection in the Western Hemisphere and was recognized by the NAPCC in

2007. A partnership was recently established between Vizcaya and Montgomery when Vizcaya agreed to become a repository for some of their endangered Cycads. Some of the Cycad collection is now on display at Vizcaya.

Vizcaya works together with Adopt-a-tree and Million Trees Miami to produce and disperse propagated genetic material from the protected and endangered species to homeowners and other institutions for use in landscapes around Southern Florida. Vizcaya grows these trees in their green houses. These trees are not accessioned, and they are not tracked.

Vizcaya continues to look for opportunities to invest in partnerships because, as Chief Horticulturist Ian Simpkins said in regards to plants and public horticulture, “The whole is greater than the sum of its parts.”

Funding

Vizcaya is a hybrid between a non-profit and a private organization as they are considered an agency of the Miami-Dade County Parks Department. Vizcaya’s institutional operations are now being removed from county authority and the departments are able to operate more like a contractor would for any government agency. Vizcaya’s budget is a line item on the county budget but the money comes from a number of sources. Admissions in addition to membership and events make up a large portion of the operating budget. They depend on large donors to allow them to engage in new work. In the last ten years they have successfully built a case for the county to create a line item in the overall county budget for ongoing tree maintenance at Vizcaya. Vizcaya horticultural staff showed that ongoing tree maintenance could benefit the county through protection of its antiquities in addition to proving the

money saving benefits of ongoing maintenance when compared with the cost of liability concerning tree neglect and the public.

Because Vizcaya was a home that was used for entertainment and was always intended to become a museum, there are wonderful locations for events. Vizcaya's heritage and legacy make a clear expression of the necessity to preserve both the buildings and the landscape. Because this is understood, it is easy to enforce the guidelines between the events and horticulture departments. Events are held in places where guests can appreciate the majesty of Vizcaya, but that are less damaging to the natural environment.

Challenges

Vizcaya is facing difficult future decisions about whether to map, accession or recognize historic trees in natural and non-public areas. The challenge here is the amount of manpower and staff resources necessary to maintain an area or a tree once it's been labeled as historic, especially if it's a tree that is inaccessible to the public.

Future

Upgraded mapping will be completed by GPS. Currently 1/3 of Vizcaya's trees are in public viewing areas, 1/3 are natural areas and 1/3 are in Vizcaya Village and the Science museum area across the street from the estate. There is a goal for the expansion of the education department's use of the historic trees. Historic tree tours will become an option with admission and the map of all the historic trees in the public areas will be made available to all the visitors.

Vizcaya is currently working on its interpretive plan where signage is concerned. Currently there are no plant labels at Vizcaya. It is yet to be determined whether plant labels and designating signage are necessary and/or appropriate at Vizcaya. They are considering the use of QR codes as a way to provide more information to guests who are curious without being intrusive to the landscapes. There are plans in place to create labels for Champion Trees.

Case Study Follow-up

All six case study sites were asked to rank the following items according to priority at their institutions: Aesthetics, Biodiversity, prolonging the life of historic trees, opportunity for education, display of historic trees, minimizing risk of litigation, safety. Five out of six institutions rated Safety as the highest priority and four of those, who put safety first, placed minimizing risk of litigation in second position. Figures 10 through 14 display the comparisons of the results of this question.

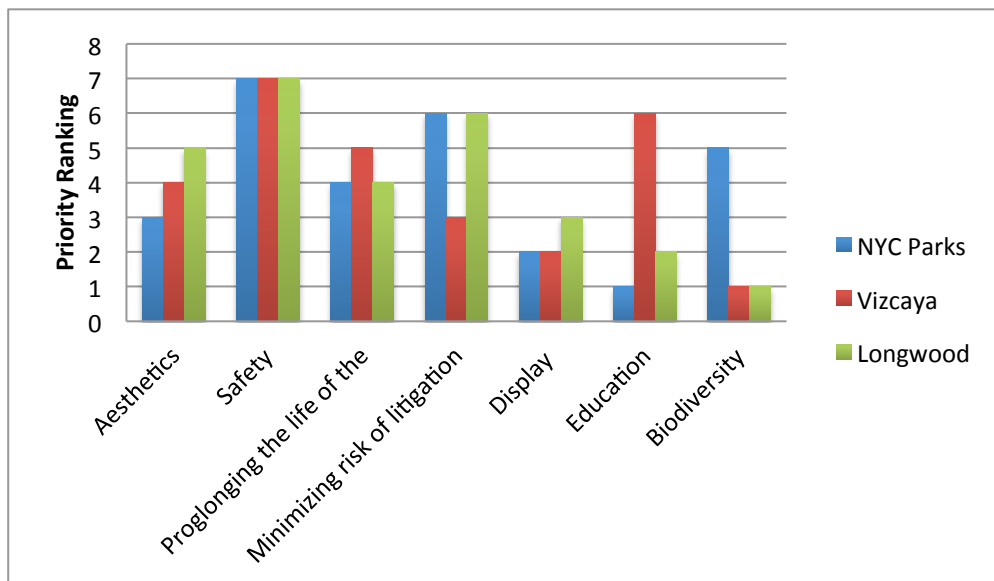


Figure 4.10 Displays a graph of the way US institutions ranked their institutional priorities.

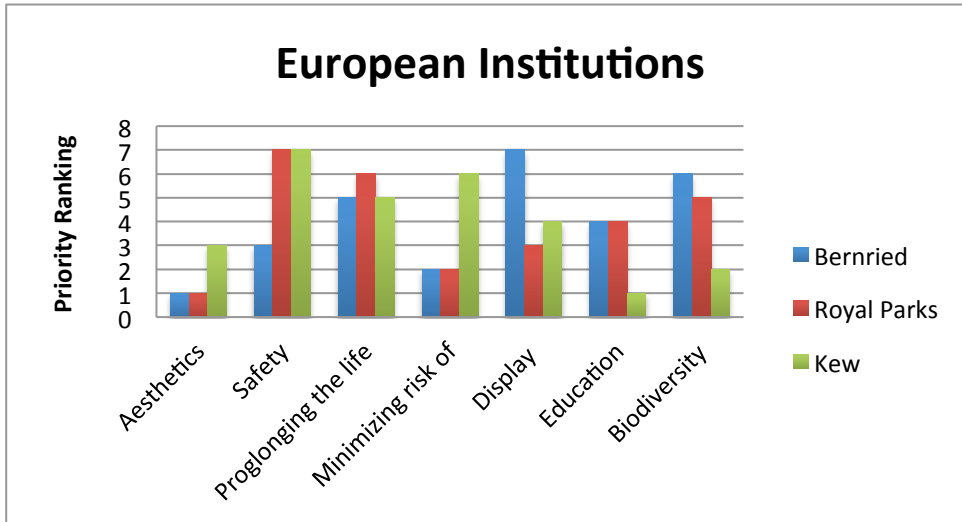


Figure 4.11 Displays a graph of the way European institutions ranked the priorities

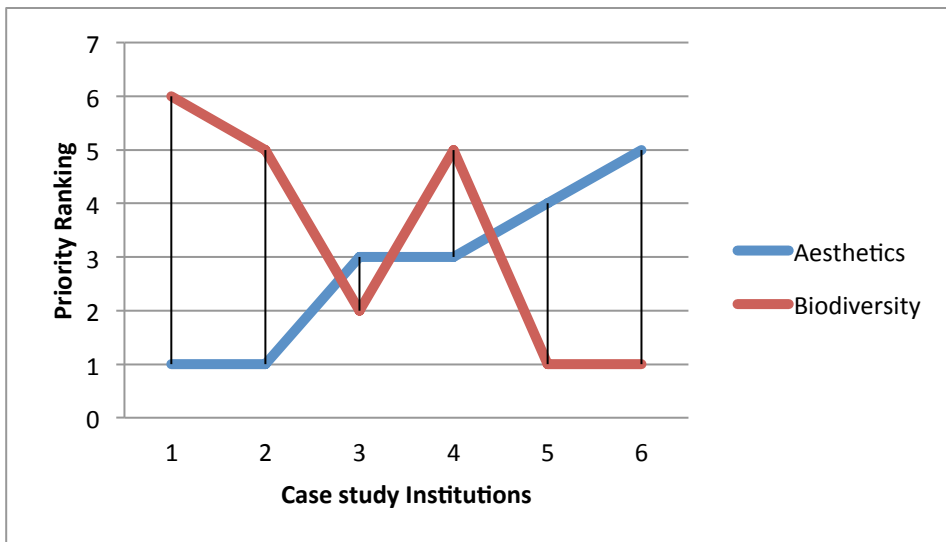


Figure 4.12 Displays all six institutions' rankings when comparing bio diversity and aesthetics.

The data shows that in a small population there seems to be an inverse correlation between institutions with aesthetics as a top priority and those with biodiversity or prolonging the life of historic trees as a top priority.

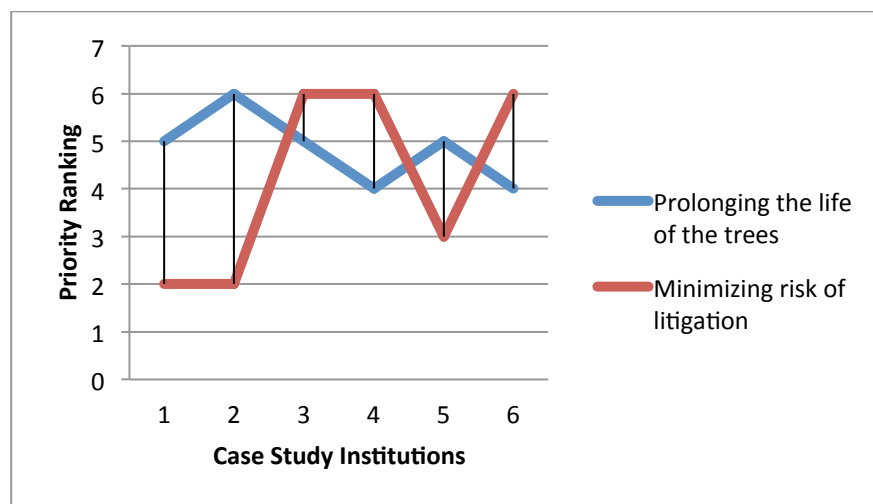


Figure 4.13 Displays all six institutions' rankings when comparing Minimizing the risk of litigation with prolonging the life of old trees.

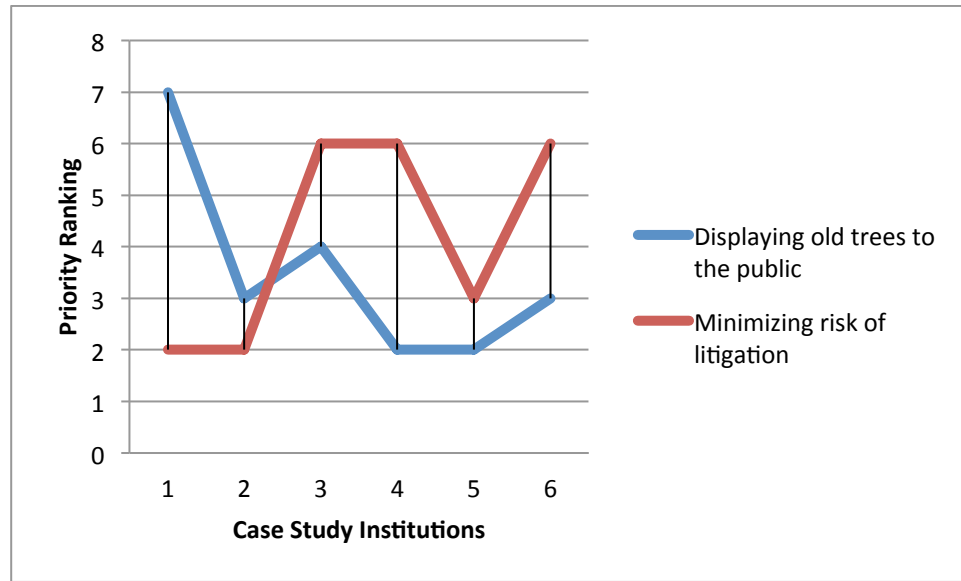


Figure 4.14 Displays all six institutions' rankings when comparing Minimizing the risk of litigation with displaying old trees to the public.

Figure 4.13 and 4.14 show that the concern with minimizing risk of litigation interferes with institutional interest and priority regarding prolonging the life of old trees and displaying the trees to the public. This confirms what was found in case studies and interviews. Tree management plans are implemented more often to protect people and institutions rather than to preserve trees.

Chapter 5
ADDITIONAL FINDINGS

Certification Programs

To address the issue of awareness, and to look at alternatives to statutory protection of historic trees, an aspect of the hypothesis was concerned with the idea of creating a tree certification program. The method for this research was through conversation with case study participants. It addressed only the level of interest in a tree certification program in order to begin a conversation. Future research could explore the feasibility of such a program. As mentioned in the literature review, the National Big Trees and the State Champion tree programs do exist, but more might be done to raise awareness of these giants. US case studies and experts were asked to voice their opinions regarding the possibility of an historic tree certification program based on the idea that trees and tree collections could be recognized or certified as official landmarks or protected objects in the way that museum objects and architecture are certified. The idea is similar to that of the national historic register for buildings supported by the National Parks Service. This philosophy could aid in tree protection and preservation. When asked, each case study expressed enthusiasm. The curator at Longwood Gardens put forth the idea of mimicking the work completed by Edward Wildman in 1931 when he created a criterion and invited the public to submit their most beloved trees to earn status as *William Penn Trees*. Once accepted to this prestigious group, the trees were given a plaque, looked after and honored in their communities. There are no laws protecting the Penn's Trees but the community

generally rallies around them and they have lived longer and healthier as a result (Wertz and Callender, 1981). Similarly in the NYC, citizens were encouraged to submit trees to the Great Tree Hunt. Out of those submitted, 100 were designated at NYC's Great Trees. A management plan has been designed specifically for those 100 trees. The trees have become well known and propagation has been done. In the UK there was an Ancient Tree Hunt, sponsored by the Woodland Trust. There are now bike trails that take visitors nearby the ancient trees identified in Central London and a website that features the ancient trees according to location. According to Gary Knox, Extension specialist and Professor of Environmental Horticulture at the University of Florida, it would be beneficial to have a national website listing trees that are currently significant, historic, in danger, or have already died. Similarly there could be a certificate or a formal validation, bringing attention to the caretakers of the tree, perhaps enabling them to receive grants or gifts for its care. Similarly, ideas were discussed for recognizing the institutions or caretakers of historic and ancient trees. The certification systems used by LEED and The National Register of Historic Places were explored and discussed at some of the case study sites. National or regional criteria could be created and approved. It is possible, like LEED that a merit award could be earned by institutions that manage their collections by adhering to an established methodology. This exploration also considered the current standards set forth by the Alliance of American Museums (AAM), the National Parks, and the International Society of Arboriculture (ISA). A program like this could encourage best practices and communication among institutions with historic tree collections. Each

conversation garnered interest and new ideas. Additionally, this research looked to current leaders in the field of environmental merit awards like SITES and the Living Building Challenge as examples. There is no direct relation between the tree's ecological or biological benefits and designating signage or labeling, however, there is an indirect relationship. Based on what we know from the National Registry of Big Trees and the William Penn Oak project, if people are able to get in any way attached to an aging tree, it raises the level of care and lessens the likelihood that it will easily be removed (Wertz & Callender, 1982). Therefore a label or a sign indicating some detail about the fact that the tree is historic can indirectly prolong its life. It is important to note additionally that the life of the tree will also depend on how it is cared for after the signage is installed. One of the issues in the US is that unless there is a human in danger, there is little recourse if tree care standards are not followed and a tree declines as a result. In most cases institutions are not legally required to keep up with arboriculture standards, to prolong the life of aging trees or to contribute to the bio-diversity of their areas. It is a possibility that financial grants or partnerships that requiring a specific standard or tree care could increase motivation in institutions and individuals to preserve trees as important cultural specimens.

Chapter 6
DISCUSSION

Justification

While a plethora of literature exists on topics related to general collections management, at the outset there was a clear absence of specific literature or scientific data regarding collections or planning methodology for historic living collections. The impetus for this research began with the theory that there was a need for management plans specific to historic or aging trees. Overwhelmingly, through surveys, site visits, and interviews, the research confirmed both the need and the desire for management plans across the population. This was confirmed by evidence at all case study sites in simple but standard discussions. Many discussions focused on reasons for tree removal whether it is tree decline, new construction or garden design and the addition of new trees to the collection, whether it is in the form of tree replacement, succession planting or species interest. These case studies confirmed what Genoways and Ireland outline in their book, Museum Administration, 2003. While the book is directed to a museum audience, the information can easily be adapted for a living collection. Genoways and Ireland discuss the necessity of these policies and make recommendations regarding issues to be considered when creating such policies. Their discussion of facilities management is even more striking in relevance to an outdoor living collection because it confirms the fact that making decisions about maintenance, planting and accessioning can be time consuming and those decisions can have negative outcomes without a policy in place (Genoways and Ireland, 2003).

The two fatalities outlined in the case study results section demonstrated, most obviously, the need for a policy specific to aging trees. Both institutions suffered human fatalities as a result of falling trees or tree limbs. In one case, a management plan was in place and protected the institution during litigation. The plan and the detailed records helped to prove that the tree limb fell as an act of God and not of negligence on the part of the institution. These instances demonstrate that when similar institutions are compared, it becomes clear that with more management, fatalities can be prevented and the institution can be shielded from liability claims. This is confirmed by recommendations included in the last chapter of the Ancient Tree Forum's publication, Ancient and other Veteran Trees. The chapter focuses on what should be included in a management plan and further elucidates the details that might be included in a description of work being completed on an ancient tree or tree collection (Lonsdale, 2013).

The survey data matched the ideas voiced in early interviews with case study staff and other experts. Many gardens and arboreta do not have tree management plans specific to their historic collections. From a perspective of health and safety, the necessity for written management plans and detailed record keeping is essential. The research, especially according to the case studies, indicates that tree management plans are necessary, not just to avoid litigation but to avoid the situations that would lead to litigation. On the other side, plans are necessary so that all the aging and ancient trees are not lost due to human interference, so that national treasures are preserved.

The further discussion addresses the various overriding topics that surfaced in regard to historic tree collections when the survey results, case studies and current literature were combined.

Continental Comparisons

As reflected in the surveys and confirmed through the case study visits, there exists a disparity in the topics of conversation and in the priorities articulated by the European gardens when compared with the topics focused upon by the US gardens throughout the case studies. This disparity is mainly found in the level of concern with biological diversity and the interest in preservation and presentation of historic and ancient trees at the European case study institutions when compared to their North American counterparts.

The literature shed some light on this disparity. In his chronicle of American history, American Canopy, Eric Rutkow makes it clear that upon arrival on American shores, the settlers were overwhelmed by the density and abundance of the forested landscape. That reality, in addition to the American industrial reliance on wood products and the conquering spirit of the original pioneer, postponed the onset of America's recognition of the necessity of tree conservation (Rutkow, 2012). In his treatise, The German Forest, Jeffrey K. Wilson describes a very different attitude regarding land use and the forests in Germany, dating back to the late 18th and early 19th centuries. The German forest was portrayed as the largest, most unifying part of the German national identity. The public's right to walk, hike, and hunt were seen by some as a matter of civil liberty, a mode for understanding one's self and one's

history. As the industrial revolution made its way across Europe, activists and politicians fought for access to the German forest for the working class as a matter of national health. To prevent access to the forest was seen as criminal (Wilson, 2012).

We must consider the relative ages of the nations when we make comparisons. Because Europe has been addressing the challenges of conservation longer than the US, they have insight to offer in this vein. It isn't that Europeans were conservationists at heart, it's that their wood resources began disappearing much sooner, historically, than those resources in North America. The literature and the research show that the collective priorities of the people are continually changing based on the economy, industry and culture. Awareness, like a forest, grows slowly and is based on consequences, loss and necessity (Wilson, 2012).

To that end, all the European case study institutions mentioned the Ancient Tree Forum and their publication, Ancient and other Veteran Trees: Further Guidance on Management, edited by David Lonsdale, as a resource and guide in their management and practical methodology. The publication was virtually unknown at the US case study institutions. That fact, combined with the survey data indicates an opportunity for an international conversation to share information as well as insight about the preservation and usage aging and ancient tree collections.

Tree Collections and Institutional Mission

The case study participants and the survey data repeatedly showed the opportunity for connections and collaboration among departments at the institution. The development of an historic tree collection can be likened to the development of an ecosystem, many parts dependent on each other to create a functioning whole. An aging living collection is collaborative by its mere existence. In cases where trees are already aging, that environmental system has been long at work and, alternatively, in cases where the institution is doing succession planting, there is an opportunity to set the stage for a high-functioning multi-tiered microcosm of a managed woodland, knoll or meadow inside the garden proper. These ideas mirror those expressed in A Sand County Almanac, when Leopold describes the way ecosystems function. He details the bog, marsh, prairie and woodland, recounting a symphonic harmony, perfected over centuries and millennia.

With a little imagination, institutions can combine science and history education within their historic tree collection. Wertz and Callender echo this idea in their 1981 book, *Penn's Woods*. A follow up to the original book, produced in 1932, this project started in schools as an attempt to get students engaged with American history and to increase their knowledge and protection of the natural monuments around them (Wertz and Callender, 1981).

Aging trees can even be viewed as works of art or sculpture and can easily contribute to a mission that includes the arts. This is currently being achieved at Tyler Arboretum, as they showcase the sculptural trunk of a long dead Osage orange tree,

twisted and beautiful without decay. When trees like these are featured and interpreted, they are seen as something other than a dead tree. In this way they become memorable to the visitor, creating in impact, and stretching the visitor's idea of what a tree is, what art is, and how our natural environment informs our manufactured environments. Nina Simon puts forth similar types of ideas in her book, The Participatory Museum. Herein she describes ways to truly engage with visitors,

When visitors encounter surprising design choices or objects that don't seem to go together, it raises questions in their minds, and they frequently seek out opportunities to respond and discuss...(Simon, 2010).

Haverford College features another fallen Osage orange tree, yet this one is still living. This tree has fallen repeatedly. It only grows horizontally now and most of the tree is dead. However, the tree is situated next to a children's play area on the campus. There are no fences or signs discouraging the children from climbing on the strangely shaped tree. According to Haverford Arboretum staff, often the tree has more children climbing on it than the nearby jungle gym. In this way the tree has taken on a new life.

Ancient trees that have twisted themselves into shapes or grown around crevices and holes express a kind of creative tenacity that could be interpreted in numerous ways by the institution, as a kind of living sculpture, as a testament to age, as a host for biodiversity or historical arboriculture techniques. These ideas are echoed in the writings of Neville Fay.

Combining the purposes of the collections could make a budget item for tree work something that could be divided among all the departments that use the collection. Some benefits and bi-products of the creation of a document specific to the historic tree collection include the requirement on the part of the institution to gather

information. In doing so, the institution will likely establish connections with other institutions and ideally become aware of the most up to date management methods. This will hopefully raise the level of care and use of the historic tree collection, while also creating or strengthening a network among professionals.

With a management plan specific to the historic collection, these creative ideas could be utilized to help to prolong the life of the original trees and to integrate the historic collection with the other aspects of the institution's mission. One local garden director repeatedly offered the following recommendation,

You must adhere to the mission and let that guide you, but consider the many different aspects of value....

Safety and Perception

The aforementioned tree fatalities sent a message to the public that trees, especially aging trees, are dangerous. Disseminated widely, this message created pressure to take down other trees prematurely, as the public outcry after the tree fatalities indicated. The subject of the public's perception of old trees was verbalized at all six case study institutions. When fatalities occur it creates what appear to be valid concerns. However, Rackham, details the causes and the trends in tree failure. Time and time again, the oldest trees have the least incidences of failure in storms and strong wind. Data is presented concerning one grove of ancient trees that remained standing even when younger trees collapsed on top of it. Rackham states that free standing; ancient trees almost never break or become uprooted in storms. Because they have had no competition for root growth, they are able to solidly hold on even in extreme wind. He also reports that the most vulnerable age for a tree is when it has recently grown to its full height. After this point, the tree gains more and more ability to withstand wind on account of the fact that it grows in girth each year (Rackham, 2003). The International Society of Arboriculture addresses the issue of safety perception as well, discussing the discrepancies with the current tree risk assessment model and putting forth recommendations for principles that should govern decision-making where tree work is concerned. Those principles include the reminder that trees are living organisms and periodically will shed branches; in addition to the statistical reality that the risks posed to human safety, by trees, is extremely low. ISA

also sites the exaggerated media coverage as partly to blame for the public's perception of old trees (ISA Arbor, 2011).

Furthermore, at institutions that have yet to utilize a management plan, some of the best qualities of aging trees are lost when the tree is taken down in haste. Based on the research, in some cases this can be attributed to a lack of awareness about aging trees and how to care for them. The British Tree Care Standards and numerous articles from Neville Fay, arborist and former Chairman of the Ancient Tree Forum, demonstrate that practical arboriculture truly has two prongs, maintenance for young trees, and management for aging and declining trees (Fay, 2011)

The institution boasting an aging or ancient tree collection could consider public messaging that informs visitors of the difference between the real and the perceived dangers of old trees. This will aid in education and in preservation.

Labeling and Interpretation

Participants were asked whether their historic trees are labeled in a different manner than that of the regular tree collections. 75% of institutions surveyed said, “No.” Case studies were probed further to discover the institutions’ reasons for choosing not to label the historic trees. The probing questions were based on inkling that when trees are not labeled, the public is less likely to develop a relationship with the tree. The tree is less likely to become a cultural icon because people are less likely to be aware of its existence. If guests are unaware of the significance of the trees, arguably there will be less friction when a decision is made to dispense with it. Not one institution reported this to be true and therefore no formal connection can be made. Participants reported the following reasons for not labeling their historic trees: too many trees to label, not enough time for display labels, our collection is not about featuring individual trees, the interpretive plan is not yet complete, and sometimes drawing attention to the trees is worse for their health. Yet even without statistical evidence, it seems reasonable to say that if visitors don’t know where the historic trees are, if they can’t tell an historic tree from a regular tree, then the historic trees may not become beloved or culturally valuable. The inverse is also true: when the public is aware of a large historic tree, they are likely to fight for its preservation. The following

is an example from Survey I, indicating a situation where the institution may have preferred that the ancient tree be unknown to visitors,

The tree is actually quite hazardous in that it is not in very good health however, many of our patrons would be devastated if it were removed.

Methods for labeling and interpretation must be carefully considered and are specific to the institution (Rakow&Lee, 2011). The recommendation is to bring positive and not damaging attention to the trees themselves. Interpretation could be done in the form of a map so that the guests are aware of the tree's existence and its' location even if they are not able to get that close to it. This technique is used at RBG Kew among the "Old Lions" and is regularly a part of the collections policies of museums containing priceless art, like Louvre. One cannot get that close to the Mona Lisa, but there is still information to allow visitors to know where it is, how to find it, and to explain why it is significant (Louvre website).

Storytelling

As the survey results indicated, there are countless ways to tell the story of old trees. The results showed numerous opportunities to bring attention to these trees and engage with the public. The results also revealed the following realities: there is great interest in the stories of aging and ancient trees, there plenty of stories about those trees and there is very little storytelling being done in comparison to the amount of existing information.

Forty-one of the 127 individuals asked about the value of an historic tree, took the time to write their answers in the ‘Other’ category. A few of the answers were similar but most of them were unique and unable to be categorized for the purpose of this summary. This indicates that there is a story for every collection, possibly every tree. We see this illustrated in the numerous books for sale about significant trees. A well-known few are the Wye Oak in Maryland, Elvis’s Oak at Graceland and the Angel Oak in South Carolina. The majority of Rackham’s 532-page book is filled with stories about specific types of trees and forests of trees all over the United Kingdom. Penn’s Woods has two different versions and the lively color coffee table book America’s Famous and Historic Trees is full of sweet personal anecdotes by the author (Meyer, 2000). Anyone can attest to the change in interest that occurs when the back-story of a tree or living thing is revealed.

There doesn't seem to be a shortage of stories and there doesn't seem to be shortage of interest, there does seem to be a shortage of either storytellers or venues for the stories to be told. Regarding history and storytelling Leslie Bedford writes in her essay, Find the Story in History, there is a difference between a story and a narrative. The story is about what happened, the narrative on the other hand addresses the way the story is told, the vehicle that is used to communicate the story (Bedford, 2010). In a historic collection, there is an opportunity for the garden, or the curator specifically to become the voice of the trees to establish a narrative. Trees can create the display, but they cannot speak an audible language. Most of their stories are hidden within, secrets to the naked eye. The surveys showed that some of the gardens with the smallest staffs invest in docents. Others could follow suit utilizing staff or volunteers. Often the trees are the only living things that have witnessed 100 or more years of existence in that particular spot. The stories the trees contain in the record of their rings could contribute greatly to the history of the family that lived on the land or inform the understanding of the institution's history. An aging or ancient tree can tell the story of the earth's climate and moisture levels over a period of time that is likely longer than any living person can recall (Pederson, 2012). This information could be very useful for the creative curator or the education staff at an institution of horticulture. A disconnect occurs for visitors and for future staff when the garden doesn't keep records or pass down the story of the trees. Part of this can be understood when we relate historic trees to numinous cultural objects.

If the object is of sufficient antiquity that no one now living recognizes its significance from personal experience, documentation, such as museum cataloging and labeling, is the only link with the past; if this documentation becomes separated from the artifact, the numen is irretrievably lost. The history in which the object participated is not visible, tangible, or ultimately verifiable unless the documentation is intact and convincing.(Maines and Glynn, 1993).

Tree stories can raise awareness and significance of an entire institution.

Case studies confirmed that the stories of the historic trees are often not being told and sometimes they are lost. At many institutions, the stories of the old trees die with the “Old-timers” who cared for them. The onset of detailed record keeping in some cases has now remedied that future loss.

Collaborative Partnerships

The research garnered several examples of partnerships at work. In the case of the Longwood Gardens, there are examples of relationship building and educational exchange with tree experts and professionals. Additionally, in the case of the Theresienstadt Tree, Longwood provides space and human resources for the nearby institution who needs help with propagation and storage. The New York City Parks Department partners with a nursery in Oregon. The Vizcaya Estate and Gardens partners with local urban planners. All the case studies engaged in partnerships of one kind or another in order to establish their goals. This kind of investment is effective and it is encouraged, as is confirmed by Claire Sawyers in her essay “Associations and Partnerships” (Rakow & Lee, 2011). When asked why the institution invests time and resources into saving genetic material, institutions answered in a variety of ways but all of them speak, in some way, to partnership potential. Answers included research purposes, for a plant sale, for future use in landscape designs, re-creation of an historic landscape. The uses for genetic the genetic material can foster relationships and partnerships. Furthermore, the genetic material can be used to grow the value, the notoriety of and the lifespan of the collection.

The partnerships featured at Bernieder Park in Germany were bio-diversity based. These partnerships helped with funding, interpretation and programs. These partnerships reflect the kind of cooperative collaboration that is mirrored in the natural world. Like a good financial advisor, who always recommends diversifying, the natural environment around aging trees is made up of a complex ecosystem. This is delightfully outlined in Neville Fay's article "Old Trees, Artists, and Dead Poets" which was featured in the ISA publication *Arbor* in June 2011.

Nomenclature Consensus

The research showed that with few exceptions, US institutions are unaware of the progress being made in Europe but that European countries are in general agreement when it comes to tree management. This is especially true with nomenclature. It would be useful for the industry to move towards a consistent vocabulary system for historic trees. Institutions in the United Kingdom and in Germany rely heavily on the work of the Ancient Tree Forum. The Ancient Tree Forum's publication, Ancient and Veteran trees: further guidance on management, outlines the following definition of Ancient:

An ancient tree is one that has passed beyond maturity and is old or aged, in comparison with other trees of the same species.

The publication goes on to say that an ancient or veteran tree maybe a site for biological diversity. Details of ancientness relative to development and form are also clarified.

Institutions in both Germany and the United Kingdom are able to communicate clearly because they are using a common language concerning ancient and aging trees. It seems useful and efficient for the institutions in the US to adopt a version of this vocabulary when discussing the trees officially, as apposed to creating an institutionally specific name or title for aging trees (i.e. heritage, witness, ancient, veteran, historic, champion, great, etc.) As is reported in the results section, survey

participants showed consensus on the meaning of the words: Ancient and Historic. An ancient tree is defined as:

A tree that has lived to be an exceptional age for the species and contributes to bio-diversity because of the insects and animals that have made their homes in it or rely on it for life.

According to those polled, an Historic tree is defined as:

A tree that has been planted by someone significant or associated with a significant story from the past or present.

When discussing aging and ancient trees with other professionals, the above definitions could be adopted to promote communication and understanding, therefore streamlining the process.

Institutional size

Across institutions of varying size, management planning is being done. Genoways and Ireland site countless cultural institutions in their book about museum administration. They feature institutions of varying sizes and never make any indications that size matters regarding strategic planning. Similarly, information regarding management and planning are directed at public gardens in general with no mention of size as a limiting factor (Rakow & Lee, 2011). Cross tabulations were presented in the results regarding management and staff size. What is notable about these cross tabulations is that for the most part, the gardens with ten employees or less and the gardens with 100 employees or more appear to have similar priorities as do the mid-range gardens with staff numbers between twenty-six and 100. Another tabulation displayed the gardens relative to size that *do* utilize a management plan specific to their historic trees. This is relevant because it shows that there are institutions of all sizes utilizing management plans. The use of management plans does not seem to be unique to large organizations. It is notable that nearly 40 % of gardens that utilize a management plan have staff sizes between 1 and 25. It is also remarkable that institutions employing between 26 and 100 employees make up only 22% of all gardens that have a management plan for their historic trees. Based on the literature and the results there is no conclusive evidence indicating that management planning is

dependent on staff size. This is an encouragement for the smaller institutions, as many of those who participated seem to be utilizing creative methods for planning and prioritizing in their collections policies.

Practical Methodology

Practical methodology was outlined in each case study. However some methods stood out as particularly innovative. These methods were mentioned repeatedly in papers by arborists, Fay and Mellicur in addition to being described in the Ancient Tree Forum's handbook. All these publications recommended methods specific to historic tree collections and different from typical tree management methods. The first is Retrenchment Pruning. This is not just structural pruning, although it maybe referred to as Crown Reduction. In some cases retrenchment pruning has prolonged the life of the tree by a decade or more.

Natural Fracture Pruning or Coronet Cutting is another technique recommended by Fay. This technique involves mimicking the way fractures naturally occur in aging trees. The natural jagged surface that is created, unlike the flat unnatural surface made a regular chain saw cut, encourages re-growth and creates habitats for microorganisms. Well-documented speculation exists about the possibility of a relationship between the microorganisms and the longevity of the tree (Fay, 2003). Additional practical techniques include spreading a heavy layer of soft mulch around trees that struggle with compaction to discourage visitors from treading on the roots and the planting of meadow grasses that require little to no mowing. Both

were techniques recommended and utilized by both The Royal Parks and The RBG Kew.

Succession Planning

Questions regarding succession planning for historic collections revealed a number of results. At almost all of the institutions included in this study, succession planning means,

Planting young trees with the hope that one day they would reach historic status.”

The other possibility is to move trees successively into the historic category as they age and meet the requirements the institution has designated for a tree to attain historic status. In the case of Longwood gardens, the new curator expressed interest in adding the trees that were purchased and planted by Longwood’s founder Pierre S. Du Pont to the historic collection. These trees were not part of the original arboretum planted by the Peirce brothers in the mid 19th century; the current members of Longwood historic collection. However these Du Pont trees were purposely purchased or grown and planted in the early 20th century by Longwood’s founder. These Du Pont trees could be the earliest representatives of Longwood’s mission and vision. As is outlined by Genoways and Ireland, it is important to address the purpose of the collection in the long term. This should be applied to historic living collections as well. A decision must be made regarding the planned lifespan and usage of such a collection. If the collection is meant to exist perpetually then plans must be made for the succession

plantings that will take the place of the current ancient trees after they fail. Size of specimens and total size for the collection area must be considered. Additionally, in order for the collection to be most effective and valuable, plans must be generated for the interpretation of the collection in perpetuity (Genoways and Ireland, 2003). Fay discusses the perspective required to maintain an historic tree collection,

The arboricultural paradigm began shifting from the planning, planting and maintaining of trees in safe and amenable condition to considering trees as ecosystems operating within ecosystems, as keystone species for dependent wildlife.

This perspective indicates yet another consideration for the purpose of the collection.

A tension between aesthetics and aging trees

In both surveys, questions were posed regarding which characteristics designate a tree as historic. One of the most common answers was, “its appearance or habit sets it apart from other like species.” This indicates that the very age and look of the tree makes it significant. Similarly there was a question posed regarding *the value of a historic tree*. The second most common answer to this question was, “Aesthetic value.” The implication here is that institutions appreciate the appearance of old trees. But like humans, old trees can sometimes look their age. Aging trees retain some of their glory, while they display some of the problems that come with age. Based on the results, aging trees are valuable because of their age, and their appearance.

Case study participants were asked to rate their institutional priorities in regard to historic trees. The priorities being: aesthetics, safety, minimization of risk of liability, bio-diversity, prolonging the life of historic trees, displaying historic trees, and opportunity for education. When the rankings for aesthetics were compared with the rankings for biodiversity, there seemed to be an inverse correlation. There was an equally inverse correlation between aesthetics and prolonging the life of old trees.

The priority of aesthetics seems to be a roadblock to getting the maximum impact from historic trees. But this roadblock can be changed into a resource if the institution is willing to redefine ‘aesthetics’ to embrace a concept richer than mere

appearance. In the case of an historic tree collection, the institutional aesthetic standard does not need to be lowered. Instead the word “beauty” could be redefined or widened in scope. The survey results and the case studies indicate that effective historic tree collections management plans have less to do with practical tree care and more to do with these three factors: the way the collection is displayed, whether or not the story of the collection is communicated and the way the institution or curator defines beauty. These are similar to the factors that set art collections or material collections apart and make them engaging and effective. The research seemed to show that the time is ripe for a shift in purpose, value and use of historic tree collections.

Institutions across Europe have recognized their fleeting natural resources. Their collections policies have come to include the beneficial relationship they share with other living things. A tightly mowed lawn that met the requirements for *aesthetically pleasing* a decade ago has been replaced by meadow grass and wildflowers. These alternatives represent a beauty defined by depth and a richness of inclusion. But who is to assess which type of beauty is more beautiful? Based on discussion with experts at RBG Kew, not only do the meadow grasses have a romantic appearance, their beauty extends to the fact that their mere existence allows dozens of organisms to have a home. Furthermore, the grasses provide a relief to the trees as they suffer less often from the compaction of pedestrian traffic and the weight of the mower. Environments, even cultivated ones, can be planned to include resource saving, beneficial relationships, and those can be considered beautiful. In addition, this definition of beauty can be communicated through creative messaging. Creative

messaging is encouraged in the textbook, Public Garden Management (Rakow & Lee, 2011).

Conclusion

Historic tree management is a task that works best from a holistic perspective (Fay, 2011). A perspective that sees the trees as lead performers in the existing environment instead of seeing the trees as sculptures placed in a static gallery that happens to be outdoors. The curator of such a collection could be an observant, aware, appreciative advocate for the trees, a stage manager of sorts, who can be a caretaker of all the parts (Leopold, 1948). It would benefit the collection if the curator engaged in conversation with other institutions boasting similar collections and carrying out comparable work. Awareness and communication are key aspects of being effective in this regard. Practical tree work should reflect the age and stage of the trees. Methods for aging trees should be applied.

The priorities of the institution are reflected in the tree collection. If a change in management style or practical technique is desired, the institution must make the priorities and mission of the collection line-up with those of the institution.

It is clear that consensus is needed regarding nomenclature and that cooperation between institutions and countries would be useful when creating effective tree management plans. Last but not least, the historic tree collection cannot be viewed in vacuum because it is clear now that the trees are part of a functioning ecosystem.

There are aging or historic trees at institutions that may not meet the current standards for beauty, yet they may provide other relevant qualities for the collection. Bringing the multi-leveled benefits, systems and stories to light could allow the historic tree collection to redefine the current standards of beauty, deepening and enriching the public's understanding of beauty. Beyond that, this route could be a way for institutions of horticulture to contribute to the ongoing conversation about beauty in society at large.

This conversation puts the institution of horticulture boasting an historic tree collection in a fortunate position. If gardens are in search of a way to stay relevant, to engage further with society, the historic tree collection may be it. Because gardens are already revered as keepers of beauty, these institutions have an innate authority on the definition of beauty. If the institution's updated definitions of beauty are displayed properly and communicated provocatively, they could be widely accepted, influencing the public, far and wide. Botanic gardens and arboreta could potentially find a new relevance when they connect with other disciplines and industries that are also attempting to redefine beauty.

This research shows that the mission of the historic tree collection could encompass utility and beauty. The historic collection is collaborative by nature, connecting the collection to the institution and the institution to the world at large.

Recommendations

1. Determine the purpose and uses of the historic and aging tree collection.
2. Define criteria for historic and ancient trees specific to the institution.
3. Determine whether or not the historic tree collection is meant to last in perpetuity. If so, adopt or create methods for succession planning.
4. Adopt terminology that is consistent across the field.
5. Work incrementally where interpretation is concerned. Take small steps, interpreting one portion of the collection at a time so that the public can begin to appreciate and engage with the collection.
6. Interpretation should be simple, informative and personal to the institution or collection.
7. Signage in general should be informative more than prohibitive in tone.
8. Consider methods for integrating the historic tree collection into the educational and programmatic framework of the institution.
9. Engage in collaborative partnerships with surrounding institutions to achieve goals.
10. Apply practical arboriculture methodologies specific to historic and ancient trees. Include information about these methods in messaging, providing another opportunity to engage with the public.
11. Consider benefits and characteristics that are specific to aging trees when making decisions about the lifespan of the tree, and the way it is presented. Opportunities for engagement in a larger context exist. Use

these opportunities to make the institution and the collection relevant to the surrounding community and the world at large.

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Appendix A

SURVEY I

1. As assessed by your institution and by your own definition, do you have any trees that are historic or significant at your institution?		
Answer	Response	%
Yes	195	85%
No	34	15%
Total	229	100%

Questions for those who answered “no” to Question 1:

2. Based on your personal and professional opinions, do you think it's important for historic trees in public places to be labeled or designated in some way?		
Answer	Response	%
Yes	25	100%
No	0	0%
Total	25	100%

3. What is the best way for historic trees to be labeled by a public horticulture institution?		
Answer	Response	%
Designating signage on the tree	19	76%
Language on an institutional map	9	36%
Story telling by docents	10	40%
Other	6	24%
Total	25	
Other		
sign or label near tree		

or near the tree		
IPhone/hand held apps		
identified by a cell tour perhaps or other high tech to provide additional information		
combination of signage and story telling		
Historic tree website		

4. From the choices below, what do you believe are the greatest benefits of historic trees? (Please check all that apply.)		
Answer	Response	%
Understanding of place	21	84%
Understanding of self	5	20%
Appreciation of nature	19	76%
Physical health benefits	2	8%
Increased learning about trees	16	64%
Creation of value for neighborhood or park	16	64%
Other	4	16%
Total Responses	25	
Other		
Aesthetic		
Building a sense of wonder		
Understanding/appreciation of history of site		
Ecological habitat		

5. How would you define the word historic regarding trees? (Please check all that apply.)		
Answer	Response	%
A significant figure in history planted this tree.	13	52%
It contributes to a story about a significant historical figure.	16	64%
It was part of a significant historical event on the property.	18	72%

Its exceptional age for the species.	23	92%
Its appearance or habit sets it apart from other like species.	8	32%
It is rare and/or endangered.	11	44%
Other	2	8%
Total Responses	25	
Other		
part of historic landscape		
usually a combination of the above, but age is, in my opinion, the most significant factor		

6. Can you recall a situation when a tree had a personal impact on you?		
Answer	Response	%
Yes	17	68%
No	8	32%
Total	25	100%

7. Please write the situation/story/anecdote about the tree in the space provided.
Total Responses 17
Too many to enumerate.
Large Banyan tree in Foster Garden in Honolulu that made an impact with me and my children where we had a picture taken
Evangeline Oak
There was a cherry tree outside the LGP Office at Longwood that hadn't bloomed yet, but you could smell the fragrance coming off the trunk - that has happened only once in my life.
Seeing my first Redwoods
As a child I played in an old tree that kept me and my friends entertained for hours. Also, Stark Co, has the oldest and largest Tulip Cucumber tree in the US. It's size and age are overwhelming
Rooted my childhood experiences with trees: the longleaf pine where we played neighborhood football; the southern magnolia that was the local climbing tree; the elephant ear tree (Paulownia) that marked the bike trail in the woods; etc...
A very large oak tree on my family farm stands in view from the front porch. The tree canopy measuring seventy feet wide or more across has sheltered children at play, grazing livestock, and family memories, some long forgotten.
There are way too many to write about including the national champion bald cypress and national champion live oak, but the first tree to have a significant, psychological

affect on me was the Bender Oak at Morris Arboretum. It is the first big tree you see when you get into the parking lot and it is a monster! It really blew me away.
Many of the memories that stick with me about certain places/gardens are the old or historic trees - places and trees such as the Arnold Arboretum (original Acer griseum), the Moscow Apothecary Gardens (willow supposed to be oldest tree in Moscow and larch planted by Peter the Great), one of the "moon trees", etc.
My grandfather and his brothers posed for a picture in an old oak tree in about 1910 - the tree eventually died and limbs have fallen off over the years, but the one main branch that my grandfather sat on is still there
I remember an old dogwood tree at my grandmother's house from my early childhood years. My brother and I climbed that tree and spent countless hours in it. Years later, as an adult, I remember looking at that tree and thinking about how small it seemed now.
The size and age of the pecan tree in my grandmother's yard.
An ancient Oak on a farm, next to a small road, was hollow and had many fractures. Several of the hollowed and dissociated tree parts were still growing as individual parts, where they had been a single stem. The parts were creating Ram's Horns and were becoming independent but still vital. This continuation and renewal of life after destruction appealed to me and informed my discipline of inspecting trees. I was intrigued that a once fragmented and apparently senescent tree could continue to survive beyond anyone's imagination, because it had been left alone. A tree in decline does not mean the end of the tree, but can be a renewal and re-imagination of itself.
An am elm was the first tree I climbed as a small boy in Colorado.
It is a Banyan tree in Santa Barbara, CA. It is believed to be the largest living Banyan tree with a canopy in excess of 250 feet. It is located just off the Camino Real and is believed to be over 200 years old.
Recently I visited Seville (Spain) and I was really impressed by a huge (and very old) magnolia tree in a public park.

Questions for those participants who answer "yes" to Question 1:

8. Does your institution have a written policy or management care plan for historic trees?		
Answer	Response	%
Yes (60)	60	34%
No (117)	117	66%
Total	177	100%

9. Would your institution benefit from having a written long-term tree care management plan?
--

Answer	Response	%
Yes (104)	104	90%
No (11)	11	10%
Total	115	100%

10. What are your criteria for a tree to be identified as historic or significant at your institution? (Please check all that apply)		
Answer	Response	%
A significant figure in history planted this tree.	83	47%
It contributes to a story about a significant historical figure.	86	48%
Its exceptional age for the species.	127	71%
Its appearance or habit sets it apart from other like species.	94	53%
It is rare and/or endangered.	74	42%
It was part of a significant historical event on the property.	84	47%
Other	43	24%
Total Responses	178	
Other		
part of a family arboretum planted in the mid 1800s		
In our case, we have one loosely designated historic or significant tree with no real reason behind that designation.		
An important provenance can also provide a basis for considering a tree historic or significant. Some combination of factors may contribute to a tree being considered significant, rather than a single important factor.		
planted over 100 yrs. ago		
It is original to the planned landscape		
De State Champions		
The tree is a species native to the area and part of the historic garden		
Remnant of original vegetation		
Woodlots that have never been clear cut		
have been managed over hundreds of years for firewood, fodder and pannage.		
Registered with the Live Oak Society		
Tallest of fattest for its species		

it is a significant element in a designed landscape
Identified as a Champion
It has been propagated from a historic parent plant
Grafts from an original Johnny Appleseed-planted tree
state champions
planted as part of the original garden design, planted by members of the family that lived in Rockwood Mansion,
Part of the cultural landscape as interpreted on the site.
State Champion
It is located on an historic piece of property
It has been pollarded (historical management method)
Its size & overall contribution to the landscape
Any trees planted that were specified on original plans
It's nature conservation value - it may be a habitat for many organisms
It was planted by a landscape architect who designed a lot of the properties over a hundred years ago. Also, this plant is one of the largest of its kind in the northeast.
Trees that are located on historic sites on city property
state champion; planted during the time of the owner/designer of the property
It is listed in the TROBI system as the largest of its species in the UK.
It normally does not grow in our colder climate.
State Champion Tree
local legend
We have no established criteria for designating trees as historic, but there are certainly historic trees in the collection.
State champions
It forms part of an eco system that can only be achieved through age. The question below is largely species dependent
planted or saved by significant designer
contributes to, or represents on its own, a character defining feature of the historic landscape as designed and implemented during the site's interpretive period
unique and early (1902) concept of the forest arboretum as an image of forest types worldwide
Vet tree program and "Ancient and other veteran trees:

further guidance on management" by David Lonsdale
biodiversity
virgin forest trees that were alive before the United States were united.

11. From your institution's perspective, at what age does a tree become historic?		
Answer	Response	%
0-25 years	6	4%
26-50 years	17	10%
51-100 years	83	50%
100+ years	61	37%
Total	167	100%

12. What metrics do you use to measure the value of an historic tree?		
Answer	Response	%
Tree appraisal value	47	27%
Environmental/human physical health value	69	40%
Psychological health value	42	24%
Aesthetic value	129	74%
Significance of place	148	85%
Other	30	17%
Total Responses	174	

Other
We are not currently measuring the value of historic trees
legacy or cultural significance
Trees are not measured for value, but value is defined on a sliding scale and considered subjectively as an intangible.
we don't measure the value of historic trees
State/local Heritage Tree Committees
Size, species
cultural and economic heritage
We do not attempt to calculate value.
recognized by other organizations
At present we haven't assigned a value however I would think all would be appropriate

age, class tree, planted on a significant date
Habitat for red data book species
Are you using the term historic to include cultural or ancient trees as well?
conservation
its historic context
planted in honor of family member
Planted by/ Bred by Luther Burbank
Biological value (species associated with it)
Age and size
provides shade
part of our history
Collection details
the associated bio-diversity that live on, within and close to the tree
Have not conducted an historic tree survey
combination of species in significantly composed stands (often more important than individual tree)
Curatorial/Collections value
In our opinion, an historic tree is because the heritage, culture and history. We prefer to use veteran tree or ancient tree because biological, growth stage and chronological (ancient tree) reasons. So we could differentiate four types of trees: ancient, veteran, champion and historic

13. Using your institution's definition of historic, how many historic trees are on your institution's property?		
Answers	Responses	%
One featured tree	10	6%
More than one historic tree or an entire collection of historic trees	167	94%
Total	177	100%

Questions for institutions with one historic or significant tree:

14. Approximately how old is the tree?		
Answer	Response	%
50 years	3	30%
100 years	1	10%
150-200 years	5	50%
250-300 years	1	10%
older than 300	0	0%

Total	10	100%
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15. Is there interpretive signage to explain the significance of the historic tree to visitors?		
Answer	Response	%
Yes	4	44%
No	5	56%
Total	9	100%

16. Which practices do you use to care for this tree? (Check all that apply.)		
Answer	Response	%
Lightning protection	1	11%
Mulch	2	22%
Protection from pedestrian, biking and/or motor traffic	4	44%
Written policy to ban climbing	1	11%
Protective fencing	0	0%
Other	6	67%
Total Responses	9	
Other		
no protection in place		
none		
bracing		
root zone aeration with air spade		
regular tree works		
injections to prevent Dutch elm disease		

17. Does your institution see the tree as a liability or an asset? (Please choose one option and comment if necessary.)		
Answer	Response	%
Asset	7	78%
Liability	0	0%
Both	2	22%
Total	9	100%
Asset		
Not many large mature trees on the property		

Both		
The tree is actually quite hazardous in that it is not in very good health and close to pedestrian walkways, however, many of our patrons would be devastated if it were removed.		

18. If the tree is fatally damaged and/or removed, will you replant it?		
Answer	Response	%
Yes	5	56%
No	4	44%
Total	9	100%

19. If the tree is fatally damaged and/or removed will you display signage to explain its disappearance?		
Answer	Response	%
Yes	5	56%
No	3	33%
Not sure	1	11%
Total	9	100%

20. If the tree must be removed, what will you do with the wood? (Please check all that apply.)		
Answer	Response	%
Make Mulch	2	22%
Make charcoal	0	0%
Provide it to artists to create objects for sale	1	11%
Provide it to artists to create objects for display	3	33%
Sell it as firewood	1	11%
Nothing	1	11%
Other	5	56%
Other		
Make firewood for our own purposes but not for sale		
not sure		
Make a piece of commemorative furniture		
unknown, sculpture?		
have no plans yet!		

21. Do you collect and store seeds and/or vegetative materials (buds, cuttings, e.g.) from this tree for future use?		
Answer	Response	%
Yes	2	20%
No	8	80%
Not sure	0	0%
Total	10	100%

22. If you use this collected material to replant, will you (for interpretive purposes) say that it is the same historic tree?		
Answer	Response	%
Yes	1	50%
No	0	0%
Not sure	1	50%
Total	2	100%

Questions 23 and 24 were questions regarding contact information

The next questions were for institutions that answered “more than one” to Question 14:

25. Based on your institution's definition of historic, how many historic trees does your institution have?		
Answer	Response	%
Up to 3	11	7%
20-Apr	73	44%
20 or more	82	49%
Total	166	100%

26. In your estimation, how far back do your historic trees date?		
Answer	Response	%
1600's	15	9%
1700's	23	14%
1800's	76	46%
1900's	45	27%
Unsure	8	5%
Total	167	100%

27. Are your historic trees labeled in a different manner than the rest of the collection?		
Answer	Response	%
Yes	41	25%
No	126	75%
Total	167	100%

Question 28 was for those who answered “yes” to question 27.

28. How are the historic trees labeled? (Check all that apply.)		
Answer	Response	%
Sign on the tree	17	41%
Designation on a map	11	27%
Sign on the tree and designation on map	12	29%
Click to write Choice 5	5	12%
Other	12	29%
Total Responses	41	
Other		
signs on trees and designation on self-guided tour brochure specific to historic plants and buildings.		
bronze plaque on a post near the tree		
Horti-code		
Sign on post near tree		
Currently with an 'L' identifier on the tag		
In some cases with stone markers or		

plaques; in other cases with nothing; a brochure (2005 outlines some of our historic trees for visitors, but is in need updating)
Named and registered with the Live Oak Society
bronze plaque
Numbered tag
sign near tree
Tag referenced to GIS
Landscape tour

29. Aside from identifying age, do you have signage or interpretation that explains the significance of the historic trees at your institution?		
Answer	Response	%
Yes	79	47%
No	88	53%
Total	167	100%

Question 30 was for those who answered “yes” to question 29.

30. What kind of interpretation do you use to explain the story of the trees? (Check all that apply.)		
Answer	Response	%
A video	3	4%
A docent tour	37	47%
A map/brochure	43	54%
Website explanation	29	37%
QR code, URL or descriptive signage	23	29%
Other	22	28%
Total Responses	79	
Other		
large interpretive sign		
signage		
on site signage or audio tour		
signage		
sign		

ipods
label
interpretation panels
sign on site
dedication plaques or markers
Photographs
Posted signs with historical information
labeling
signage
Visitor centre
Interpretive sign near trees
basic signage
tree label describe its significance
Labels
exterior exhibit panels
better disclosure through panels on the spot planned for future

31. By your institution's definition, are the historic trees considered an official collection?		
Answer	Response	%
Yes	52	31%
No	95	57%
Not sure	19	11%
Total	166	100%

32. Have you ever lost a historic tree and then used its wood to make something for the institution?		
Answer	Response	%
Yes	80	48%

No	87	52%
Total	167	100%

33. What did you make with the wood? (Please check all that apply.)		
Answer	Response	%
Furniture	31	39%
Bowls	33	42%
Kitchen utensils	7	9%
Firewood	9	11%
Charcoal	0	0%
a structure for the site	19	24%
Other	32	41%
Total Responses	79	
Other		
Writing pens		
gavel; frames; items for sale in our Museum Store		
gavel		
wood-collection		
donor label wall		
giant tree cookie		
flooring		
Contemporary Sculpture		
Mulch, compost		
Fallen trees are considered as more diverse habitat. Some sections are converted into benches		
Pens, pencils and related materials		
flooring for a new structure on the site		
Benches		
sculpture in a different garden		

pens, gavels
matt geller outside sculpture incorporated the historic dead star magnolia that was planted by the art colony founder
The planed wood is still in storage available for some future use
A box made from a historic cedar tree
wood donated to craftsman to make furniture for own use not for institution
pen, letter opener
pens
large sculptural work
Parts of sites infrastructure
signage for historic trees
A piece of areal root was mounted for museum and education purpose
pens
part of the trunk was used in the children's garden
pens
slices of wood for future display.
A cabin built out of American Chestnut suffering from the blight.
park furniture

deadwood

34. Do you consider the wood and those objects as part of the historic tree collection?		
Answer	Response	%
Yes	25	31%
No	55	69%
Total	80	100%

35. Do you display those objects at your institution?		
Answer	Response	%
Yes	50	63%
No	29	37%
Total	79	100%

36. Do you have stored seed or vegetative stock from the historic trees?		
Answer	Response	%
Yes	46	28%
No	104	63%
Not sure	16	10%
Total	166	100%

37. Do you consider the stored genetic material from the historic trees a part of the collection?		
Answer	Response	%
Yes	28	61%
No	13	28%
Not sure	5	11%
Total	46	100%

38. If a historic tree dies, does your
--

institution replant it?		
Answer	Response	%
Yes	54	33%
No	23	14%
Maybe	89	54%
Total	166	100%

39. If your institution used the stored genetic material to propagate and replant a historic tree, (for interpretation purposes) would you consider it to be the same tree?		
Answer	Response	%
Yes	10	22%
No	29	63%
Not sure	7	15%
Total	46	100%

40. Which of the following reasons would acceptable, at your institution, for removing an historic tree? (Please choose all that apply.)		
Answer	Response	%
Decline in tree's health	120	73%
Liability (danger to visitors or staff)	151	92%
Garden maintenance	14	8%
Building a new structure in the location of the tree	30	18%
Building a road in the location of the tree	16	10%
Building a new garden in the location of the tree	15	9%
Other	15	9%
Total Responses	165	
Other		
Options 4-7 would be possibilities if there was no other solution; however, the tree would be saved and alternative plans made if at all possible for a particularly significant historic tree.		
digging a grave		
Our parent organization may determine that building necessitates removal of trees, even if		

not advisable from the garden staff point of view; i.e. we do not have full control of our collections given the nature of our organization
Removal would be the last resort after fencing off or tree surgery.
Usually move the liability not the tree
The tree's shade does not allow us the ability to grow a green any longer
None
public safety
when the tree is Dead.
fenced 300+ year old bur oak tree rather than removing it due to liability
death
Tree death leading to safety concerns
infringes on health of surrounding historic landscape elements, or creates an imbalance in the landscape
None
Organizational priority. However this has not happened yet.

41. At your institution, if a tree is no longer aesthetically pleasing, is that reason enough for its removal?		
Answer	Response	%
Yes	31	19%
No	135	81%
Total	166	100%

42. At your institution, is the negative impact of pedestrian traffic alone, (compaction, e.g.) enough reason to remove a tree?		
Answer	Response	%
Yes	6	4%
No	160	96%
Total	166	100%

43. Does your institution currently plant trees with the intention that one

day they will reach historic status?		
Answer	Response	%
Yes	112	68%
No	53	32%
Total	165	100%

44. Do you interpret these trees in any way? (If you check yes, use the text box to tell us how you interpret the trees.)		
Answer	Response	%
Yes	42	38%
No	70	63%
Total	112	100%

Yes
labels: Arbor day trees
We interpret their historic, cultural or natural significance and the role they played in the landscape design, the history of the site, or the lives of the people that lived there
Part of the "Landscape Renewal Plan"
individually and as part of a historic landscape
Website, blog, tours
Website
Plant label
Interpretation panels, public speaking, tours
in conjunction with owners and historical development of gardens
size in relation to same species in the state
Detailed Signs
interpretive display
Through interpretive tours
They are discussed during landscape and garden tours
Member's garden tours and curator talks
Information about the trees is part of the interpretive tour of the site
We have tree tours and a listing of significant and notable trees
online
labels and QR codes
tours
Through guided garden tours
educational labels

Do not understand question
Guide Book, Garden Guides, Themed Walks, Audi Guide
Information sign
The are interpreted on web sites and in publications
We interpret every plant in he garden, some as individuals, others a species
Docent Tours
memorial plaques
Website interpretation for Heritage Tree and other Historic Collections
tree tour brochures
In response to the above question, we plant every tree with the hope and intent that it will one day reach historic status. No, we do not interpret each planting.
significance as part of forest type
Website
we use ITREES to convey O2 production Carbon sequestration and storm water interception

45. What is the total number of staff at your institution? (Including part-time, full-time as long as they are paid.)		
Answer	Response	%
1-10 staff members	42	26%
11-25 staff members	34	21%
26-50 staff members	20	12%
51-100 staff members	22	13%
more than 100	46	28%
Total	164	100%
46. What is the approximate land area of your institution in Acres?		
Answer	Response	%
25-Jan	42	25%
25-75	24	15%
75-150	16	10%
more than 150	83	50%
Total	165	100%
47. Do you have an ISA certified arborist on staff?		
Answer	Response	%
Yes	73	45%
No	91	55%

Total	164	100%
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48. Would you be willing to participate in further research?		
Answer	Response	%
Yes	136	84%
No	26	16%
Total	162	100%

49. Please type state and country of your public horticulture institution in the box provided below.
Total Responses
South Carolina, USA
Pennsylvania, USA
Pennsylvania, United States of America
Alabama USA
Pennsylvania, USA
New Jersey, USA
North Carolina, USA
Statewide organization with 110 properties, Commonwealth of Massachusetts
Washington, DC
PA, USA
Kentucky, USA
TN - Davidson County
Sintra, Portugal
Los Angeles County, California
Sarasota, Florida
Kane county IL
Kentucky, USA
California, US
Maine, USA
New York, USA
De New Castle Co.
District of Columbia, USA
Switzerland, Basel-Stadt
Virginia, USA
Georgia, USA

Wisconsin, Sheboygan County
Pennsylvania, United States
Pennsylvania, USA
Pennsylvania, USA
Tulsa, Oklahoma
New York, USA
Texas, USA
Oregon, USA
Oregon, Marion
Richmond, Virginia
California, USA
California
New Zealand
New South Wales in Australia
Wellington, New Zealand
Virginia USA
Public university
WI USA
Washington, DC
Massachusetts/US
Ontario, Canada
Ohio, Hamilton County
PA and USA
Pennsylvania, USA
Greater London, United Kingdom
St. James Parish, Louisiana, USA
England, Wales and Northern Ireland
Michigan USA
Kentucky USA
Illinois, United States of America
MA, USA
Delaware, USA
Richmond, Surrey, UK
WI
PA, USA
New Jersey, United States of America
Illinois (DuPage County), USA
Ohio, United States of America

Pennsylvania, USA
Bennington, Vermont
New Jersey, Essex County
Pennsylvania
North Carolina USA
Delaware, USA
Washington DC
New Castle County Delaware
California, USA
Ohio Licking County
Gibraltar
British Columbia, Canada
Florida, USA
CA USA
Georgia, USA
Minnesota, USA
London, UK
District of Columbia, United States
Michigan, USA
Tennessee, United States of America
CT, USA
Heritage section England
NC, USA
Kent, United Kingdom
Oklahoma USA
FL USA
Rhode Island, USA
South Carolina, United States
Virginia, Fairfax County
Virginia, USA
Virginia, US
Virginia, USA
Monroe County, New York
CT, USA
Baltimore City Forestry Division in Baltimore Maryland
Harford County, MD
Washington, D.C.
Washington State, King County

50. What is your position at your institution?
Total Responses
Park Manager
University Architect
Director of Public Programs
Park Manager 2
Executive Director
Executive Director
Director of the Arboretum
Assistant director and curator of collections
Director of cultural resources
Botanist
Education Coordinator
Superintendent, Sec. & Treasurer, landscape designer, sales mgr.
Executive Director
Director Gardens and Parks
Grounds Supervisor
President and CEO
director for public visitation at historic house and garden
Executive administrator
Manager of Horticultural Operations
Executive Director
Horticultural Manager
Supervisor, Gardens and grounds, ISA Certified Arborist and Outreach Arborist
Superintendent
manager
horticulturist
Curator/Property Manager
Landscape Director
Parks Curator
Director of Horticulture and Curator
Program and Communications Coordinator
Chief Horticulturist, City of Tulsa
Director
Site Manager

Forester/Arborist
Urban Forester for the City of Salem, Oregon
consultant
Curator of Woody Collections
education manager
team leader
Horticultural Supervisor
Manger
Chief of Horticulture
Professor and Director of the Arboretum
Head Arborist
Director of Gardens & Grounds
Building and Grounds Superintendent
Manager
Forester and Horticulture Curator
Grounds Division Leader
director
Arboricultural manager
Director of Research and Interpretation
Ancient Tree Adviser
IPM Specialist
director
I am the only "forester" for an urban forest that has an estimated 200,000 trees
Property Manager
President
manger of arboriculture
Director
Horticulturist
Arboretum Manager
Head of Collections and Curator
Supervisor of Horticulture
Treasurer & co-manager of grounds
Board member / Family member
garden manager
Site Administrator
Arborist Manager
Site Administrator
Horticulturist

Executive Director
horticulturist
Garden Coordinator
Director of Horticulture
Director
Head Gardener
Director of Horticulture
Executive Director
Golf Course Superintendent
horticulture supervisor
Conservation Officer, Burnham Beeches
Arborist & Tree Collection Manager
director of landscapes
Executive Director
curator and director of interpretation and programming
Park and garden Manager
manager
Gardens & Estate Manager
Garden Director
Chief Horticulturist of Historic Landscapes
Director of horticulture
Historic Site Director
Director of Horticulture
City Arborist, my "institution" is the City of Virginia Beach
Curatorial Horticulturist
Director
Landscape Curator
facilities manager
Education Director
urban forester

Appendix B

SURVEY II

1. Do you have a management plan specific to your historic trees?

Answer	Response	%
Yes	34	41%
No	49	59%
Total	83	100%

Questions 2 and 3 were displayed for those institutions that answered “No” to question 1.

2. Are your institution's historic trees included in another collection on the property?

Answer	Response	%
Yes	14	29%
No	35	71%
Total	49	100%

3. Do those collections have a management plan specific to them?

Answer	Response	%
Yes	4	29%
No	10	71%
Total	14	100%

4. Do those existing management plans specifically include care and maintenance for your historic trees?

Answer	Response	%
Yes	2	50%

No	2	50%
Total	4	100%

5. Is the management plan for the historic trees a part of an institutional collections policy?

Answer	Response	%
Yes	15	44%
No	19	56%
Total	34	100%

6. Of the following choices, which best describes your institution's collection policies?

Answer	Response	%
We have an Institutional collections policy but no policy that is specific to the historic trees	6	33%
We have a collection policy specific to the historic trees, but no institutional collections policy	0	0%
We do not have a collections policy	1	6%
We have practical management plans for historic trees, but no long term collections policy	11	61%
Total	18	100%

7. Does your management plan include a tree assessment?

Answer	Response	%
Yes	26	81%
No	6	19%
Total	32	100%

8. Who did the assessment?

Answer	Response	%
Certified Arborist	13	52%
Consulting Arborist	6	24%
Member of Horticulture Staff	5	20%
Volunteer	1	4%
Other	0	0%
Total	25	100%

9. Does the Management plan for the historic trees include a Risk Management Assessment?

Answer	Response	%
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Yes	24	75%
No	8	25%
Total	32	100%

10. Does the Management plan for the historic trees include a maintenance schedule?

Answer	Response	%
Yes	24	75%
No	8	25%
Total	32	100%

11. Is the maintenance schedule for the historic trees adhered to regularly?

Answer	Response	%
Yes, there is a budget allocation for the maintenance of the historic trees.	14	58%
The maintenance schedule is followed when there are resources available.	10	42%
No, we are aware of the maintenance needs but we don't have the resources at this time.	0	0%
Total	24	100%

12. When a tree fails, does the management plan require replanting to keep the original design intent?

Answer	Response	%
Yes	17	55%
No	14	45%
Total	31	100%

13. Does the management plan for the historic collection include recommendations and requirements regarding signage and interpretive material regarding the identification and story of the trees?

Answer	Response	%
Yes	17	55%
No	14	45%
Total	31	100%

14. Who authored the management plan?

MA certified Forester
Our general manager
Garden and Park Manager
Horticultural staff, Executive Director

Director of Horticulture
 Chief Horticulturist
 City Arborist
 Treework Environmental Practice and The Royal Parks
 Olmstead Center for Landscape Preservation, NPS
 Staff
 Facilities Management
 Arboristry (Charlottesville, VA) and our horticulture department
 Botanic Garden senior staff
 Care of Trees
 Landscape and Arboretum Program at College
 Head of Arboretum
 Managing staff
 Arboretum Director
 Staff
 Brucemore Inc.
 Operations Manager, Certified Arborist, and Gardener
 Van Yahres Studio
 Director of horticulture
 Property staff or advisers, we have hundreds of properties so it varies greatly, many have no plans
 Total Responses 25

15. Is it a flexible document?

Answer	Response	%
Yes	31	100%
No	0	0%
Total	31	100%

16. Is the management plan based on the philosophy of your institution's mission?

Answer	Response	%
Yes	28	90%
No	3	10%
Total	31	100%

17. Do you save genetic material from your historic trees? (For example: cuttings, seeds, tissue culture, seedlings, saplings, and/or scions)

Answer	Response	%
Yes	29	36%
No	52	64%

Total	81	100%
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Questions 18 and 19 were displayed for institutions who answered “no” to question 17.

18. What prevents you from collecting, storing and saving genetic material from your historic trees?

Answer	Response	%
Lack of space	7	14%
Lack of human resources	15	30%
Lack of funding	7	14%
Lack of interest	12	24%
Lack of knowledge	9	18%
Total	50	100%

19. If you had a partner to help with the propagation efforts or to help with the storage efforts would you maintain a collection of genetic material from your historic trees?

Answer	Response	%
Yes	32	65%
No	17	35%
Total	49	100%

20. What type of genetic material do you collect? Choose all that apply.

Answer	Response	%
Cuttings	19	73%
Seeds	18	69%
Tissue culture	1	4%
Saplings	5	19%
Seedlings	11	42%
Scions	7	27%
Other	1	4%
Other		
we have only done this sporadically, not systematically		
Total Responses	26	

21. In what kind of environment do you maintain your collected genetic material?
Choose all that apply.

Answer	Response	%
Nursery	19	73%
Controlled environment (i.e. growth chamber)	0	0%

Planted on the premises	15	58%
Greenhouse	7	27%
Seed Bank	4	15%
Other	3	12%
Other		
Total Responses	26	

22. Based on the question above, where do you store the collected genetic material?

Answer	Response	%
On the premises	16	64%
At an auxillary site	3	12%
At a partner's site	5	20%
Other	1	4%
Total	25	100%

Other

we try to raise significant trees where ever we can until they are ready for their permanent location

Total Responses	25
-----------------	----

23. Why do you save this genetic material?

Answer	Response	%
Research purposes	2	8%
Preserving the original landscape	16	62%
Re-creating an original landscape	10	38%
Future use in landscape designs	13	50%
Following the stipulations of a last will and testament	0	0%
Other	5	19%

Other

Preservation of historic genetic lineages

Possible gifts and dissemination

planted by notable people

we try to preserve them as part of the history of our City

to preserve the genetic significance of ancient trees

Total Responses	26
-----------------	----

24. Do you have propagated or genetic specimens of every historic tree on your property? Please feel free to elaborate on the genus and species you have propagated or have been unable to propagate in the space below.

Answer	Response	%
Yes	0	0%
No	27	100%
Total	27	100%

No

Have propagated: Quercus alba, Q. coccinea, Q. prinus, Q. stellata, Chamaecyparis pisifera, Pinus rigida, P. echinata, Symplocos paniculata. Have not propagated Cedrus atlantica, Fagus sylvatica, Acer palamatum cultivars, Sciadopitys verticillata, Syringa reticulata, Picea abies, Taxus sp

Far too many!

Malus

Some trees seem to be very shy in producing seed, while others are self sowing prolifically. Grafting of some of the historic trees has been problematic due to the condition of the tree itself.

oaks and maples

able to propagate Aesculus, ginkgo, franklinia, and others. had difficulty with pyrus, quercus

We're just getting started and there is currently no additional funding for it

Deodar Cedar, Chinese Parasol

Not all historic material is saved genetically. It's usually material that is no longer available from its original environment.

25. Does the maintenance of this genetic material require an additional funding source?

Answer	Response	%
Yes	3	11%
No	24	89%
Total	27	100%

26. What is the source of the additional funding?

Answer	Response	%
Grant or Contract	1	33%
Donor	0	0%
Government allocation	0	0%
Endowment	0	0%
Other	2	67%
Total	3	100%

Other

TRP charity bid

We don't have extra funding, so nursery maintenance tends to be haphazard.

27. Do you partner with any person or institution to maintain your genetic material?

Answer	Response	%
Yes	8	31%
No	18	69%
Total	26	100%

28. Who do you partner with to maintain your collection of genetic material from the historic trees?

Text Response

External private bodies

Society for Protection of New England Antiquities

Private tree nursery

Nurseries on the west coast

nursery

Tree Pittsburgh

Millennium Seed Bank

We occasionally share material with other BG's, particularly Melbourne BG (for historic exotics). Historic natives, if successfully vegetatively propagated are sent to climatically appropriate gardens in NSW.

Total Responses 8

29. Who, at your institution, manages the stored genetic material from your historic trees?

Answer	Response	%
Gardener	9	60%
Curator	6	40%
Intern	0	0%
Graduate student	0	0%
Total	15	100%

30. In your opinion, how would you determine that a tree is "Historic?"

Answer	Response	%
It has lived to be an exceptional age for its species and contributes to bio-diversity because of the insects and animals that have made their homes in it or rely on it for life.	18	24%
It was planted by someone significant or is associated with a	49	65%

significant story from the past or present		
It has witnessed or survived a significant event	2	3%
It has become the emblem of a community, giving the community a sense of place and significance	6	8%
Total	75	100%

31. In your opinion, how would you determine that a tree is "Ancient?"

Answer	Response	%
It has lived to be an exceptional age for its species and contributes to bio-diversity because of the insects and animals that have made their homes in it or rely on it for life.	67	88%
It was planted by someone significant or is associated with a significant story from the past or present	5	7%
It has witnessed or survived a significant event	2	3%
It has become the emblem of a community, giving the community a sense of place and significance	2	3%
Total	76	100%

32. In your opinion, how would you determine that a tree is a "Heritage Tree?"

Answer	Response	%
It has lived to be an exceptional age for its species and contributes to bio-diversity because of the insects and animals that have made their homes in it or rely on it for life.	14	19%
It was planted by someone significant or is associated with a significant story from the past or present	33	44%
It has witnessed or survived a significant event	7	9%
It has become the emblem of a community, giving the community a sense of place and significance	21	28%
Total	75	100%

33. In your opinion, how would you determine that a tree is a "Veteran Tree."

Answer	Response	%
It has lived to be an exceptional age for its species and contributes to bio-diversity because of the insects and animals that have made their homes in it or rely on it for life.	28	41%
It was planted by someone significant or is associated with a significant story from the past or present	3	4%
It has witnessed or survived a significant event	31	46%
It has become the emblem of a community, giving the community a sense of place and significance	6	9%

Total	68	100%
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34. Have you heard of the Ancient Tree Forum in the United Kingdom and/or their handbook on the management of Ancient and Veteran trees?

Answer	Response	%
Yes	15	20%
No	61	80%
Total	76	100%

35. Are the historic trees at your institution mapped?

Answer	Response	%
Yes	64	84%
No	12	16%
Total	76	100%

36. What type of mapping software does your institution use?

Answer	Response	%
GIS software	29	45%
AutoCad Software	19	30%
Hand drawn map	10	16%
Other	6	9%
Total	64	100%

Other

MapPro

Archicad

Asset Manager Tree Inventory System

BGmap

We're inventorying our notable trees for the first time in 20 years, they will probably end up in a GIS,

Iris BG

37. Are visitors able to access the map?

Answer	Response	%
Yes	17	27%
No	47	73%
I'm not sure	0	0%
Total	64	100%

38. Is your garden or arboretum divided into land use areas and managed accordingly?

Answer	Response	%
Yes, we allocate more human resources and budget to highly visible areas and less to those that have little visitation.	53	72%
No, we manage all the areas equally.	21	28%
Total	74	100%

39. In your opinion, which of the following is the most important reason to protect and preserve historic trees?

Answer	Response	%
Biodiversity	13	17%
Significance of place	35	46%
Landscape preservation	24	32%
Species rarity	1	1%
Champion status	3	4%
Total	76	100%

HISTORIC TREE SPECIFICATIONS

Created 2011-Vizcaya Estate and Gardens

Overall Maintenance Procedures and Justification:

Vizcaya is predominately a forested property. Originally, in 1912, the house and gardens were carved from a contiguous forest. Because of Deering's environmental interests, many of these trees (especially in the Rockland Hammock areas) were saved. Today, because of Deering's foresight, Vizcaya is home to many, many large and old trees, including at least one known national champion. For the purposes of Vizcaya, an existing tree is judged historic if:

1. It predates Vizcaya by at least 50 estimated years.
2. It was planted during Vizcaya's period of interpretation (1918-1925)
3. It was planted between 1926 and 1934 under the direction of Paul Chalfin or Chauncey McCormick (and ideally confirmed through archives)
4. We know of a particular story or provenance associated with the tree that links it to Vizcaya or one of the significant figures in the museum's history 50 or more years ago.

Designation and Identification Procedures:

Each tree known to be over 50 years old in the cultivated areas, and over 100 years old in the forested areas, will be evaluated using these parameters. If a tree meets one or more (two or more in the case of criteria #4) guidelines it will be designated a historic tree and will be assigned a unique accession ID number as follows:

HT – 011 - 0178

HT = Historic Tree

011 = Last 3 digits of accession year

0178 = 178th tree to be accessioned in 2011

The tree will be entered into BGBASE and an identification tag will be made to be permanently attached to the tree in an unobtrusive manner. The tag should be attached to the trunk with only a stainless steel screw.

Evaluative Procedures:

Once the tree is entered into BGBASE, it will then be scheduled for an evaluation. This evaluation looks at the health of the tree, structural safety, and any maintenance issues (if the tree resides in a cultivated area) that must be

addressed. The evaluation will then recommend a plan of action be followed. A copy of the evaluation is attached at the end of these guidelines.

1. A tree, once it is designated, should be evaluated on the following schedule:
 - Forested area, accessible to the public:
 - Every 3 years
 - Forested area, not publicly accessible:
 - Initial evaluation only
 - Garden and cultivated areas:
 - Every two years.
2. An evaluation is comprehensive and is based upon ISA (International Society of Arboriculture) evaluative guidelines.
3. An evaluation will also take into account and record the specifics of any site disturbances (hurricanes, construction) that has occurred during the previous evaluative period, and will note the effects, if any, such disturbance has had.
4. An evaluation can recommend pruning and removal. Pruning actions will be determined by the Chief Horticulturist. Removals generally should receive a second evaluation by an outside consulting arborist.
5. The only exception to #4 is if the Chief Horticulturist determines that the tree presents a significant safety hazard for the visiting public and employees, and must be removed quickly. This should no longer happen under normal circumstances under the evaluative process as outlined above. A notable exception would occur in the aftermath of a hurricane.
6. If a tree has been severely damaged in a hurricane and cannot be saved or will present a serious and urgent hazard to public and employee safety, the tree may be removed without an outside appraisal.

Pruning and Removals:

1. Trees should be scheduled for pruning or removals on Tuesdays, when the museum is closed.
2. Under no circumstances should the work be performed by anyone other than an ISA certified arborist. Supervision by an ISA certified arborist is not sufficient – especially if the tree is in a cultivated area.
3. Pruning can be done by Vizcaya staff if the work is not involved, very time or labor consuming, or dangerous with the equipment that Vizcaya possesses. If the pruning is such as the above, the work should be contracted, and then qualification #2 should be applied.
4. All historic trees within the confines of the main gardens cannot be reached by a boom truck, and so the trees must be climbed.

5. Determination of pruning scope shall be determined by the Chief Horticulturist, and under normal circumstances shall not exceed 30% removal of live canopy.
6. Under no circumstances shall an otherwise healthy and un-pruned tree be topped, lion – tailed, or hat raked.
7. The only exception to #6 is the Live Oak allee lining the Center Island, in which the trees have been pruned and topped regularly since the 1920's. In such case, additional guidelines are to be followed specifically tailored to those trees.

Replacements:

It is cost prohibitive (although sometimes possible) to replace a lost historic tree with one of equal size. However, the following steps should be taken when a determination is being made to replace a historic tree.

1. Should the replacement be the same species?
2. Can the space accommodate a tree that will become as large as its predecessor?
3. If this tree does not date to the periods of interpretation or pre-construction, does it indeed need to be replaced?
4. If yes, how does the replacement of the tree improve the space over originally intended appearances and conditions?
5. If no, do not replace. If yes, the following questions must be asked.
 - a. Should the replacement be the same species as historically shown, or is there an improvement (cultivar, etc.) available now that fits the original (1918-26) design intent better than the predecessor?
 - b. How large of a replacement tree can be afforded?
 - c. What is the largest size that can be afforded that can be brought to the planting location, keeping in mind site access limitations?
 - d. Do we have archival evidence showing the size of the predecessor when it was installed?

HSRB DOCUMENTS

Certification of Training Human Subjects in Research

The University of Delaware certifies that Laurie A. Metzger
attended an institutional training session on the use of human subjects in research on

February 21, 2013.
(Date)

The session included the following topics:

- The Belmont Report
- Federal regulations for using humans in research (45 CFR 46)
- The University's Federalwide Assurance
- Informed consent
- Institutional procedures
- Sources for additional information.



Maria Palazuelos, PhD
Director of Compliance

Research Office
University of Delaware
Newark DE 19716
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DATE: May 14, 2013

TO: Laurie Metzger, BS
FROM: University of Delaware IRB

STUDY TITLE: [464007-1] Historic Tree Collections Care and Management

SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: May 14, 2013

REVIEW CATEGORY: Exemption category # 2

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will put a copy of this correspondence on file in our office. Please remember to notify us if you make any substantial changes to the project.

If you have any questions, please contact Jody-Lynn Berg at (302) 831-1119 or jlberg@udel.edu. Please include your study title and reference number in all correspondence with this office.

OTHER SIGNIFICANT TREES

Museum Wiezienia Pawiak, Poland

An elm tree stood in the courtyard of this Nazi Gestapo prison during World War II. At the end of the war the buildings were set on fire, but the tree survived. After the war ended, in 1945, the tree became a sort of memorial, as families began to place plaques in honor of the dead. In 1984 the tree became a victim of Dutch Elm Disease. However, as a result of root strengthening, the removal of dead wood, the tree was able to live for 11 more years. For years after the plaques held the tree up. In 2004 a model of the tree was cast in bronze and ‘replanted’ in the exact spot where the tree had stood. All the plaques were reattached to the new tree. The tree was visited and blessed by Pope John Paul II. What is notable about this tree is that when the replica was cast, it was cast as an exact replica of what it looked like when it died. It was cast in bronze looking the way it looked after it had witnessed all the atrocities and survived. It was not replaced with a replica of what it looked like at its finest moment according to the arbitrary standards of tree beauty. For this tree, its old age was its best age because it was only after a lifetime of witnessing tragedy, tyranny and evil, that it was able to provide the best peace to those whose memories it served.

Theresienstadt Tree, modern day part of the Czech Republic

Sometimes called the “Tree of Life,” this tree was planted and maintained by children in the concentration camp at Theresienstadt during WWII. Some sources call it a sycamore and others call it a maple. Most likely it is a sycamore maple, *Acer psuedoplatanus*. It was about five feet tall when the war ended and it was moved to the

front of the camp to tell the story of the children. Seedlings of this tree have been taken from the ground at the site of the old camp and planted at significant places all over the world. One of the seedlings was planted in its place when the original died. Offspring from the Theresienstadt tree of life have been planted in at least 600 official locations and this does not account for unofficial saplings. A few cuttings were taken from the original tree and one of them is planted in Philadelphia. Longwood Gardens is caring for the tree while the site undergoes construction until it can be replanted.

This is a story not just about an old tree. It's a story of hope and collaboration. After that it is a story of survival and perseverance. It has become a story of honor and in practical terms it is even about partnerships. Numerous partnerships were formed to create this memorial, beginning with the partnership between the teacher, who requested the seedling, and the sympathetic Nazi guard who provided it to her.

Ivenacker Eichen Park in Ivenacker, Germany (former East Germany)

Ivanacker is what remains of an ancient grazing land with history that reaches all the way back to the first century A.D. The thousand year old oaks that stand today are believed to have sprouted during that time. In a hidden corner of the village of Ivanack, Mecklenburg Vorpomern, the park is about 2.5 hours NE of Berlin. When it became a deer park in 1700, the ancient trees were already towering over the landscape. Ivanacker remained a deer park until 1929 when the economy plummeted and the deer were removed. As a result the trees were allowed to grow unchecked. The park was mostly forgotten about until 1972 when the fallow deer were reintroduced and the park was reopened to the public.

What is notable about this park is that in the wake of each ancient oak, there is wooden signage. The carved wooden signs are non-intrusive to the landscape. In simple language they explain that oak wood is heavy and that the trees are old. The sign explains the dangers of walking underneath the trees without using the words ‘danger,’ ‘keep out’ or the like.

A split rail fence surrounds the ancient trees as an indicator that one shouldn’t go to the tree. According to Ivanacker’s website, the fence’s purpose is to lessen foot traffic around the root systems and prevent compaction.

In close vicinity to the largest and oldest tree in Germany, there is a storyboard that uses pictures and time markers to depict the tree’s progress over the last 1000 years. Also nearby stands a copper reproduction of the trees’ ring width. While life size in its width, the reproduction is less than a foot tall and shows the size of the tree, so that a visitor/child doesn’t need to walk near the tree to understand its mass. The reproduction is safe for climbing. There are other interpretive panels in a picnic type of structure that tell various stories and myths accompanied by hand drawn pictures about how the trees came to grow on this land.

Tanzlinder Northern Franconia, Bavaria, Germany

There are a dozen or so notable linden trees (*Tilia*) throughout Bavaria, Germany. These trees were planted in the town centers in the 16th century and were used for meetings and dances. They have been given the colloquial name Tanzlinder or dancing lime tree. Each town has a different albeit similar way of caring for the tree but a few generalizations can be made. There is usually a space designated just for the tree. There is no mowing near the tree; pedestrian traffic is the only traffic.

There is usually a structure surrounding the tree made of another type of wood. Sometimes the structures hold the branches up; sometimes the structure has stairs that allow visitors to go into the tree. These trees are beloved and well known throughout their regions.

The Crown Estate, Windsor Park, England, United Kingdom

The Crown Estate is the institution responsible for looking after a number of the royal lands in the vicinity of London, England. Windsor Castle and the park surrounding it boasts both a tree that is 1000 years old and a tree that is believed to be 3000 years old. Both these trees are growing in very low profile areas. One would need to know where to look to find these trees. Other than removing invasive vines, the current management plan for these two ancients is to check on them periodically but generally leave them to live and senesce on their own terms. There is old bracing present, but the Crown estate has since abandoned the necessity for bracing. No mowing is done anywhere near either of the trees and brush is allowed to grow at the foot of both. They are near a dirt road that is easily accessible if you know its whereabouts but it is mostly used by staff. In this case the remarkable aspects of the trees are their sheer will to keep on growing. One was clearly pollarded hundreds of years ago and so has a relatively short, wide profile. It also has a hole in its trunk large enough for a small person to walk through, yet its canopy is relatively full. The other has bent over or fallen over but never uprooted itself and continues to grow almost horizontal to the ground in certain areas. According to staff, these trees are providing innumerable homes for creatures large and small. They are improving the atmosphere significantly and the soil nearby as well. It seems they will both go on

living indefinitely as they are already stout in profile and seem to have carry very little risk of getting blown over. Windsor Park has numerous other more manicured areas with high visitorship. One tree in particular stands by a paved road. This tree is typical in stature and beauty. It is beloved by staff and guests alike. Each staff member that I questioned about the tree and it's future care confidently confirmed that if the tree ever showed signs of stress, the road would be moved to accommodate the tree's needs.

ROYAL PARK SITE VISITS

Hyde Park

Located in central London, Hyde Park is used by Londoners and tourists alike. Hyde Park contains many old sweet chestnuts. Dutch Elm Disease took all the original elms, so the design that is left is made up of trees that were added in the Victorian Era instead of the original design period.

Kensington Gardens

Bridgeman's original landscape design plan was developed in 1680's. The chestnuts from that time are still alive. The elms here were also lost. The allees are from the Victorian Era, however some trees have been replanted. There is lively debate around the United Kingdom about how and whether or not to replant allees (called "avenues" in the United Kingdom).

Richmond Park

Richmond Park is a National Nature Reserve, London's largest Site of Special Scientific Interest and a European Special Area of Conservation. The historic trees at Richmond Park were originally working trees, planted 500 years ago, used as fodder, firewood and as boundary markers. When the land was closed and made into a park, they stayed like a time capsule and act as markers where there is no map. There are 1517 ancient or veteran trees in Richmond Park.