

Title: **To Speak for the Trees: A Self-guided Arboriculture Tour at Morris Arboretum**

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Abstract:

Morris Arboretum has been a place where the public can experience and appreciate the beauty and inspiration of majestic trees on a preserved historic site for nearly a century. The Arboretum has invested significant resources in the education of citizens and professionals in the tree-care industry both through the School of Arboriculture and other educational programs.

This internship project is a three-fold effort to create new material that can help disseminate valuable knowledge and understanding of arboriculture practices to visitors at the Arboretum. The foundational product is an online self-guided tour of the Arboretum highlighting and explaining arboricultural practices and techniques that have been employed throughout the garden. This tour is an ArcGIS Story Map and it includes information about tree biology and function as well as details about specific pruning practices and management strategies. Building on this curriculum, the other two components of the project will be two classes that will take place in May 2016. The first is a class for the Volunteer Education Guides that will focus on providing answers to frequently asked questions they receive from visitors. A second class, designed for home-owners, will be offered through the education department and focus on how people can influence the health of their own trees as well as when to seek professional input.

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DESIGN OF PROJECT AND GOALS

As the 2015-2016 Walter W. Root Endowed Arboriculture intern, I had the opportunity to work at the Arboretum and learn about planting, climbing, pruning, and managing the beautiful and historic collection of trees from around the world. In addition to the training and hands-on work of climbing and maintaining the collection, I have also been learning about tree inspection, hazard assessment, and preventive measures that can be taken to avoid destruction or damage of property. Through the process of learning about tree management, I identified an opportunity to compile some of that valuable information for the purpose of sharing it with visitors at the Arboretum who might be interested in tree management. This project is an effort to translate some of the information into formats that will hopefully reach a variety of audiences. Primarily, I would like to explain some of the techniques and strategies that are common practice among arborists in dealing with trees in urban settings. If people in the public and private sectors understand these strategies, I believe that more effective and sustainable efforts can be made to establish and preserve valuable tree specimens. Some basic elements of tree biology are fundamental to an understanding of arboriculture practice and theory. Therefore the goals of this project are to explain arboriculture topics related to tree health, safety, and longevity while also providing supporting concepts of the biological function of trees.

HISTORY AND BACKGROUND

Even before 1887, the year John and Lydia Morris purchased the land that we know of today as the Morris Arboretum, many trees existed on the property as evidenced by the presence of mature trees on the map that John Morris created in 1909 (Morris Arboretum Archives, 2011). Several of those trees are still notable living features of the garden today. In the 1930s, the Arboretum began to transition from a private residence to a place of public education, research, and horticultural display as a part of the University of Pennsylvania. In the mid-1970s, the first efforts were made to create a tree care program and arborist education program. The Director of Education and Visitor Experience, Bob Gutowski, explained that an urban forestry outreach program was part of the Arboretum master plan during this time. That led to many local and national efforts and initiatives such as TreeVitalize and a partnership with the USDA Forest Service. These educational programs and workshops advocated and invested in tree education and urban forestry efforts in Pennsylvania and throughout the country (personal communication, February 24, 2016). The Morris Arboretum still invests in urban forestry outreach and professional arboriculture education through the School of Arboriculture and the Urban Forestry Consultants on staff.

The Arboretum also seeks to educate the people who visit the 92-acre garden. The volunteer Guides have played a key role in visitor education at the Arboretum since 1973. As Morris Arboretum's Assistant Director of Visitor Education and Youth Programs, Liza Hawley shared: "The Guides have committees that develop tours and programs, continuing education programs, recruit new volunteers and reward current [volunteers], train new and refresh current guides. Additionally, they lead tours, programs, and staff the Welcome Cart" (personal communication, February 29, 2016).

Arboretum visitors can schedule a tour in advance to meet with a guide through the Education Department. The guide will meet the group on site and lead them through the garden explaining various aspects of the history, plants, and story of the Arboretum. The guides also offer a weekly Saturday tour for visitors who don't book a tour in advance. These tours are valuable because they extend an invitation to the otherwise casual visitor to gain a deeper understanding of the story of the Arboretum.

METHODS AND PROCESS

The first element of this project is the foundational component that connects the digital text and photographic content with geospatial data. This component was created through the Story Map website and is accessible online and through the use of a smartphone or computer. The second component is the presentation that will be offered to the Volunteer Guides. Finally, the third component is the tree education class for homeowners through the Morris Arboretum Education Department.

Methods: Story Map Project

The process of creating this tour began with assessing the amount of information about trees readily available to visitors through existing self-guided tours. As advertised on the Arboretum website, the tours include a "Native Trees Tour" and the "Great Trees Tour" along with several guided tour options that may be scheduled in advance for a group and led by one of the Volunteer Guides ("Morris Arboretum Tours and Maps," 2016). The tours are focused on the identity of the trees and explain information about the species or the history of the specimen in particular. This Arboriculture Tour adds another dimension to the tree tours at the Arboretum by focusing on the management of trees from an arborist's perspective. This includes the science of how trees function as well as the ways that people can positively and negatively impact tree development and longevity.

A Story Map is a way to communicate a narrative through a series of images, text, and other multimedia with the ability to associate each piece of information to a location on a digital map or series of maps. The Story Map website offers several templates or styles of formatting the content and relating it to the map. This project employs the "Map Journal" because it offers the ability to connect more than one image to each location. This format is comprised of a scrolling pane for the content and a background map of the entire area that zooms to the point of interest as the user scrolls through the content ("Story Map Journal Tutorial," 2016). The online interface can be manipulated by the user to zoom in and out and view different points on of the map regardless of their location. The map may be accessed with a computer, smartphone, or tablet using internet or cellular data plans. This format is ideal for a self-guided tour of an arboretum because it allows visitors to proceed at a self-determined pace and choose which part of the tour they would like to view in detail. The incorporation of images and text can provide more information for each tour location than would be possible on a printed map.

The process of creating the tour began by considering basic principles of arboriculture to determine which topics should be included in the tour. Tree biology, pruning, vegetative

propagation, and tree structural stability are the four elements of arboriculture that direct the content of the tour (Harris, Clark, & Matheny, 1999; Murray, 2011). While selecting concepts and specific trees to include, the following considerations were important: the limitations of appropriately capturing the example in a photograph, the accessibility of the physical location of the tree in the garden, the relative significance of the topic for people in public and private situations, the coherence of the hypothetical explanation, and the complexity of the topic. The photos were taken with a Canon Rebel T3 during the dormant season so that the branch structure and form of the tree could be seen in the photos. The tree location data points were collected using ArcGIS Collector application and iPad supplied by the Urban Forestry Consultant team. In order to use photographs in a Story Map, they must be hosted online. The photos taken and used for this project are hosted on Morris Arboretum's Flickr page.

Methods: Arboretum Guides

The Volunteer Guides served as a valuable source of information for this project because of their significant interaction with visitors and because the nature of their interactions facilitates a good opportunity for sharing detailed information about trees when visitors are interested. As part of the planning and shaping process of this project, many of the guides responded to a survey regarding common questions, conversations, and visitor interest in the trees at the Arboretum. Their responses were factored into the process of shaping the content of the story map.

The individuals who volunteer as guides come from a wide range of careers. According to Jim Kohler, Volunteer Education Guide, they are professionals in the medical field, educators, school bus drivers, corporate business executives, homemakers, business owners, professional gardeners, and computer programmers. New guides undergo a 14-session training to form a common base of information about the Arboretum that they can then share with the public on their individual tours (personal communication, February 26, 2016). They have the freedom to tailor the tour to the interests of the specific group, focusing more on history, botany, or horticulture as their judgement would lead them based on the visitors' interests. Due to the fact that the guides at Morris Arboretum already have an established process and ongoing schedule for leading tours, this work was approached as an optional and complimentary source of additional information for any guides who might be interested. The map and compiled content of the project will be shared with the guides as a part of their spring training event for new and returning guides in May 2016.

Methods: Homeowner Class

Through the process of determining the potential scope of a project that aimed at educating Arboretum visitors about trees, a significant opportunity was found in the form of current and ongoing classes offered through the Morris Arboretum Education Department. Jan McFarlan communicated the value of the class and was instrumental in determining focus and audience. The result is a class that is offered through the spring 2016 course brochure which will include a guided tour of many trees on the story map tour. The focus will remain relatively unchanged, but the discussion will intentionally include practical steps that individuals who are not trained arborists can learn from arboriculture and potentially apply as a property owner. The

main concepts covered will be basic tree function and care along with preventive measures that can be accomplished by a typical homeowner. These strategies will relate to tree health, long-term impact of major and minor damage, visual cues for potential problems, and knowing when to consult a professional arborist. The class is marketed to homeowners and any individuals who desire to know more about tree biology, management, and appreciation. The class will be offered in May of 2016 on a Saturday morning.

In planning for this class, several factors must be considered or addressed. First, homeowners cannot and should not attempt most of the actions that trained arborists are able to execute relating to tree work. There must be a clear delineation between simple safe actions attainable while working on the ground and those actions that require specialized knowledge and equipment. The class will emphasize the importance of employing certified, insured professional tree-care companies to safely and efficiently take care of the vast majority of tree management tasks. The class will empower homeowners to take the initiative to understand tree issues and therefore be better able to converse with arborists about required actions. It will also focus on the crucial and often overlooked role of preventive care. When people are aware of the impact of common practices in and around private property, they are able to make changes to favor safe and conscientious interaction with trees. In this vein, the class will include concepts such as soil compaction, mechanical damage from lawn equipment, and the way that other common preventable injuries might impact trees (Lilly, 2008; Shigo, 1984).

RESULTS AND PRODUCT

The digital map tour is currently available through the Story Map website, through one of the ESRI sponsored Story Map applications for mobile devices, and will be included in tour options on the Morris Arboretum website. The tour consists of 18 trees within the Arboretum and the content attached to each stop is a description of the practice or concept being discussed. The photo or series of photos are intended to convey a visual representation of the point being discussed and give the visitor an opportunity to compare the actual tree in front of them with another view or vantage point. Depending on the time of year, the photo may be very helpful in understanding the concept. The photos also provide an opportunity to offer more information than could otherwise be explained only in text.

A screenshot of the primary map and starting view of the Story Map is shown in Figure 1 below. The panel on the left side of the screen scrolls to display each tree, photos, and descriptions of the other stops on the tour. Paired with that scrolling, the map extent on the right will zoom to a closer view of the tree being discussed. The photos may be enlarged and the map may be panned and zoomed by the user.

FIGURES

Figure 1: Base map and display for the Story Map tour

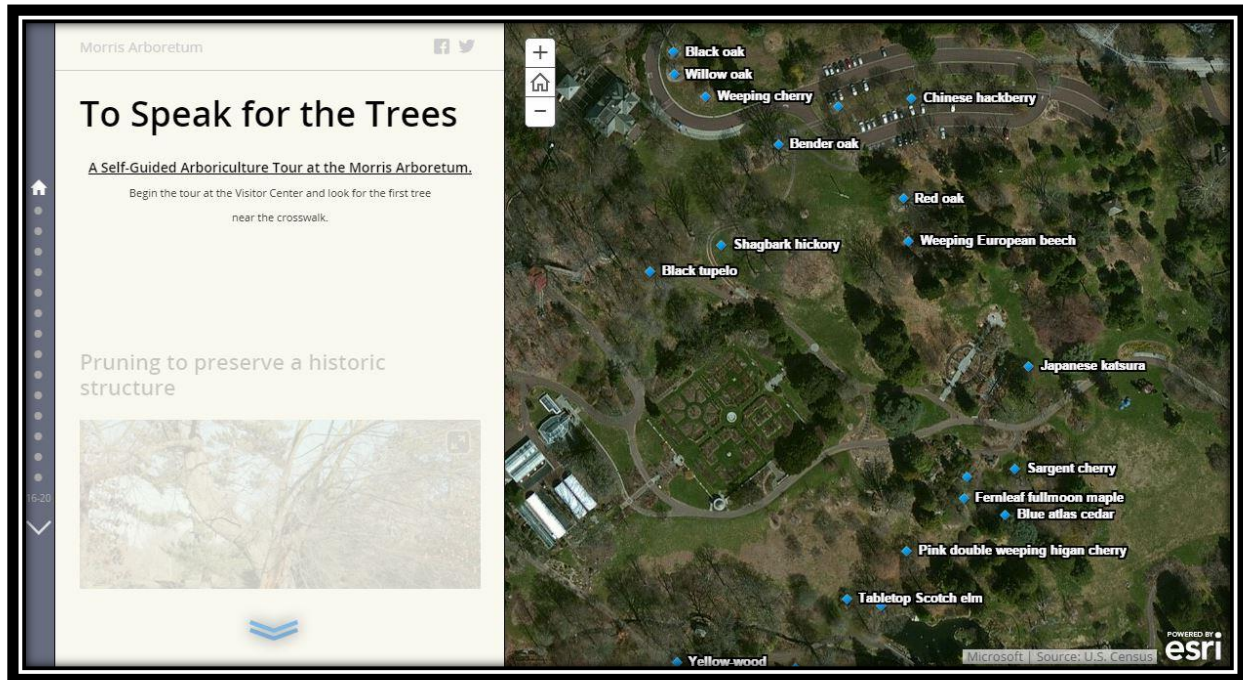


Figure 2: Labeled photograph for the *Zelkova serrata*



The following excerpt is an example of the content included in the tour for one of the stops and it accompanies the photo visible in Figure 2.

If you stand near the crosswalk and look at the line of trees in the center of the parking lot, the closest large tree you see is a Japanese zelkova or *Zelkova serrata*. This tree has three main wounds where the arborists pruned big branches to improve clearance on the sidewalk and parking lot. The year the cuts were made is shown on the image. Notice how the older cuts have sealed with woundwood around the edge of the cuts. This response helps the trees keep out bacterial and fungal pathogens. The ring of woundwood is mostly even all the way around indicating that the pruning cut was made well and did not injure the branch collar. (To Speak for the Trees, 2016)

The content of the tour draws a connection between the visible elements of the trees and concepts or elements that may not be visible to the observer. In the above example, the woundwood will likely be more easily viewed while physically standing beside the tree, but the digital content can include the dates of the cuts and the explanation that woundwood is a growth response to help the tree seal the wound and compartmentalize against decay (Gilman, 2012; Gilman and Lilly, 2008). Both the common name and the scientific name of the trees are used as a way to familiarize visitors with the Latin names of trees they may already know by the common name. Each paragraph of text explaining a concept is joined with at least one photo designed to effectively capture a visual representation of the topic. When possible, multiple photos or captions are included to more fully explain the concepts. It is inevitable that the appearance of the trees will change over time and the photos can allow the users to view the tree at a point in time in the past. As an example, the photograph of the *Fagus sylvatica* ‘Pendula’ includes the old decaying trunk as well as the younger trunks that grew up from layered-in branches. Eventually the old decaying trunk will disintegrate or be removed for safety reasons, but the image will continue to give visitors a glimpse into the past of the tree.

CAPABILITIES AND LIMITATIONS

According to onsite research conducted by Stacey Kutish, Arboretum Digital Interpretation Strategist, 86% of Arboretum visitors have a smartphone with them (personal communication, February 2016). Regardless of smartphone access, anyone with internet access from a computer will be able to view the map and take a “virtual tour” of the Arboretum while offsite, reading about the various arboriculture practices and seeing the photographed examples of concepts. Using a mobile app to access the tour in the garden will require cellular data usage. A project that is currently underway to provide wireless hotspots in several locations with the garden would significantly reduce the amount of time that an individual will have to use their data if they connect to the WIFI on their device. When those WIFI locations are available, the visitors could access and view all of the content of the tour in specific locations in the garden without using and data from their phone plan.

FUTURE WORK

The map and tour would be improved if the base map was easier to interpret and follow. The aerial imagery associated with the ArcGIS online map software is accurate and displays the various locations and reference points throughout the garden, but it can be confusing for some people to follow due to the lack of differentiation between vegetation types. The paths are visible for the most part, but the texture of the various vegetation types combined with the blurring of detail as viewers zoom in can make it challenging to determine the next location on the tour. If enough interest and support are demonstrated for tours such as this, a digital version of the graphic map of the garden could be created and supplied as the base map for the tours. This map should include such features as scalable text for the names and titles of locations, handicap accessibility listed on the various paths, and good contrast to differentiate between the various elements of the garden such as trees, lawn, water, paved surfaces, and built structures.

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