BATTLING BOXWOOD BLIGHT IN HISTORIC AMERICAN GARDENS

by

KEELI MICHAEL WINDHAM

(Under the Direction of Cari Goetcheus)

ABSTRACT

Boxwood is a quintessential garden shrub that has been used in landscape design since ancient times. The beloved evergreen is an irreplaceable component of American gardening heritage and history as it has been used in garden design since the country's founding. Today, many historic American gardens of the Colonial, Antebellum, and Colonial Revival eras retain historic boxwood that are irreplaceable. However, a devastating disease caused by the fungal pathogen, *Calonectria pseudonaviculata,* which targets *Buxus sp.* is threatening the future of boxwood in historic American gardens. This research evaluates boxwood blight best management practices used in historic American gardens and how it affects the integrity of the historic landscape.

INDEX WORDS: Boxwood, boxwood blight, boxwood history, *Calonectria pseudonaviculata*, cultural landscapes, cultural landscape management, historic American gardens, heritage plants

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KEELI MICHAEL WINDHAM

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KEELI MICHAEL WINDHAM

Major Professor: Cari Goetcheus
Committee:
David Spooner
Jean Williams-Woodward
Lynn Batdorf

Electronic Version Approved:

Ron Walcott
Vice Provost for Graduate Education and Dean of the Graduate School
The University of Georgia
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DEDICATION

To Odette and Nelli, my beloved companions.

To Mama, Daddy, and Rose for their unwavering advocacy, love, and solidarity.

And to Taylor, my anchor in all things.

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CHAPTER 1

INTRODUCTION

Not only do boxwood play a major role in the history of horticulture and landscape design from ancient times to the present, but they are an integral and foundational garden shrub that is embedded in American gardening tradition and heritage. As a resident of historic Madison, Georgia since childhood, early on I developed a deep love and appreciation for the beauty of historic gardens and landscapes: the details of their designs, stories of their inhabitants, and history of their plants. Boxwood have always been a personal favorite of mine not only because of their dense green form, but because of their mystique. They evoke a sense of antiquity wherever planted, bringing a regality to the landscape that only *Buxus* species (*Buxus sp*.) can. When conjuring images of the historic American landscape, I can almost guarantee that the shrub will be present in the scene. The boxwood is, after all, one of the oldest cultivated shrubs in history.

I first came across the subject of boxwood blight in 2017 in the *Identification of Woody Trees and Shrubs* class, taken during my freshman year in the Horticulture undergraduate program at the University of Georgia's College of Agriculture and Environmental Science. While boxwood blight was acknowledged as a serious health concern for *Buxus sp.*, no detailed information regarding the management or prevention of the disease was conveyed. The lack of definite instruction regarding boxwood blight was not a reflection of the academic integrity of the UGA Horticulture program, but rather how recent the pathogen had appeared in the United States. At that time, boxwood blight had prevailed in the US for six years. When considering

time, funding, and labor constraints involving plant pathogen studies, it is understandable that critical research would have still been ongoing.

Boxwood blight is a destructive disease which targets *Buxus* sp. This disease is caused by the fungal pathogen *Calonectria pseudonaviculata* and causes rapid boxwood decline, eventually leading to death. The contamination was first discovered in the United States in 2011 and has since spread to many southern states.[1] Historic gardens, both public and private, are particularly being targeted due to the pathogen's highly transferrable nature as well as the type of boxwood present in historic landscapes. Particularly susceptible to boxwood blight is the dwarf English boxwood (*Buxus sempervirens* 'Suffruticosa') and the American boxwood (*B. sempervirens*).[2] *B. sempervirens* 'Suffruticosa' and *B. sempervirens* are the most common boxwood planted in historic American gardens. The disease spores are incredibly sticky and can be spread via garden tools, clothing, shoes, and wind, amongst other vectors. Boxwood blight is especially damaging to the southern landscape as the pathogen thrives in the wet, cool climate that is characteristic of fall, winter, and early spring in the southern United States.[3]

There are only preventative management strategies available to combat the spread of boxwood blight as there is no cure yet for this disease.[4] The simple horticultural answer to address the disease is to completely remove the infected boxwood. However, this answer has not

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[1] Norm Dart, Mary Ann Hansen, and Elizabeth Bush, "Boxwood Blight: A New Disease of Boxwoods Recently Found in Southeastern U.S.," *The Boxwood Bulletin* 51, no. 1 (July 2011 2011), https://www.boxwoodsociety.org/uploads/51_1_2011_July.pdf#page=7.

[2] M. Ganci, K. Ivors, and D.M. Benson, *Susceptibility of Commercial Boxwood Cultivars to Boxwood Blight* (NC State University 2013), https://plantpathology.ces.ncsu.edu/wp-content/uploads/2013/05/final-Cult-trials-summary-2013.pdf?fwd=no.

[3] "Expanding on the Boxwood Blight Management Decision Guide," accessed 11/15/2021, 2021, https://ext.vt.edu/content/dam/ext_vt_edu/boxwoodblighttaskforce/files/expanding__BB_decision_guide_v1.pdf.

[4] Adria Bordas et al., "Best Management Practices for Boxwood Blight for Professionally Managed Landscapes and Public and Historic Gardens in Virginia," (September 26, 2016: Virginia Cooperative Extension, November 15, 2021 2016), Extension Service Publication. https://resources.ext.vt.edu/contentdetail?contentid=2388.

settled well with many historic sites because of the age and/or significance of the boxwood at these historic sites.[5] Horticultural industry leaders and universities have studied this disease and have established two comprehensive management strategies for boxwood infected with boxwood blight.[6] Although these techniques are readily being used by historic homeowners and garden professionals, it is unclear the results of the management approaches and how they affect the integrity and significance of the historic garden. The first management option is to remediate the disease. Remediation involves the protection and maintenance of the diseased boxwood. Eradication is the second method which requires the replacement of the infected boxwood with a less susceptible cultivar or a different species of plant.[7] The management strategy chosen, either remediation or eradication, depends on the severity of the disease, the preservation goals of the garden, and the historic boxwood in question, amongst other factors. Many horticultural journals, cooperative extension publications, and academic reports outline information regarding current best management practices for boxwood blight.

As an avid researcher and reader of all things encompassing historic American gardens, I frequently came across publications commenting on the devastation of boxwood blight, particularly in historic public gardens.[8] While historic gardens on both the East and West coast

[5] Virginia Cooperative Extension, "Expanding on the Boxwood Blight Management Decision Guide."
[6] Bordas et al., "Best Management Practices for Boxwood Blight for Professionally Managed Landscapes and Public and Historic Gardens in Virginia."; Virginia Cooperative Extension, "Expanding on the Boxwood Blight Management Decision Guide."; Kelly Ivors, "Prevention and Management of Boxwood Blight," (2013). https://plantpathology.ces.ncsu.edu/wp-content/uploads/2013/05/Box-blight-Guide-07.22.13.pdf?fwd=no; Jean L. Williams-Woodward, "Disease Update: Boxwood Blight in Georgia," 2 (2015). https://plantpath.caes.uga.edu/content/dam/caes-subsite/plant-pathology/extension-pdfs/GA-Boxwood-Blight-Alertv2.pdf.
[7] Virginia Cooperative Extension, "Expanding on the Boxwood Blight Management Decision Guide."
[8] "The Historic Gardens," The Woodrow Wilson Presidential Library & Museum accessed 10/19/2022, 2022, https://www.woodrowwilson.org/historic-gardens ; Reynolda, "Reynolda on the Forefront of Identifying Replacements in Response to Boxwood Blight Epidemic," news release, 04/01/2019, 2019, https://reynolda.org/about/news/reynolda-on-the-forefront-of-identifying-replacements-in-response-to-boxwood-blight-epidemic/.

of the US are being affected by this devastating disease, the climatic conditions of the South are optimal for the lifecycle of the pathogen, increasing the severity of the disease in the southern US. These publications often focus on the aftermath of boxwood blight and stress the uncertainty of the future of boxwood in historic gardens. It was at this point I decided to focus my thesis research on the impact of boxwood blight in historic American gardens.

As I began my preliminary research, I discovered in current boxwood horticultural literature, none of it focused specifically on boxwood in the historic landscape. Unsurprisingly, nothing concentrated on the contemporary maintenance and management of boxwood for boxwood blight in the *historic garden;* the most recent significant publications which focused on the management practices of *Buxus sp.* were from the late 1990's. Horticultural literature does not have a long shelf life; the pool of plant knowledge is constantly and rapidly developing as research methods and technology advance. Because boxwood blight was discovered in the US in 2011, these dated publications do not have information regarding up-to-date management of the disease. Although academic reports and extension publications outlining the best management practices for boxwood blight are continually being published and updated, they are not focused on the maintenance of the disease in historic gardens. The lack of published material pertaining to boxwood blight in historic gardens has created a vacuum of guidance specifically on how to avert or remediate the disease under the constraints of managing a historic property. Because of the dated literature, lack of publications focusing on boxwood blight in the historic landscape, in combination with the rapid spread of boxwood blight in historic gardens, I believe this kind of research is long-overdue. As such, the results of such a study could potentially serve as a resource for historic garden managers as they hunt for information regarding how current boxwood blight best management practices affect historic gardens as well as identify what best

management practices are being applied for the prevention and protection of the devastating disease.

Protecting the longevity of boxwood in historic American gardens would ensure an irreplaceable piece of our gardening history and heritage is preserved. A few preliminary questions surfaced when trying to understand what is currently being done to protect this important historic garden shrub: *Are there boxwood blight prevention strategies being implemented by historic garden managers? If so, have these strategies worked? What types of management and maintenance techniques, if any, are being implemented when boxwood blight is discovered? How are these management decisions ultimately affecting the historic landscape?* This thesis aims to *address the current best management practices of boxwood blight that are being applied to historic American gardens, encompassing Colonial to Colonial Revival eras of garden design, and how it affects the authenticity/integrity of the historic landscape.*

Additionally, this thesis aims to answer the following questions:

- *How has boxwood generally been used in garden design throughout history?*
- *What are the horticultural industry standards for boxwood cultivation?*
- *What are the standards for best management practices for boxwood blight?*
- *What are current best management practices for historic preservation and cultural landscape preservation, emphasizing authenticity and integrity?*
- *What are the boxwood blight best management practices being implemented at historic gardens?*

The results of this research will hopefully serve as a resource for historic American garden managers, providing them with a guide of what methods of prevention are currently being implemented as well as current management and maintenance techniques that are being used,

and ultimately, how these horticultural practices affect the integrity and authenticity of the historic American landscape.

Methodology

Per contemporary landscape architecture research methodology, this thesis will utilize descriptive research strategies which "produce new knowledge by systematically collecting and recording information that is readily available", as defined by M. Elen Deming and Simon Swaffield in *Landscape Architecture Research Inquiry, Strategy, Design*. Generally, I will be using three of the four types of descriptive research strategies: observational strategies, descriptive social surveys, and descriptive case studies. While my primary research methodology will involve these three types of descriptive research strategies, I will be combining traditional historic landscape preservation methods of conducting site history research and undertaking survey interviews with standard landscape architecture methods of documenting existing site conditions and performing site analysis and evaluation.

According to Swaffield, observational data is "a very efficient way to gain insight into the character, use, and performance of places already designed." and can be organized based on a specific site, or place. Observational data will be utilized to document the existing conditions of the case study boxwood gardens which will be critical in assessing boxwood health, how well the garden is managed and maintained, the success of the boxwood blight prevention and management plan, how well the historic garden design is represented, amongst other assessments. Another way to organize observational data involves recording a specific landscape

phenomenon and its distribution across a selected region or territory.[9] Thus, observational data will be useful in analyzing the spread of boxwood blight in the US.

Descriptive social surveys, which "require information that can only be found by asking what other people have seen or experienced", will be necessary to understand current boxwood blight prevention and management techniques used in the historic American garden.[10] Historic garden curators, boxwood industry professionals, and historic landscape designers will be asked to provide information via a formal survey or interview.

Descriptive case studies "are complex multifaceted investigations into a particular place, project, organization, or landscape." and will be utilized to document the history of the garden, role of boxwood on site, and the history of boxwood blight identification on the property.[11] Additionally, descriptive case studies will be necessary to document the management practices used to control boxwood blight, the amount of change to the historic boxwood shrub, and the resulting impact of boxwood blight on authenticity and integrity of the site. Historic design intent and characteristics of the case studies will be established through analysis of historic photographs, landscape designs, planting plans, journals, articles, and other historical documents. Integrity will be evaluated based on the existing landscape characteristics.

A synthesis of the results of the historic site research, existing conditions, and boxwood blight best management practices, found through observational data, will afford the opportunity to assess what potential changes there may be to integrity of the design intent, plant materials, pruning techniques, etc.

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[9] M. Elen Deming and Simon Swaffield, *Landscape Architecture Research Inquiry, Strategy, Design* (Hoboken, New Jersey John Wiley & Sons, Inc. , 2011).
[10] Deming and Swaffield, *Landscape Architecture Research Inquiry, Strategy, Design*.
[11] Deming and Swaffield, *Landscape Architecture Research Inquiry, Strategy, Design*.

In order to contextualize the observational data, it will be necessary to conduct background research on a variety of topics that will assist in grounding the research question. The topics to be researched include but are not limited to: history of boxwood pre-European gardens, history of box in European gardens, history of box in American gardens, boxwood cultivation considerations, boxwood blight, horticultural standards/best management practices for boxwood blight, and historic preservation standards focusing on authenticity and integrity.

It is important to understand the pre-European history of boxwood in gardens to fully grasp the contextual influence on European and, ultimately, American use of boxwood in garden design. I believe that I will find evidence pointing to their use as a foundational garden shrub due in part to its dense growth habit, lush green foliage, and relatively easy maintenance requirements. I have identified a few sources which I am hoping will produce information regarding the pre-European use of boxwood including *A Cultural History of Gardens In Antiquity* by Kathryn Gleason and *Gardens and Gardeners of the Ancient World* by Linda Farrar. A few boxwood industry professionals who may know of more information regarding the pre-European history of boxwood in gardens may include The American Boxwood Society and the Cherokee Garden Library.

Because boxwood originated in America from immigrating Europeans, the contextual history of boxwood in European gardens will be key to understanding their traditional and continued use in early American gardens. I believe that I will find information regarding boxwood used in aristocratic gardens to show control over nature and how they were commonly used because of the ease of manipulation into topiary, hedges, and edging. In my preliminary research, I have compiled a few sources that I believe will be beneficial in understanding the history of boxwood in Europe including, but not limited to: *Garden Shrubs and their Histories*

by Alice M. Coats, *Boxwood Gardens, Old and New* by Albert Addison Lewis, and *The Story of Boxwood* by Clara S. McCarty.

Because this research is focused on American gardens encompassing Colonial to Colonial Revival design eras, it will be necessary to thoroughly research the history of boxwood in American gardens to establish their traditional use in American garden design and understand the context in which they were used during the Colonial, Antebellum, post- antebellum, and Colonial Revival eras. Findings may include the use of boxwood in early American garden design for the same reasons that their predecessors in Europe employed: to show control over nature and doing so with one of the most popular and easily manipulated shrubs. Authorities on American garden history will be consulted. Authors including Rudy and Joy Favretti, James Cothran, and Denise Adams will be consulted to identify the use of boxwood in American gardens.

From a horticultural perspective, understanding common boxwood pests and diseases, boxwood blight, and current best management practices involving boxwood blight will be imperative for this study. Contemporary industry professionals including Saunders Brothers Nursery and The American Boxwood Society may be able to provide tailored information encompassing boxwood care and maintenance, as well as specifics on boxwood blight management and maintenance. Regarding normal boxwood pests and diseases pre-boxwood blight, it is reasonably assumed that these issues are influenced by geographic location, climate, and care and management of the shrub. Articles published by academic authorities on the topics of boxwood care and management, pest and diseases, and boxwood blight will be consulted to identify the most updated boxwood pest and diseases and boxwood blight prevention and management techniques. The American Boxwood Society, Virginia Tech, and the Virginia

Boxwood Blight Task Force are three primary sources for current updated literature regarding *Buxus* sp.

Once a solid foundation and understanding of the breadth of these topics have been established, I intend to undertake surveys of historic properties, boxwood industry professionals, and historic landscape designers in order to establish a holistic understanding of the issue of boxwood blight, as there is not enough known about those specifics. Not only will I need to define criteria by which I will choose the survey sites, industry professionals, and designers, but once identified I will create survey questions in order understand each group broadly. In governing the selection of historic sites, I will define criteria relating but not limited to geography, time-period, type of design, and garden management. Selection of boxwood industry professionals and landscape designers will be determined by their professional standing and recognition in the industry. After defining criteria, I will select ten to twenty sites, two to three industry professionals, and two to four designers to survey. I will then craft questions which will be formatted for use in surveys. The results of the survey interviews will assist in understanding holistically how boxwood have been cared for and managed and how boxwood blight is being addressed. I will then look at each historic site and conduct case studies using traditional landscape architecture and historic landscape preservation research methods. Once the case studies have been completed, I will conduct a cross analysis of the background research key takeaways, survey conclusions, and case study results after which I plan to have concluding thoughts.

Thesis Organization

Chapter 1: Introduction presents the reader with the topic of my thesis, research methods, and approach to answering the research question. *Chapter 2: Background Research* will compile a brief history of boxwood in gardens of pre-Europe, European gardens, American gardens, boxwood cultivation considerations, boxwood blight, horticultural standards/best management practices for boxwood blight, and historic preservation practices emphasizing authenticity and integrity. *Chapter 3: Need for Surveys, Survey Methodology, and Results* will cover the method, criteria, questions, and results of the surveys. *Chapter 4: Historic Site Case Studies* will cover the case study assessments. *Chapter 5: Answering the Research Questions* will synthesize the research from Chapters 2-4. *Chapter 6: Conclusion* will summarize the information gleaned from Chapters 2 through 5, identify future research possibilities, and provide the author's concluding discussion.

CHAPTER 2

BACKGROUND RESEARCH

This chapter provides context for several topical areas specified in the research questions including: history of boxwood in ancient gardens, European gardens, and American gardens; horticultural industry care and management of *Buxus sp*. regarding common cultivation considerations, pests, and diseases, specifically concerning boxwood blight; and historic preservation and landscape preservation standards, programs, and processes, emphasizing historic significance and integrity.

2.1 Brief History of *Buxus sp*. in Gardens of the World

Boxwood, as an ornamental shrub, has been used in gardens for millennia. Yet, in researching its history, a single reliable reference that discusses that history and use of boxwood over time does not seem to exist. As such, this section pulls from numerous sources to create a cumulative narrative, as possible. Hence, in this section, the history of boxwood use in gardens over time will be discussed chronologically, from ancient times to contemporary, through the lens of boxwood species used, how it is used in design, what form and size it is kept, how it has been maintained and cared for, and the accessibility of plant material. Prior to delving into the history of the use of boxwood in gardens, it must be stated that the common name for *Buxus sp.* is simply boxwood. 'Boxwood' is the correct term when discussing one or multiple box plants, as the word 'boxwoods' does not exist.[12] Although there are 117 accepted species and 284

[12] Lynn R. Batdorf, *Boxwood handbook : a practical guide to knowing and growing boxwood*, 3 ed. (Winchester, Virginia: Greater Valley Publications, Inc. , 2005, 1995).

accepted cultivars of *Buxus sp.*, when this thesis uses the common name 'boxwood', 'box', or '*Buxus sp'.* it is referring exclusively to taxa within the genus *Buxus.*

Boxwood in the Gardens of Ancient Mesopotamia and the Near East (3,000 – 500 B.C.)

The use of boxwood in the gardens of ancient Mesopotamia and the Near East was strongly influenced by the high value that the ancient culture placed on trees. These ancient gardens were typically associated with a temple or palace and were maintained as ritualistic sites and sites of contemplation. Sacred temple gardens, or groves, were often planted with trees, which were associated with deities and other cultural symbolic meanings, as well as to provide shade. Trees were oftentimes brought back from distant lands through trade or taken as plunder during war and planted in the gardens of the nobility. A description of such a prize was inscribed by King Tiglathpileser I on clay and stone tablets dating from c. 1000 BC:

> I took cedar, box-tree, and Kanish oak from the lands over which I had gained dominion – such trees as none among previous kings, my forefathers, had ever planted – and I planted [them] in the orchards of my land. [13]

According to Linda Farrar's detailed research[14] on garden plants of ancient Mesopotamian and Near Eastern gardens of the period, boxwood was found growing in gardens of Lebanon, Israel, Syria, Iraq, and portions of south-east Turkey. Boxwood was also discovered in the literature of that time. Although *B. sempervirens* is native to large portions of the northern

[13] Linda Farrar, *Gardens and Gardeners of the Ancient World* (United Kingdom: OXBOW BOOKS, 2016).Pg. 50

[14] Farrar, *Gardens and Gardeners of the Ancient World* Pg. 45. When researching boxwood used during ancient times, this author found Linda Farrar's *Gardens and Gardeners of the Ancient World* to be the only current source which discusses the use of boxwood during this period. I was first introduced to Farrar's work in 2018 because of an interest in gardens of ancient Egypt. Using garden archaeological findings and historical research from ancient literature and herbals, Farrar details garden design and designers, and provides a period plant list at the end of each chapter. Samuel J. Record and George A. Garratt, *Boxwoods*, vol. 14, Yale School of Forestry Bulletin (New Haven, Yale University 1925).

Mediterranean region and Turkey[15] and may have been cultivated, the exact *Buxus* species used in these ancient gardens has not been identified.

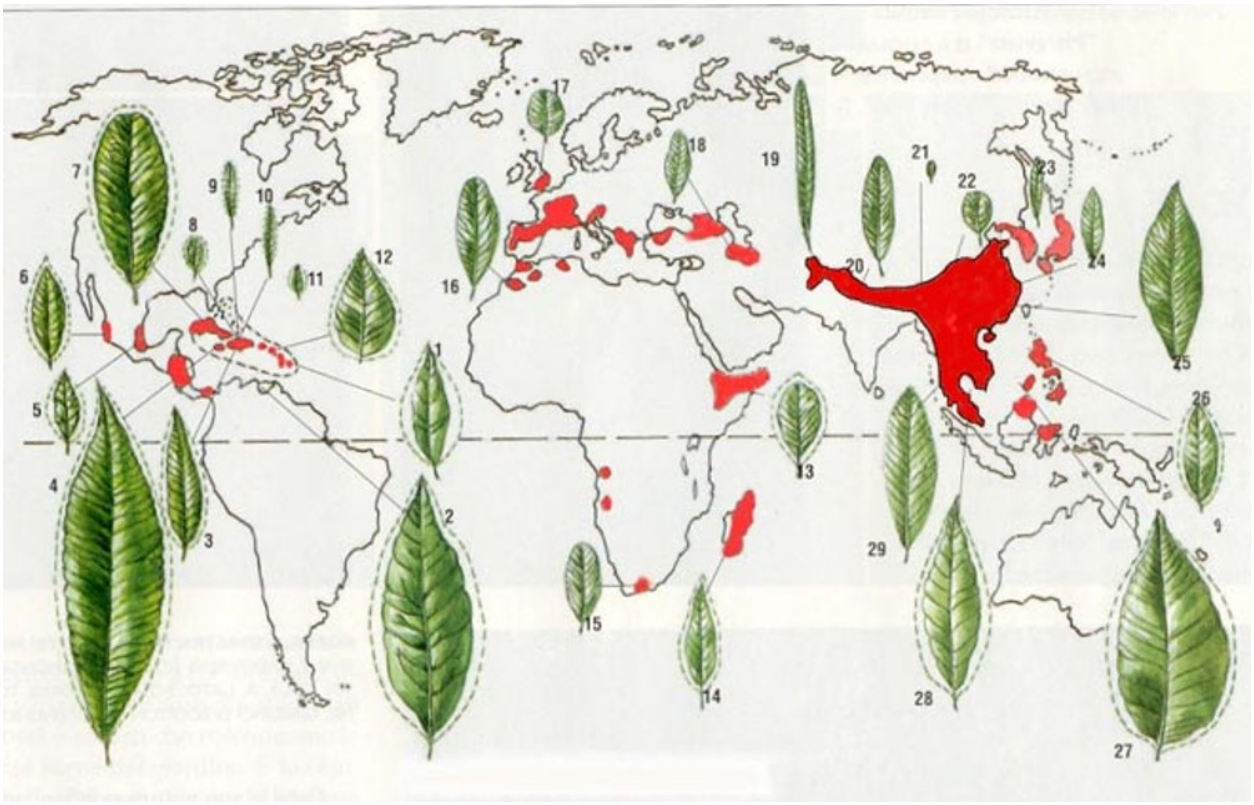

Figure 1 Highlighted in red are the native regions of *Buxus sp.* Number 17 identifies the native region of *B. sempervirens.*[16]

[15] Samuel J. Record and George A. Garratt published "Boxwoods" in the Yale School of Forestry Bulletin in 1925 which discusses *B. sempervirens* as well as other *Buxus sp.,* including their native distribution: *"The natural range of the true box* [*B. sempervirens*] *embraces southern Europe, .part of northern Africa, the coastal regions of Asia Minor, the Caucasus, northern Persia, and from the higher elevations of Afghanistan extends along the Himalayas into China .and Japan*." Record and Garratt, *Boxwoods*, 14. pg. 7

[16] This worldwide map accurately depicts, in red, the natural distribution of 29 *Buxus* taxa. Illustrated with botanically correct *Buxus* leaves (shape and venation) they are portrayed in relative size to each other. There are 17 leaves outlined with dash marks which indicate the maximum observed size and shape for that species. This map, with its various features, was created by Egon Köhler Ph.D. (1932–2015), professor and research scientist of *Buxus* cytogenetics at the Humboldt University, Berlin, Germany. It was commissioned by Mark and Elizabeth Braimbridge, founders of the European Boxwood and Topiary Society, London, England. (Courtesy of Lynn Batdorf).

In the ancient maritime city of Ugarit, located in north-west Syria, a library of cuneiform texts was discovered dating to 1500-1200 BC. In one of the ancient texts discovered, *Buxus* was identified in a list of garden-worthy trees that were possibly being traded with the Canaanites.[17]

Boxwood in the Gardens of Classical Hellenistic and Roman Antiquity (c.1000 B.C. – 450 C.E.)

Like the gardens of ancient Mesopotamia and the Near East, in the utilitarian gardens of ancient Rome, boxwood were planted to reaffirm Roman cultural values of exploring control over and artistic manipulation of nature in the garden. This ethos characterizes the Roman garden and their influence on garden design.[18] Our understanding of gardens and gardening traditions in antiquity has increased dramatically in recent years because of advances in archaeology, as well as the discovery of highly preserved gardens in the Vesuvius area of Italy. Archaeological evidence suggests three types of gardens prevailed during antiquity: a *large garden park, a highly planted garden attached to a structure,* and *a garden located inside a structure*.[19] The second type of Roman garden, *a highly planted garden attached to a structure*, will be the focus of this section because of the archeological evidence revealing the use of boxwood.

The *highly planted garden attached to a structure* is characterized as a rectilinear garden often enclosed by a wall or portico, containing carefully laid out trees and shrubs, including boxwood. Thanks to literary figures of the day and archaeological discoveries, great documentation of this garden type has allowed ancient garden authorities to understand it in

[17] Farrar, *Gardens and Gardeners of the Ancient World*
[18] Kathryn Gleason et al., *A Cultural History of Gardens In Antiquity* 6vols., vol. 1 ed. Kathryn Gleason, A Cultural History of Gardens (London, England
New York, USA: Bloomsbury Academic 2016).
[19] Gleason et al., *A Cultural History of Gardens In Antiquity* 1

detail. This type of garden, typically associated with a palace or villa of the elite, would have been used as a space for promenading, dining, and recreation.[20] One ancient author, Pliny the Younger, wrote of his villa gardens at Tusculum and at Laurentum, documenting his use of boxwood in detail.[21] At his garden at Larrentum, Pliny describes a circular drive, which was a place for leisure walks:

> All around the drive runs a hedge of box, or rosemary to fill gaps, for box will flourish extensively where it is sheltered by the buildings, but dries up if exposed in the open to the wind and salt spray even at a distance.[22]

He further details a terrace garden at his Tuscan villa:

> In front of the colonnade is a terrace laid out with box hedges, clipped into different shapes, from which a bank slopes down, also with figures of animals cut out of box facing each other on either side. On the level below there is a bed of acanthus so soft one could say it looks like water. All around is a path hedged by bushes which are trained and cut into different shapes, and then a drive, oval like a race-course, inside which are various box figures and clipped dwarf shrubs. The whole garden is enclosed by a dry-stone wall which is hidden from sight by a box hedge planted in tiers…. [23]

When discussing Roman gardens, boxwood, along with myrtle and laurel, is among the most often mentioned plants by writers of the day. Reigning from 238 C.E. until his death in 244, the emperor Gordianus III had planned a public park-like garden in the city center, the Campus Martius, which was never built. His biographer describes the public garden as having:

> a portico on the Campus Martius, just under the hill, a thousand feet long, intending to erect another of equal length opposite to it with a space of five hundred feet stretching evenly between. In this space there were to be pleasure-parks on both sides, filled with laurel, myrtle, and box-trees, and down the middle mosaic walk a thousand feet long with short columns and statuettes place on either side.[24]

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[20] Gleason et al., *A Cultural History of Gardens In Antiquity* 1
[21] Farrar, *Gardens and Gardeners of the Ancient World*
[22] Farrar, *Gardens and Gardeners of the Ancient World* pg. 166
[23] Farrar, *Gardens and Gardeners of the Ancient World* pg 167
[24] Gleason et al., *A Cultural History of Gardens In Antiquity* 1 pg. 76

It is unsurprising that box was among the list of evergreens to be used in the Campus Martius public garden. Such a highly uniform and planned space would have exhibited trimmed and sheared evergreens, but probably not as topiary.[25] Sources suggest that topiary would have been limited to the private villa gardens of the elite.

Although the practice is said to have originated with the Syrians, the art of topiary was first used by the Romans in the Augustan Age where they would clip box into hedges or shear them to look like sculptures.[26] The adjective *tonsilis,* meaning to cut greenery and plants by clipping or shearing them, is used when discussing topiary in Latin literature. Unsurprisingly, boxwood is the plant that is most discussed in topiary writings and most associated with the word *tonsilis.*[27] In addition to his box-bordered circular drive and terrace garden, Pliny the Younger's gardens at Laurentum boasted box-topiary in the garden's *hippodromus,* a space that has many similarities to our modern racetrack. The *hippodromus*, rectangular in shape with curved edges, was used for entertainment and filled with many topiary designs. He describes the box topiary:

> Between the grass lawns here and there are box shrubs clipped into innumerable shapes, some being letters which spell the gardener's name or his master's; small obelisks of box alternate with fruit trees, and then suddenly in the midst of this ornamental scene is what looks like a piece of rural country planted there. The open space in the middle is set off by low plane trees planted on each side; farther off are acanthuses with their flexible glossy leaves, then more box figures and names.[28]

Roman gardeners used the *falx* as the principle pruning and topiary tool. The *falx,* a title which describes a sickle, billhook, pruning knife, and pruning hook, is a curved tool with various

[25] Gleason et al., *A Cultural History of Gardens In Antiquity* 1
[26] P.D. Larson, *Boxwood : its history, cultivation, propagation and descriptions* (1996).
[27] Gleason et al., *A Cultural History of Gardens In Antiquity* 1
[28] Farrar, *Gardens and Gardeners of the Ancient World* pg. 168

configurations. Each variation is associated with a specific gardening task, of which the *falx putatoria* or *falx arboraria* was affiliated with pruning trees and topiary.[29]

Justification for the creation of hedges and topiary may have involved the necessity to protect against the elements, or the desire to physically define gardens associated with the elite. While speculation exists, Romans are believed to be the first to create topiary because of the lack of topiary literature prior to the first century C.E. In addition to the written accounts of Roman gardens and their use of box for edging, hedges, and topiary, archaeological excavations have further provided details of Romans gardens and the use of box.[30]

Among other trees and shrubs, boxwood were discovered to have been used as edging for the promenade and garden paths of the excavated villa of Oplontis in Campania, Italy, built in the first century B.C.E. The use of *Buxus sp.* as hedges to border the garden paths in the Oplontis villa is the generally accepted interpretation based on the location and size of the excavated root cavities, as well as the descriptions of Roman authors of that time. Hedges were probably cut linearly, based on the cavity's linear orientation. While the placement of box hedges would have emphasized the order and control of the garden paths, the way they were trimmed as well as the height they were kept at would have further emphasized the notion of order and control.[31]

While archaeological excavations evidence the common use of boxwood in a utilitarian form, one example of a more artistic garden expression using boxwood is found in the gardens of Pompeii. Evidence of a geometric planting of hedges was discovered in Pompeii in the House of the Gold Bracelet. Root cavities excavated at this garden indicate a hedge that mirrors a knot garden, a design that would not be established until after the Middle Ages, beginning in 1400

[29] Caroline Foley, *Topiary, Knots, and Parterres* (United Kingdom Pimpernel Press LTD, 2017, 2017); Farrar, *Gardens and Gardeners of the Ancient World*
[30] Gleason et al., *A Cultural History of Gardens In Antiquity* 1
[31] Gleason et al., *A Cultural History of Gardens In Antiquity* 1

C.E.[32] This discovery is significant because of the edging in a refined, geometric artistic design while most boxwood during this period was used in utilitarian hedges.

According to Farrar's plant list for this period, *B. sempervirens* was the box species used in ancient Roman gardens, as *B. sempervirens* remains have been found in archaeological samples and are often mentioned in period texts.

The Romans are responsible for refining the use of boxwood in the garden, planting *B. sempervirens* in simple, geometric patterns and shearing it into topiary as a physical embodiment of the cultural value of mastering and artistically exploring nature in garden design and plantings.[33]

Boxwood in European Gardens (1300 – 1700 C.E.)

Following the decline of the Roman empire in the fifth century AD, the Dark Ages, also known as the Middle Ages or the medieval era, halted cultural and scientific advancement across the world for almost 900 years. The emergence of the Renaissance in the fourteenth century welcomed a new age of knowledge and cultural development, including garden design.

During the Renaissance, the practice of garden design in Europe maintained its roots in antiquity by continuing the use of symmetry and geometric forms in the garden. A surge of gardening herbals debuted in the sixteenth century due to many new innovations, including the rise of printing, exotic plant introductions, and a countrywide zeal for gardening. These

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[32] Gleason et al., *A Cultural History of Gardens In Antiquity* 1 ; William C. Welch et al., *The Southern Heirloom Garden* ed. Greg Grant (Dallas, Tex.: Dallas, Tex. : Taylor Pub., 1995).

[33] Larson, *Boxwood : its history, cultivation, propagation and descriptions*; James R. Cothran, *Gardens and historic plants of the antebellum South* (University of South Carolina Press, 2003), Bibliographies Non-fiction
Government documents.
https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=cat06564a&AN=uga.9934474463902959&site=eds-live&custid=uga1.

published herbals discussed gardening, design, plant materials, as well as technical instruction, amongst other topics of interest. During the sixteenth century, a strong distaste was associated with boxwood due to its strong odor, which caused literary figures to limit its use in typical forms associated with the use of box, like hedges and edging. Written and published in 1554 by Charles Esteinne, *L'Agriculture et Maison Rustique,* contains strong comments against the use of box:

> as for boxe in as much as it is of a naughtie smell, it is to be left of and not dealt withal… It must not be planted neere the place where bees are kept, for the flower killeth them soddainly. Some affirme that it corrupteth the aire by the stinking smell it hath, and for this cause it would be as sparingly planted in the garden as possiblie may be. [34]

In his 1578 herbal, Henry Lyte discussed the characteristics of boxwood and wrote that it is 'very hurtful for the brayne when it is but smelled to'[35], with John Gerard following suit in his famous herbal of 1597 as he called the scent 'evil and loathsome'.[36] These sixteenth century publications indicated that boxwood was seen as plant that should be avoided in the garden.

While *Buxus sp.* was not commonly used in the gardens of the sixteenth century due to its scent, a resurging favor of *Buxus sp.* at the turn of the seventeenth century brought the evergreen shrub back into the garden spotlight as a low maintenance and easy-to-shear plant. With the seventeenth century also came the creation of a simple garden type made of compartments of various shapes and sizes exhibiting 'embroidery'. These new gardens, called *parterres*, began in France, and were laid out with the popular-again boxwood.[37] The term *parterre* is derived from the Latin verb *partire*, "to divide", and the French word *par terre*, meaning "on the ground", thus

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[34] From the 1600 English translation by Richard Surflet. Robin Whalley and Anne Jennings, *Knot Gardens and Parterres* (London, United Kingdom: Barn Elms Publishing, 1998; repr., 2008). pg. 52
[35] Whalley and Jennings, *Knot Gardens and Parterres*. Pg. 38
[36] Whalley and Jennings, *Knot Gardens and Parterres*. Pg. 38
[37] Barbara Gallup and Deborah Reich, *The Complete Book of Topiary* (New York: Workman Publishing 1987); Welch et al., *The Southern Heirloom Garden*

parterre literally translates to "divided on the ground".[38] At the beginning of the seventeenth century, agriculturalist Oliver de Serres (1539-1619) published *Le Theatre d'agriculture et mesnage des champs* which discusses boxwood as a suitable plant for *parterre* gardens: 'the beauty of box foliage stays the same in any weather, even in ice and snow. Its hardiness gives it long life and easy maintenance'.[39] A clan of celebrated royal gardeners, the Mollet family, were amongst those who were responsible for making boxwood popular again because of their use of *Buxus sp.* in *parterre* designs. Claude Mollet (c.1564-c.1649) was the principal gardener to Henri IV and Louis XIII. After the collapse of a clipped cypress *palissade* in the Jardin Neuf gardens at the Tuleries due to winter conditions, Mollet was resolute in using boxwood in future garden designs. He replaced the failed cypress with *B. sempervirens*, as it was suitable for waist-high hedging, later influencing the king to allow him to use *B. sempervirens* 'Suffruticosa' in his *parterre* designs. Mollet wrote:

> Few people of rank had box in their gardens, so I planted my compartiments en broderie with several kinds of garden plants to give a variety of green. But such plants cannot last long in this French climate, because of the extremes of heat and cold that we have here. It was the great labour and expense of remaking and replanting the compartiments every three years that led me to experiment with box.[40]

Andre Mollet, one of Claude's three sons, served as a royal gardener to the Queen of Sweden in 1648. His folio of garden designs, *Le Jardin de plaisir*, is an illustrative publication released in 1651 which addresses all things gardening. He writes of the three types of boxwood:

> viz. the Great box or Wood-box, which growth high enough if left alone, but that may be as well kept very low; for being cropt and clipt every year twice according to Art, it will not grow above three or four inches in ten years' space; and this is what is required in our Embroidery Ground-works. The second sort of box is called dwarf-Box, which never grows higher than one foot and a half, but is much tenderer than the other… The last kind of Box is between both the former, both in respect of its leaf and growth, but does not

[38] (Welch et. al)
[39] Foley, *Topiary, Knots, and Parterres*. Pg. 82
[40] Foley, *Topiary, Knots, and Parterres*. Pg. 88

afford so pleasing a Green.[41]

He goes on to say:

> I know that in this Country most part have an aversion to all kind of Box, by reason of its strong scent, but that happens only when it is suffered to grow high; for being kept short and low, it scarce smells at all, especially the dwarf-Box.[42]

It is clear from the research that boxwood was received with mixed feelings in the sixteenth century. However, it reigned in the gardens of the seventeenth century, during the Renaissance, as it was heralded for its easy maintenance and lasting evergreen foliage.

Boxwood in Gardens of the Renaissance

Italy

During the Renaissance, a time of incredible growth and development, garden designers explored the cultural interest and fascination with the natural world through geometry. The notion of revealing the natural order of the world in the garden, the essence of a Renaissance Garden, was first established in Italy and became the foundation for landscape design throughout Europe. Designs of the early Italian Renaissance pleasure gardens, elaborate and grand, incorporated clipped boxwood hedges and edging, in addition to knot garden designs from Britain.[43]

Knot gardens began during the early Tudor period (1485-1558) in Britain. Because of the importance of symbolism during this time, the source of inspiration for the knot garden design undoubtedly is connected to the symbolism and meaning associated with knots, which represent

[41] Foley, *Topiary, Knots, and Parterres*. pg. 91
[42] Foley, *Topiary, Knots, and Parterres*. pg. 91
[43] Albert Addison Lewis, *Boxwood gardens, old and new, by Albert Addison Lewis* (Richmond, Va.: Richmond, Va., The William Byrd press, inc., 1924); Welch et al., *The Southern Heirloom Garden*

eternity, and, with no beginning and no ending, the everlasting bond linked with marriage.[44] The knot garden design was meant to be viewed from a higher elevation, typically a building window and would frequently be fenced in by a hedge or wall to provide privacy.[45] In his publication *Knot Gardens and Parterres*, garden historian and author Robin Whalley explains how the knot design must be decoded to understand its symbolic meaning, a way to present Tudor conceits. One common conceit was the use of lover's initials intertwined in the knot design.[46] After the marriage of Henry VIII to Anne Boleyn in 1533, the knot gardens of Hampton Court displayed the intertwined monogram of 'H' and 'A'.[47]

Among the first publications that discusses knot design is the book of Venetian monk Francesco Colonna *The Strife of Love in a Dream*, published in 1499, which describes a mythical garden on the island of Cythera. Early publications regarding the knot designs of the sixteenth century, including Colonna's, advised the use of herbs such as thyme, lemon balm, hyssop, lavender, rue, myrtle, and marjoram, but not *Buxus.*[48] This is possibly due to plant's disfavor during the sixteenth century.

In addition to containing design elements like the knot garden and clipped boxwood edging, early Italian Renaissance gardens were characterized by their geometry, incorporating symmetry, intricate paths, and individuated gardens into the designs.[49] These gardens were carefully compartmentalized to create a unique experience with every turn, incorporating design

[44] Foley, *Topiary, Knots, and Parterres*; Whalley and Jennings, *Knot Gardens and Parterres*.
[45] Foley, *Topiary, Knots, and Parterres*.
[46] Foley, *Topiary, Knots, and Parterres*; Whalley and Jennings, *Knot Gardens and Parterres*.
[47] Foley, *Topiary, Knots, and Parterres*. Pg. 112, Whalley and Jennings, *Knot Gardens and Parterres*. pg. 32
[48] Foley, *Topiary, Knots, and Parterres*; Whalley and Jennings, *Knot Gardens and Parterres*.
[49] Elizabeth Hyde et al., *A Cultural History of Gardens In The Renaisance*, 6 vols., vol. 3, ed. Elizabeth Hyde, A Cultural History of Gardens (London, England
New York, USA: Bloomsbury Academic 2016).

elements like privacy hedges, water features, and labyrinths to further heighten the grand experience.

Boxwood was used in the gardens of the early Italian Renaissance as clipped hedges, edging, knot gardens, and topiary. In the late Renaissance, box was used in *parterre* designs. Boxwood was a standard plant for ornate and elaborate figures as a revival of the art of topiary surfaced. Gardeners of the Renaissance used Blacksmith's shears as a tool for trimming topiary figures as secateurs would not be invented until 1815. Blacksmith's shears operated on a spring system, its design possibly dating to ancient Egypt. One of the more technical works published during the early sixteenth century was the *Booke of the arte and manner how to plant and graffe all sorts of trees*, written by Lenoard Mascall in 1589. This publication contains graphics depicting popular pruning tools of the day, including the 'graffing knyfe' and 'sawe'. It is not surprising that these tools remained relatively unaltered from their Roman predecessors, particularly the *falx*.[50]

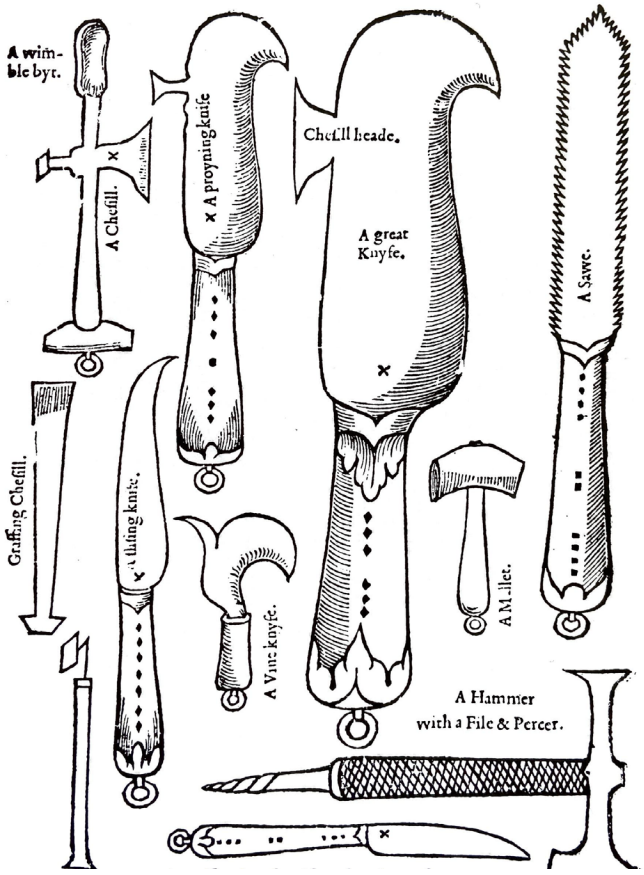

Figure 2 Illustration from Mascall's 1589 publication depicting the various types of pruning tools used during the Renaissance.

[50] Foley, *Topiary, Knots, and Parterres*; Hyde et al., *A Cultural History of Gardens In The Renaisance*, 3.

The Italian Renaissance gardens were places for pleasure and became true works of art. Design elements like box-hedge labyrinths and topiary individuated the garden. The design ideals of the early Italian Renaissance Garden became the foundation for seventeenth century French landscape design, catapulted by the genius of Andre Le Notre.[51]

France

The difference between the design ideals of the early Italian Renaissance gardens and the French Renaissance landscape design that emerged was how nature was perceived in the garden. While Italian garden designers aimed to imitate nature as art, the goal of French garden designers was to correct the imperfection of nature by creating art in the garden with vegetation. In doing so, French landscape designers conceived gardens on a much grander scale, adopting a "more is more" attitude. This viewpoint translated in the garden as much more grandiose with enhanced water features, larger and long walks, and the intricate box-*parterres*.[52]

In the eighteenth century, *parterre* gardens were further refined by the French. *B. sempervirens 'Suffruticosa'*, commonly known as dwarf edging boxwood, was almost exclusively used for *parterre* designs.[53] The intricately designed boxwood *parterre* gardens were transformed by French garden designers into highly decorative and wonderfully complicated versions of the English knot design predecessor, although knots were still in use. There were four general types of *parterres*: *parterres de broderie*, *parterres de compartiment*, *parterres à l'anglaise*, and *parterres de pièces coupées.*[54] James Cothran, celebrated American Southern Garden historian and landscape architect, provides definitions of the four *parterres*: *Parterres de broderie* (*parterres* of embroidery) are meant to mimic the arabesque figures of embroidery

[51] Hyde et al., *A Cultural History of Gardens In The Renaisance*, 3.
[52] Welch et al., *The Southern Heirloom Garden*
[53] Welch et al., *The Southern Heirloom Garden*
[54] Welch et al., *The Southern Heirloom Garden*

designs though dwarf boxwood edging and colored earth. *Parterres de compartiment (parterres* of compartment) feature symmetrical and orderly arrangements of scroll-like patterns, flower beds, and grass plots edged in boxwood. *Parterres à l'anglaise* (*parterres* after the English manner), a result of the English fondness of turf and French affinity for pattern, is an area of cut turf into patterns and edged with dwarf boxwood. *Parterres de pièces coupées* (cutwork *parterres)*, the earliest form of *parterre* design, exhibits a boxwood design, with separate compartments of the layout functioning as flower beds.[55]

[55] Gallup and Reich, *The Complete Book of Topiary* ; Welch et al., *The Southern Heirloom Garden* ; Welch et al., *The Southern Heirloom Garden*

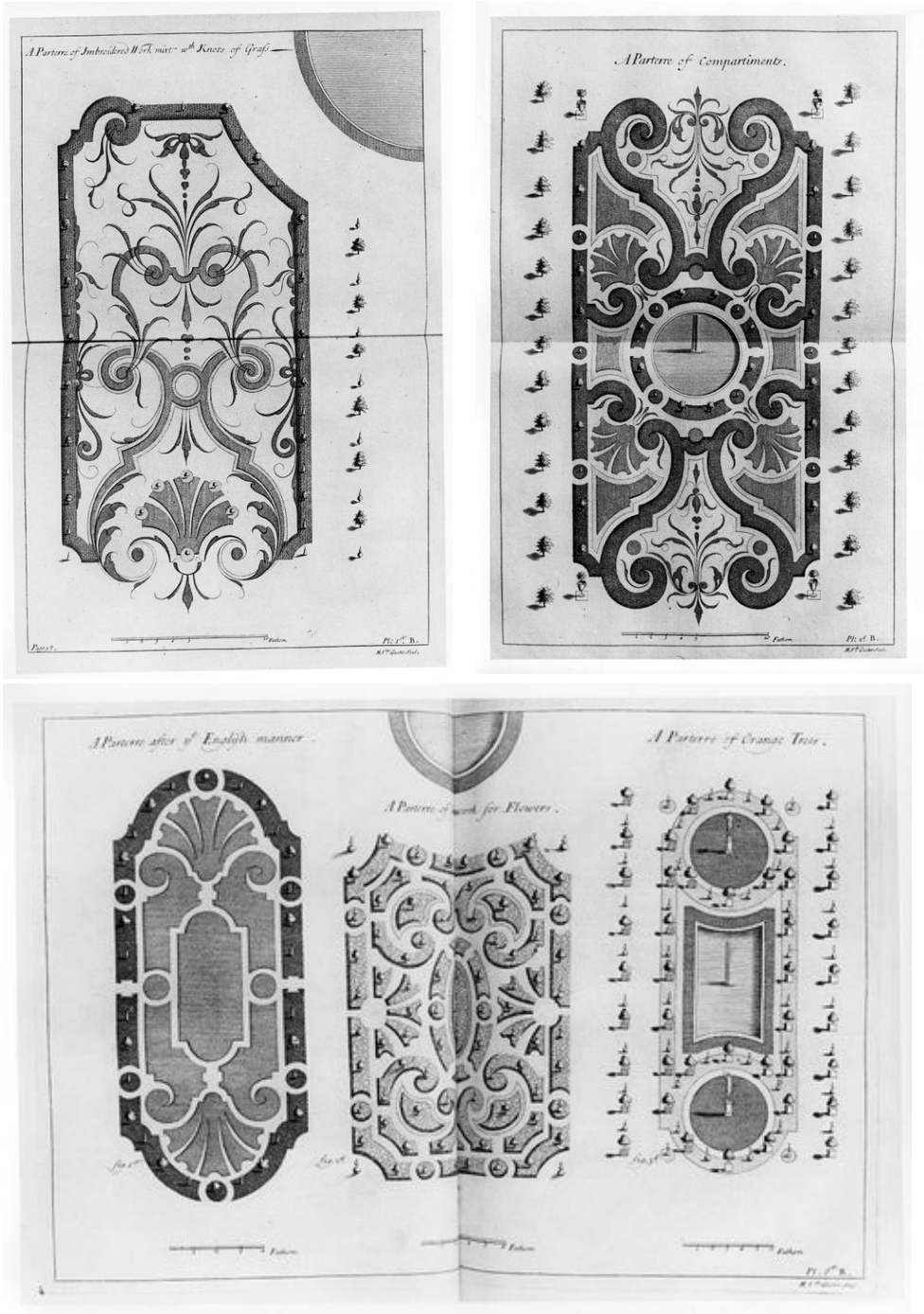

Figure 3 Michael van der Gucht *parterre* illustrations from *The Theory and Practice of Gardening*. The four general types of *parterres: parterre de broderie* (top left), *parterre de compartiment* (top right), *parterre à l'anglaise* (bottom right), and *parterres de pièces coupées* (bottom middle) and "A Parterre of Orange Trees" (bottom right).

Although boxwood was met with distaste in early European garden designs, primarily due to the smell, it was commonly used in the gardens following the sixteenth century for hedges and edging, as well as topiary. Perhaps the most revered use of boxwood in the gardens of Europe during the seventeenth and eighteenth centuries was for the highly intricate *parterres*, undoubtedly due to the popularity and prestige established by the French. These boxwood *parterre* gardens influenced and transformed English gardens of the seventeenth and eighteenth century. Because of its widespread popularity, *parterre* gardens were fully embraced by English gardeners and designers. It was from these English gardens that the boxwood, and the new tradition of the boxwood *parterre* garden, found its way across the seas to American shores and, ultimately, into the gardens of the New World.

Boxwood in American Gardens

This section will look at several periods of American Garden history, focusing on the use of boxwood in garden design in Colonial, Greek Revival, and Colonial Revival garden design eras.

17th – 18th century – Colonial

The first boxwood planted in North America was by Nathaniel Sylvester around 1653 at his manor home on Shelter Island plantation in New York.[56] Boxwood quickly became a staple of the gardens of early eighteenth-century America. American garden design of the early seventeenth and eighteenth century aligned with what European garden design principles were in the sixteenth and seventeenth century, termed the "ancient style". That existing precedent, which Europeans brought with them to America, influenced early American garden design. Further,

[56] Batdorf, *Boxwood handbook : a practical guide to knowing and growing boxwood*. pg. 8

early American gardeners relied on European publications for new knowledge and garden design advice, thus, the foundational design principles of early American gardens had their roots in European traditions. It would take years for American gardeners to experiment with gardening and garden design in the New World. As such, it would also take time to develop truly American gardening advice.

Geometric form, order, and symmetry were the guiding principles of European design termed the ancient style, which incorporated water, pruned hedges and topiary, straight walks, and other formal components of garden design. The gardeners of early America simplified the ancient style, referencing European knot gardens and *parterres*, into versions suited for their needs.

Some of the earliest guidance on the keeping and husbandry of boxwood was outlined in seventeenth century European publications. These guiding references advise that boxwood used for edging should be cut "three times per annum, as April, June, and August: minding to cut their roots at the inside every second year"[57] and instruct "clipping to prevent too much shade and to make easier the care and cultivation of the beds that are boarded".[58] Although there is evidence which suggests the use of box in American gardens of the seventeenth century, due to the minimal references to boxwood in early American gardening correspondence and publications, in addition to the lack of reference in influential literature of the eighteenth-century, garden historians question whether or not boxwood would have *commonly* been used in American

[57] Cothran, *Gardens and historic plants of the antebellum South*. 41
[58] Cothran, *Gardens and historic plants of the antebellum South*. 41

gardens prior to the eighteenth century.[59] Nonetheless, *Buxus sp.* was used in the *parterre* gardens of Colonial America.

The boxwood of Colonial *parterre* gardens were laid out in patterns that were similar to the English style which included shapes like diamonds, moons, hearts, squares, circles, and double circles.[60] In 1709, *The Theory and Practice of Gardening* by A.J. Dezallier d'Argenville was published in France. Dezallier d'Argenville's treatise discussed every detail encompassing design and planting pleasure gardens, including an entire chapter devoted to *parterre* gardens—how they should be laid out and illustrations of the types of designs. A gentleman named John James translated the monumental French publication in 1712 which allowed the influence of the author to reach English readers. This publication proved to be influential in both European and American garden design of the eighteenth century. Although the *parterre* gardens of eighteenth-century Europe were intricately designed, American *parterre* gardens of that time were simplified versions of their forms and structures.[61] A few surviving examples of these Colonial *parterre* gardens can be seen in the gardens of Virginia at Tuckahoe (1698), Westover (1737), and George Washington's Mount Vernon (1743). Examples of early *parterres* in South Carolina gardens include Crowfield (1730) and Middleton Place (1741).[62]

In d'Argenville's publication, boxwood is discussed as a suitable plant for *parterre* gardens, claiming that it is both a utilitarian shrub and superior evergreen. Because of its slow growth habit, ability to be severely clipped and sheared, as well as its shade tolerance, the commonly used boxwood for *parterres* was the English box, *B. sempervirens 'Suffruticosa',* also

[59] Raymond L. Taylor, *Plants of Colonial Days* (Mineola, New York: Dover Publications, INC. , 1996); Ann Leighton, *American Gardens in the Eighteenth Century "For Use or for Delight"* (Boston, USA: Houghton Mifflin Company 1976).
[60] Welch et al., *The Southern Heirloom Garden*
[61] Welch et al., *The Southern Heirloom Garden*
[62] Welch et al., *The Southern Heirloom Garden*

known as Edging box, Dutch box, and Dwarf box. Early American settlers used *B. sempervirens* 'Suffruticosa' as edging material for their geometric, symmetric, and utilitarian enclosed gardens.

Early Colonial gardeners often used native plants[63] as a boxwood substitution for *parterre* gardens due to the difficulty in acquiring sufficient quantities of boxwood during that time. Early American gardeners relied on European sources to acquire new plant materials. An advertisement for imported box 'for edging of walks' was printed in the Boston *Gazette and Country Journal* by Abigail Davidson on March 12, 1770. Boxwood quickly became an icon of early American gardens, not only because of its use in Colonial *parterre* gardens of the wealthy American elite, but because American gardeners recognized it as a quality plant, functioning as a reliable edging and hedging material.[64]

While new cultivars of boxwood were beginning to be discovered towards the later part of the Colonial era, there were only two cultivars of boxwood that were readily available and commonly used in early American gardens: *B. sempervirens '*Arborescens*',* Tree boxwood, and *B. sempervirens '*Suffruticosa*',* English boxwood. Tree box, also known as common box, has an oval, bushy growth habit which forms a dense, tall shrub. Tree box has deep evergreen leaves with lighter undersides which are around 1 inch long and oval.[65] The Latin specific epithet s*empervirens,* meaning "always green", and *arborescens*, meaning "growing to be a tree", points to why the plant was so commonly used as a hedging material. Tree box was planted in Colonial

[63] Amongst the native plants that were used as a boxwood substitution was *Ilex vomitoria* (yaupon holly) as referenced by Dr. Alexander Garden from Charleston, South Carolina. Other native plants included *Ilex opaca* (American holly), *Prunus caroliniana* (cherry laurel), and *Myrica cerifera* (wax myrtle). Welch et al., *The Southern Heirloom Garden* Pg. 42

[64] Taylor, *Plants of Colonial Days*; Leighton, *American Gardens in the Eighteenth Century "For Use or for Delight"*; Cothran, *Gardens and historic plants of the antebellum South*.

[65] Taylor, *Plants of Colonial Days*.

gardens not only for hedging, but for topiary, borders, and specimen plantings.[66] George Washington grew both *B. sempervirens* 'Arborescens' and *B. sempervirens* 'Suffruticosa' in his gardens at Mount Vernon. He cultivated Tree box prior to 1788 which may have been planted as accents in the garden. The flower beds of Mount Vernon were 'boxed in', most likely with edging box.[67]

19th century - Greek Revival (1820-1860)

In the early nineteenth century, a new style of gardening emerged in America that rejected the formality and geometric designs of the ancient style. Boxwood *parterres* were no longer as fashionable as they had been and were replaced by the preferred 'beautiful and picturesque' style of planting. Bernard M'Mahon, one of America's first garden writers, published *The American Gardener's Calendar* in 1806 which discussed this new style of gardening:

> Though parterres in general are now becoming rather unfashionable….. a little of that kind of work might still be permitted for variety sake, though not immediately in front of the house as heretofore. A spacious lawn, bounded with rural shrubberies, is the most eligible situation for such…[68]

Although boxwood *parterres* became unfavorable, *Buxus sp*. continued to be used during the nineteenth century for edging walkways and planting beds. Use of *B. sempervirens* 'Arborescens' was described by Joseph Breck.[69]

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[66] Cothran, *Gardens and historic plants of the antebellum South*; Taylor, *Plants of Colonial Days*.
[67] Taylor, *Plants of Colonial Days*; Leighton, *American Gardens in the Eighteenth Century "For Use or for Delight"*.
[68] Welch et al., *The Southern Heirloom Garden* pg. 45
[69] Joseph Breck was an early nineteenth century seedsman, having established Joseph Breck & Company in 1818. Breck produced seed catalogues and acquired numerous horticultural magazines, along with publishing his own work, *The Flower Garden,* which focused on the cultivation of flowers and shrubs. Illustrations and educational information were included in his publications and magazines with the hopes of using horticulture as an instructional subject. "Breck, Joseph," Biographies: The American Seed and

> Garden Box – A delicate shrub which may be pruned to any shape to tease the fancy… in general use, best material for forming edgings to beds, walks, etc. Plants may be trained singly into almost any shape, and will make large shrubs … varieties with yellow and white striped leaves, called gold and silver… a number of species, among which are dwarf and tree box, the last suitable for the shrubbery.[70]

While this new style of gardening was quickly embraced in the gardens of the North, Southerners continued to prefer the formal and geometric gardens of the ancient style. This ideal was especially prominent in the gardens of the antebellum South where elaborate boxwood *parterres* flourished.[71]

As the Greek Revival architectural style swept the American South in the early nineteenth century, the boxwood maintained its center stage position in the garden in formal *parterres* and hedges, both ornamental and utilitarian. The formality and geometry of *parterre* gardens highlighted and complemented this new architectural style, which was based on classical Greek form. The strict forms which characterize the *parterre* were a visible expression of man controlling nature. Because the Southern landscape was characterized by natural and irregular forms, the use of such formal and distinct garden designs established an elitist status and aura of wealth. The cutwork *parterre* was the most popular in Southern gardens, possibly because it is one of the more formal designs of the four *parterre* types. In the antebellum era, *parterre* gardens were often located to the side of the imposing residence, bound on one side by the colonnaded façade with the remaining three sides by a fence. Italian and French design ideals are strongly tied to the Southern *parterre* gardens of the antebellum period.[72]

Nursery Industry Smithsonian Libraries, accessed 10/19/2022, https://www.sil.si.edu/SILPublications/seeds/breckjoseph.html.

[70] Leighton, *American Gardens in the Eighteenth Century "For Use or for Delight"*. pg.35

[71] Welch et al., *The Southern Heirloom Garden*

[72] Cothran, *Gardens and historic plants of the antebellum South*.

Boxwood was also used as a hedge material in the antebellum South. Hedges were both a practical necessity and an aesthetic design element. Common hedge plants of the time were *Ilex cassine*, *Junipers virginiana*, *Ligustrum vulgare*, *Ilex opaca*, and *Buxus sp*. Two types of boxwood commonly used for planting hedges were *B. sempervirens* and *B. sempervirens 'Arborescens'*. Like their Colonial ancestors, antebellum Southerners used *B. sempervirens 'Suffruticosa'* for laying out their elaborate *parterre* gardens.[73]

Demand for trees, shrubs, seeds, and ornamentals significantly increased during the antebellum period due to an abundance of wealth and fortune. Initially, there were only a handful of American seed and nurserymen who offered such plant material; however, around 1825, there was an abundance of such suppliers in northern states with extensive listings. It wasn't until the 1840s that southern nurseries began to establish themselves. Thus, prior to the establishment of southern nurseries, gardeners of the south relied on the northern seed and nursery companies for their plant material through newspapers, agricultural journals, and mail-in catalogues. These plants were then shipped via rail or coastal routes.[74]

Used for both utilitarian and aesthetic purposes, boxwood was a staple in America's Southern gardens of the antebellum era, its use in formal designs implying the underlying message of controlling nature and exuding wealth and abundance.

[73] Cothran, *Gardens and historic plants of the antebellum South*.
[74] Cothran, *Gardens and historic plants of the antebellum South*.

As a result of the destruction caused by the Civil War, and the extreme social and economic changes that followed, countless outstanding Southern *parterre* gardens were ruined and lost to history. Many of the surviving boxwood *parterre* gardens of the South, which embodied classical ideals of geometry and a formality of a bygone era, were replaced by a new era of garden design—the Victorian era.[75] Luckily, excellent examples of surviving antebellum era boxwood *parterre* gardens exist in Georgia which includes Hills and Dales Estate in Lagrange, Georgia (1841), the Kolb-Newton House in Madison, Georgia, locally nicknamed "Boxwood" (1850), and Valley View near Cartersville, Georgia (1840's).

Figure 4 The 19th century *parterre* garden at Valley View depicting a sun with sun rays.

20th century - Colonial Revival

The South struggled to recover financially and culturally in the postbellum and reconstruction eras due to the devastation of war and the dissipation of a slaved-based economy. As Cothran describes "the South was transformed from one of the richest regions of the country

[75] Welch et al., *The Southern Heirloom Garden*

into an area of almost total ruin. Cities, towns, and villages throughout the South were damaged and destroyed, but more significantly the Civil War dashed the hopes and ideals of the southern states."[76] He goes on to say "Many southerners found themselves in a state of poverty with little in the way of financial resources to rebuild their homes and gardens."[77] Because of the national celebration of the nation's centennial following the reconstruction era, a revitalized fascination of early seventeenth- and eighteenth-century American culture gripped the United States public, resulting in a period now termed the Colonial Revival era which began in the 1880s and lasted until the 1960s. This interest began with the Centennial International Exposition in Philadelphia in 1876, which caused widespread patriotism, influencing projects which encompassed historic preservation, decorative arts, and design, including garden design. The sweeping national pride also brought about change in American history teachings, centering on the 'Founding Fathers'. Historic house museums and properties followed suite and educated the public using historical evidence and idealistic perception to create a romanticized vision of Colonial America.

Colonial Revival era designed gardens are romanticized versions of the historic functional and utilitarian gardens that would have been characteristic of the American Colonial period, "They contained formal elements such as a *parterre* or sunken garden next to the home, and informal aspects such as groups of canopy trees and flowering shrubs place further away. Other common elements include arbors, clipped boxwood hedges, heirloom perennials and roses, fountains, pergolas, stone walls, sundials, and brick walkways, as well as antiques to add a sense of days past."[78] Contemporary research on Colonial garden design has validated that Colonial Revival era gardens are not accurate representations of early seventeenth and eighteenth

[76] Cothran, *Gardens and historic plants of the antebellum South*. 11
[77] Cothran, *Gardens and historic plants of the antebellum South*. 11
[78] Cothran, *Gardens and historic plants of the antebellum South*. 5

American gardens. Colonial Revival era gardens employed the use of garden ornamentation and features such as fencing, water, gates, seats, walls, and garden houses, thought to have existed during the American Colonial era. Plant materials used in Colonial Revival garden design encompassed both historically known plants as well as plant materials considered non-historical. Research has shown that early seventeenth and eighteenth American gardens would have been relatively utilitarian and bare, while Colonial Revival gardens depict ornamentation and elaboration. The Founders Memorial Garden located in Athens, Georgia is an excellent surviving example of a Colonial Revival era designed garden, as it contains a formal boxwood garden surrounded by a white picket fence, brick walkways, a sundial, a fountain, cast iron benches, stone walls, as well as heirloom perennials and roses.

Figure 5 The Boxwood *Parterre* Garden at the Founders Memorial Garden in Athens, Georgia. The Colonial Revival garden features elements characteristic of the early 1920s style including the white picket fence, sundial, and brick walkway.

The influence of the Colonial Revival era was not limited to newly designed gardens but encompassed the interpretation of historic gardens as well, particularly in restoration projects. Historic garden restorations during the Colonial Revival era were recreated through the lens of a romanticized Colonial past. Many historic gardens that were restored during this era were done

so using both historic research, period garden plans, and aesthetic elaboration of what was thought to have existed. Perhaps the most famous example of a Colonial Revival era historic garden restoration is Colonial Williamsburg in Virginia.[79] The garden restorations that occurred at Colonial Williamsburg beginning in the 1920s were grounded in findings acquired through the new profession of landscape archaeology, as well as precedence of existing gardens in the surrounding area in Virginia that were built during the same time period. Thus, the reconstructions were based on the assumption that the gardens of Colonial Williamsburg would have looked similar to the existing gardens nearby, while being attentive to the findings of landscape archaeology.

Through present-day research to further understand American Colonial heritage, historic properties of the Colonial Revival era are working towards interpreting their Colonial heritage and are being restored once again in more accurate depictions. However, both designed and restored historic gardens of the Colonial Revival era remain solitary reminders of this significant chapter in American gardening history.[80]

[79] M. Kent Brinkley and Gordon W. Chappell, *The gardens of Colonial Williamsburg / by M. Kent Brinkley and Gordon W. Chappell ; photography by David M. Doody ; additional photography by Tom Green and the staff of the Colonial Williamsburg Foundation* (Williamsburg, Va: Colonial Williamsburg Foundation, 1996).
[80] Brinkley and Chappell, *The gardens of Colonial Williamsburg / by M. Kent Brinkley and Gordon W. Chappell ; photography by David M. Doody ; additional photography by Tom Green and the staff of the Colonial Williamsburg Foundation*.

Boxwood used in Contemporary Gardens (1950-present)

Boxwood endures in contemporary garden designs in much the same way it was used in ancient times: form, function, and fashion. Box continues to be heralded for its superior hedging qualities and toughness and is recognized and celebrated as a versatile shrub. Contemporary garden designs employ the use of *Buxus sp.* for figurative topiary, *parterre* gardens, hedging and edging, and statement plantings.

Figure 6 The 1961 White House Rose Garden (top) exhibits strong similarities to the recent renovation in 2020 (bottom).

Perhaps one of the more famous contemporary garden designs exhibiting *B. sempervirens* 'Suffruticosa' was that of the Rose Garden at the White House, informally nicknamed the Kennedy Rose Garden. The White House Rose Garden was redesigned in 1961 by American garden designer Bunny Mellon, under the direction of First Lady Jacqueline Kennedy. The redesigned Rose Garden exhibited two diamond shaped boxwood *parterre* gardens. The boxwood *parterre*s were replaced with *B. sempervirens* 'Justin Brouwers' in the late 1980s. Then, this garden was redesigned by First Lady Melania Trump in 2020 using boxwood blight-resistant boxwood, *B. microphylla var. japonica* 'Green Beauty' and B. 'SB

108' Independence®, from Saunders Brothers Nursery. The new design features a triangular boxwood *parterre* garden, similar to the diamond *parterres* of Mellon's 1961 layout.

Celebrated Australian garden designer Paul Bangay is amongst the group of contemporary garden designers who employ *Buxus sp.* in modern landscape designs. One of Bangay's inspiring designs is at his home in Stonefields, Victoria. The garden exhibits an Italian Renaissance inspired boxwood *parterre* garden, highly geometric and filled with *B. sempervirens*.

Figure 7 The intricately designed boxwood *parterre* garden at Stonefields, Victoria. The clipped boxwood circles and squares laid out in traditional a *parterre* garden evoke a sense of Italian Renaissance gardens of a past era.

Arne Maynard, famed British garden designer, also features *Buxus sp.* topiary in his designs, as can be seen in the gardens at his 15th century home Allt y bela in Wales, United Kingdom.[81]

Not only are contemporary garden designers and landscape architects using boxwood in design, but historic garden restoration and recreation projects employee the use of boxwood as

[81] Foley, *Topiary, Knots, and Parterres*.

well. Historic garden designers use boxwood for their planting designs not only because of the plant's prestige and fame, but also because its long history of use in American gardens as *parterres*, edging, and hedging. For some, historic garden design is similar to the Colonial Revival era where designs are more of the romanticized version of what would have been planted historically. For other historical landscape designers, painstaking historic research on the garden is undertaken which provides evidence for the use of box and how it was used in the garden design. Boxwood is used in contemporary gardens as well as historic garden restoration designs in the same way it has been historically.

Summary of key takeaways from the brief history of boxwood used in gardens

Boxwood has stood the test of time as a much beloved garden ornamental. Throughout history, boxwood has been used as a functional and aesthetic plant. In the gardens of Ancient Mesopotamia and the Middle East, *Buxus sp.* was prized for its tree form. From the time of ancient Rome, *Buxus sp.* has been used to delineate walkways and garden beds, as well as to create both simple and intricate designs to be viewed for pleasure. Boxwood went on to flourish in the elaborate topiary forms of the Italian Renaissance gardens and in the French Renaissance *parterre* gardens. Boxwood established itself as an all-American plant as it traveled to the New World to be planted in Colonial gardens, where it later became a Southern garden staple during the antebellum era. In contemporary gardens, boxwood is being recognized once again for its ability to shear and maintain, as well as its hardy green structure used to anchor designs. History proves that box is a tried-and-true functional and aesthetic plant as it has been a lasting staple-shrub in many significant periods of the history of garden design, encompassing a wide variety

of civilizations. Boxwood will continue to remain resolute in the gardens of the world as a beloved ornamental shrub.

A Note on the Evolution of Garden Labor & Maintenance

It is important to briefly acknowledge the evolution of garden labor and maintenance from early garden history to contemporary times. Historically, labor was inexpensive while certain tools and plant materials were costly and sometimes difficult to procure. Thus, a large workforce to maintain gardens and propagate new plant materials was common. In contrast, contemporary tools and labor-force are expensive while plant materials are often affordable and widely available. Modern gardening tools are highly efficient, user-friendly, and built to last, capitalizing the lack of a costly skilled labor force that is frequently difficult to secure. Today, gardens are maintained by fewer gardeners equipped with advanced tools that can quickly accomplish garden tasks that historically would have required a large group of individuals, resulting in long lasting plantings. The advancement in modern tools, as well as the wide availably of plant materials do not necessitate the propagation of plant materials that would have been necessary historically.

2.2 Horticulture and Boxwood

This section will introduce the field of horticulture and the horticulture industry. The focus of this section will be on horticultural industry practices, including standards for plant care and management and best management practices.

Introduction to Horticulture, Horticulture Industry, and Best Management Practices

Horticulture is the art of cultivating plants in the garden, either ornamental or edible, for food, comfort, or beautification.[82] Ornamental horticulture involves the production and use of woody and herbaceous plants for aesthetic purposes and can be divided into two categories based on the use of plants: floriculture and landscape horticulture. Landscape horticulture "includes designing plans for landscapes, installing landscapes as specified in the plans, and maintaining the landscapes". Each plant has its own fundamental cultivation requirements encompassing sunlight, soil drainage, soil pH, and more. Most often, these basic cultivation needs are overlooked. For a plant to thrive, these plant-specific cultivation requirements must be met, after which there are industry standards and guidelines which govern all aspects of plant management. These industry standards are termed Best Management Practices, or BMPs. BMPs are often outlined by academic professionals through extension service publications, as well as respected organizations like the American Horticultural Society, The Horticultural Research Institute, and the American Society of Horticultural Science. This section of chapter two is focused on boxwood as a planted garden ornamental, hence will discuss boxwood fundamental cultivation requirements and BMPs which includes but is not limited to proper selection and installation of boxwood, pruning techniques, fertilization, and seasonal care.

Boxwood Authorities

In 1961, a group of boxwood enthusiasts and amateurs founded the American Boxwood Society (ABS) in the United States. A not-for-profit membership organization, the ABS is

[82] "Understanding Horticulture." https://www.senecahs.org/pages/uploaded_files/Introduction%20to%20Horticulture.pdf.

"devoted to the appreciation, scientific understanding and propagation of the genus *Buxus* L."[83] through sponsoring and funding boxwood research projects and *The Boxwood Bulletin*, the society's publication released in the Spring, Summer, and Fall of each year. The society serves as the International Registration Authority for cultivated *Buxus* L. The ABS is an important authority on boxwood news in the United States. Similarly, the European Boxwood and Topiary Society (EBTS) is another organization that provides invaluable information on all aspects of boxwood through its publication *Topiarius*. The EBTS was founded in Europe in 1983. The aims of the EBTS "are to encourage, improve and extend the cultivation of boxwood and to disseminate knowledge of boxwood and topiary, in all its forms, by means of publications, promotions, exhibitions, scientific research, European co-operation and exchange, conferences and visits, various meetings and other appropriate activities."[84] The EBTS maintains a strong relationship with the ABS as both societies are critical to promoting the latest boxwood news, use of boxwood in garden design, boxwood history, and boxwood scientific research.

Authorities on the care and management of boxwood that maintain a literary presence are limited. *The Boxwood Handbook*, written by Lynn Batdorf and published in 1995, was the first comprehensive and authoritative publication regarding all aspects of boxwood information including history, care, pests, and diseases. Lynn Batdorf was the Curator of the National Boxwood Collection at the U.S. National Arboretum in Washington, D.C. for 36 years and is an expert on boxwood horticultural care. Batdorf has authored three boxwood books, in addition to many technical articles pertaining to boxwood. *The Boxwood Handbook* was revised in 1998 and 2005 and has proven to be a critical publication for boxwood growers and enthusiasts. Written by

[83] The "L." in *Buxus* L. refers to Linnaeus and is formatted as a citation. The reason for this is because in *Species Plantarum*, Linnaeus is the first to recognize boxwood and thus the "L." cites Linnaeus for his findings.
[84] "About," EBTS UK, 2022, accessed 10/19/2022, https://ebts.org/about/.

P.D. Larson in 1996, *Boxwood: Its History, Cultivation, Propagation, and Descriptions* is another boxwood publication that was integral in assisting boxwood professionals and amateurs during a time when boxwood focused literature was scarce.

The Saunders Brothers Nursery was established in 1915 by five brothers in Virginia. Today, the Saunders Bothers Nursery continues to operate as a family-run business offering annuals, perennials, woody shrubs, and ornamentals; however, their specialty is boxwood. Saunders Brothers are considered one of the leaders in boxwood production, research, and expertise in America. In the late 1990s, Saunders Brothers published the "National Boxwood Trials", a report with the results from testing new cultivars of boxwood at "over 40 different testing sites ranging from Connecticut to Alabama, and Chicago to Virginia Beach." The report assisted in identifying the most successful boxwood cultivars for different regions. Established in 2020, Saunders Genetics, a Saunders Brothers' sister company, was established because of the increase in boxwood cultivation concerns. Two major concerns being the introduction of boxwood leafminer in the early 2000s and the arrival of boxwood blight shortly after in 2011. Saunders Genetics produced the NewGen Boxwood line, consisting of NewGen Freedom and NewGen Independence. These two ground-breaking boxwood are the result of many years dedicated to lab testing and garden and landscape production trials in order to breed boxwood that "offer greater resistance to diseases and pests as well as incredible garden performance."[85]

Saunders Brother Nursery began publishing their *Boxwood Guide* in 2005 as a resource for boxwood gardeners and landscapers. The *Boxwood Guide* contains information regarding

[85]"About Us: Celebrating 100 Years - 1915-2015," Saunders Brothers Inc., 2022, accessed 10/19/2022, https://www.saundersbrothers.com/page/About-Us. "Boxwood Research Through the Years," Research, Saunders Genetics LLC, accessed 10/19/2022, https://www.newgenboxwood.com/research. Saunders Brothers, "Boxwood Guide," (2018). https://www.saundersbrothers.com/_ccLib/attachments/pages/Boxwood+Guide+copy.pdf.

boxwood care and management, as well as information regarding boxwood cultivars encompassing care, environmental requirements, and management and is currently in its sixth edition.[86]

Boxwood Cultivation Requirements & Best Management Practices

In nature, boxwood grows in well-drained, calcareous, often rocky soils as an understory shrub or tree. Proper sun exposure, soil drainage, and most importantly correct soil pH are three critical cultivation requirements for boxwood longevity. In cultivation, selecting sites that can best replicate these soil and exposure conditions, are crucial to allow boxwood to successfully thrive. BMPs can further ensure the success of boxwood when coupled with fundamental cultivation criteria.

The USDA Plant Hardiness Zone Map is organized by regional zones exhibiting similar average lowest temperatures. This resource indicates what plant(s) will survive in each zone. There are boxwood cultivars that are well suited to cold temperatures while others thrive in milder climates. Boxwood suitability for a planting zone is determined by its hardiness: its ability to survive in the most severe conditions including cold, heat, and drought. It is critical to determine which boxwood cultivar is acclimated for the hardiness zone in which you are planting to ensure its survival.

Drainage, one of the leading causes for boxwood issues, is critical for boxwood health as sites with chronically high soil moisture content can be deadly. Boxwood prefer sites with well-drained soils. Because they do not like oversaturated roots, boxwood should be planted higher than the soil surface for optimal drainage. Plants tend to settle over time, so planting high can

[86] Saunders Brothers, "Boxwood Guide."

assist in keeping boxwood elevated and well drained. Proper soil type and soil contours will ensure a well-drained soil. Lightly packing the backfill soil around the boxwood root ball can help fill in large air pockets left where soil did not settle during planting that could otherwise cause the roots and soil to dry out. These air pockets are not to be confused with soil air, which is contained within soil pores along with water. Soil air is a critical element to boxwood longevity.[87]

Because boxwood are drought tolerant once established (establishment takes 2 – 3 years), watering after planting is only necessary in times of severe drought, evaluating boxwood soil moisture during the hottest and most dry months. Most plants show signs of drought stress visibly through wilting leaves, however, because of their thick and rigid epidermis, boxwood leaves do not wilt when water stressed. Thus, it is critical to observe soil moisture and precipitation events to identify when watering is needed. The appropriate amount of water for established boxwood is around one inch of precipitation every ten days beginning in the spring until fall. Most of the annual root production of boxwood occur during winter months, so monitoring and maintaining good soil moisture during this time can help promote new growth. Irrigating boxwood is highly beneficial as it can be a tool to promote a strong root system and provide critical hydration for new plantings. The three major types of irrigation systems are drip, soaker, and pop-up irrigation. Saunders Brothers recommends drip irrigation systems for boxwood, which supplies water at very slow rates resulting in a steady supply of water at the root zone. Overhead and pop-up irrigation systems should be avoided as they cause wet foliage which can create optimal conditions for boxwood diseases, notably *Calonectria*, *Macrophoma*, and *Pseudonectria*.[88]

[87] Batdorf, *Boxwood handbook : a practical guide to knowing and growing boxwood*.
[88] Batdorf, *Boxwood handbook : a practical guide to knowing and growing boxwood*.

Soil preparation is necessary for any new planting, and boxwood are no exception. Boxwood thrive in a soil pH that ranges between 6.8 and 7.5 where soil nutrients are most available. Soil amendments that are beneficial for boxwood include aged manure and compost which increase soil organic matter and nutrients available for boxwood. Boxwood require minimal fertilization when the soil is at the optimal pH level. Cool soil temperatures in the late fall, winter, and early spring promote boxwood root growth. Thus, it is best to apply fertilizer in the fall to optimize root growth in order to develop a strong root system that can support new foliage in early spring.[89] Improper fertilizer techniques and timing can be devastating to boxwood. Boxwood have a shallow, wide- growing root system which, for established boxwood, extends far beyond their dripline. Important feeder roots are closest to the soil surface and can be severely damaged if fertilizer is applied near them. Thus, placing fertilizer above mulch at the plant drip line is critical. Likewise, applying fertilizer at the incorrect time can promote inappropriate growth which can leave the plant vulnerable to environmental damage.[90]

Boxwood health is affected when tilling and cultivating occurs near their shallow root system as it may damage them and cause plant death. This is particularly an issue where boxwood is planted as an edging plant. An example of such a situation would be a boxwood edge where one side is bound by a walkway, and the other side is bound by an annual flower bed. A clean edge must be maintained on the walkway side while the other side is continually tilled for plants with seasonal interest. On either side, boxwood roots are cut and disturbed. In all cases,

[89] Eighty percent of annual boxwood root growth occurs from November to March, so applying fertilizer during October will help stimulate appropriate root growth and avoid excessive leaf growth that results when fertilizer is applied in early spring. Excessive leaf growth from early spring fertilizer applications results in a stressed plant because the foliage to root ratio is unbalanced. The root system cannot support the amount of foliage and branch growth if fertilizer is applied too late in the season (Courtesy of Lynn Batdorf).

[90] Batdorf, *Boxwood handbook : a practical guide to knowing and growing boxwood*.

allow a 1-2’ buffer when cultivating and/or tilling near boxwood to protect their shallow root system.[91]

Each boxwood cultivar exhibits a unique growth habit; thus, each box has a respective pruning technique that is proper for its growth habit, as well as its function and location in the landscape. There are many different pruning techniques from light shearing and shaping, to intensive pruning and heavy shearing, all promoting a unique plant response. A late winter or early spring pruning promotes a healthy flush of new foliage prior to breaking winter dormancy. Similarly, pruning in late summer to early fall will promote fall foliage. It is critical to prune well in advance of cold temperatures as winter freezes and frost can damage tender growth if it has not been given enough time to harden off.[92] Improper timing of fertilization can also promote new growth which can be subject to damage during winter months.[93]

Thinning is a type of pruning which promotes healthy airflow and sunlight penetration and is performed by selectively pruning out short branches in the plant, typically including three years of foliage growth, resulting in small holes or “pockets” allowing air and sunlight to circulate into the center of the plant. Boxwood may be subject to another type of pruning technique called “rejuvenation” pruning. This is an appropriate technique used on older boxwood that is overgrown. A rejuvenating prune is performed in early spring by removing an extreme amount of the total plant material, promoting a flush of new, healthy growth. To reduce plant

[91] Batdorf, *Boxwood handbook : a practical guide to knowing and growing boxwood*.
[92] Hardening off is a horticulture term which the Penn State Extension defines: “Hardening, or "hardening off," is the process of allowing a plant to transition from a protected indoor or greenhouse environment to the harsh outdoor conditions of fluctuating spring temperatures, wind, and full sun exposure. A gradual introduction of these outdoor stresses will cause the plant to accumulate carbohydrates, to trigger more root development, to reduce the amount of freeze-prone water in the plant, and to actually thicken its cell walls. Plant growth will change from soft and supple to much firmer and harder. "Hardening Transplants." https://extension.psu.edu/hardening-transplants.
[93] Batdorf, *Boxwood handbook : a practical guide to knowing and growing boxwood*.

stress and maintain good health, it is necessary to leave one-third of the foliage intact when performing such a drastic prune. Rejuvenation pruning is commonly performed on *B. sempervirens* cultivars to reduce its size and promote new growth.

Due to the unusually high density of its wood, 0.85 to 1.13 kg per m^3, boxwood is an exceptionally tenacious and long-lived plant.[94] Still, without proper consideration, it can be significantly damaged in severe winter conditions when in cultivation. Boxwood winter damage occurs during the coldest months, December, January, and February and is usually caused by improper site location in which the boxwood is exposed to harsh winter sunlight and wind. Boxwood prefer sites with morning sunlight and afternoon shade. Boxwood winter damage can manifest as bronze foliage, broken branches, and split bark. Foliage bronzing occurs when green chlorophyll cells die off due to harsh sunlight, low temperatures, and wind, resulting in the exposure of orange and reddish carotenoid and flavonoid cells. Branch breakage and bark splitting occurs when the boxwood wood has been heated due to winter sunlight. To reduce winter damage, it is important to select the appropriate location for the boxwood cultivar, taking into consideration its sunlight requirements.

Mulching is one of the most important horticultural BMPs utilized in the industry. Not only does mulching suppress weeds, but as it decomposes it adds organic matter and available nitrogen back into the soil. Mulch acts as a protective shield for boxwood roots, insulating them in the winter and keeping them cool and retaining moisture during hot, dry summer months. Over mulching can be detrimental, so maintaining ½ to 1-inch mulch layer is optimal. Mulch options available include pine needles and hardwood or softwood bark or chips.[95]

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[94] Record and Garratt, *Boxwoods*, 14.

[95] "Routine Care," Saunders Genetics LLC., accessed 10/19/2022, https://www.newgenboxwood.com/boxwood-care#mulching Batdorf, *Boxwood handbook : a practical guide to knowing and growing boxwood*.

Batdorf offers guidance on the optimal time for boxwood tasks, providing a calendar for seasonal maintenance. His boxwood tasks are outlined below:

Spring: monitor pests, sanitation, transplanting, weed control, repair cold injury

Summer: monitor pests, watering, weed control

Fall: fertilizing, mulching, planting, pruning, transplanting, watering, and weed control

Winter: fertilizing, cold protection, pruning, thinning, and repair cold injury.[96]

Boxwood Pests and Diseases

Management, care, and cultivation conditions are critical for overall management of boxwood pest and diseases. A healthy boxwood plant is less susceptible to pest infestations and diseases. Weekly scouting for pests and diseases is a critical step in boxwood best management practices as early detection of diseases and pests can greatly reduce the impact on the overall health of the boxwood.[97]

Common boxwood pests include Boxwood Leafminer (*Monarthropalpus flavus*), Boxwood Mite (*Eurytetranychus buxi*), Boxwood psyllid (*Psylla buxi*), Hard and Soft Scale, and Boxwood webworm. A relatively new boxwood pest is the Box tree moth (*Cydalima perspectalis),* which is a potentially devastating pest introduced in Canada in 2018.[98] Inconspicuous and unassuming pests of boxwood also include wildlife. Dogs, voles, and other

[96] Batdorf, *Boxwood handbook : a practical guide to knowing and growing boxwood*.
[97] Batdorf, *Boxwood handbook : a practical guide to knowing and growing boxwood*.
[98] Greenhouse Product News, "Box Tree Moth Found in Canada," (2019). https://gpnmag.com/news/box-tree-moth-found-in-canada/. ; USDA Animal and Plant Health Inspection Service, "USDA Confirms Box Tree Moth and Takes Action to Contain and Eradicate the Pest," (May 28, 2021 2021). https://www.aphis.usda.gov/aphis/newsroom/stakeholder-info/sa_by_date/sa-2021/sa-05/box-tree-moth.

digging animals root around the critical shallow-growing boxwood roots, severely damaging or killing the plant.[99]

Boxwood diseases are mostly caused by fungi, a class of microscopic, spore-producing organisms which feed on a living host. Common fungal diseases include Boxwood Blight (*Calonectria pseudonaviculata*), Macrophoma leaf spot (*Neofusicoccum buxi,* syn. *Macrophoma candollei*), boxwood dieback (*Colletotrichum theobromicola*), and Volutella leaf and stem blight (*Pseudonectria buxi, P. foliicola,* syn. *Volutella buxi*). Other important diseases are caused by *Phytophthora* species and Nematodes. *Phytophthora* species were originally grouped with fungi due to similarities in morphology and lifestyle. However, phylogenetic studies revealed that they are closer to some algae than fungi and now being placed in the kingdom of Stramenopila. Nematodes are "small eel-like worms" that are parasitic and cause plant disease. Additionally, boxwood decline is a common boxwood malady and is a complex disease which is made up of an interaction between fungi and parasitic nematodes along with environmental and cultural factors. Boxwood decline only affects *B. sempervirens* 'Suffruticosa'.[100]

Boxwood Blight

Description

Boxwood blight is a fungal disease that targets *Buxus sp*., in addition to Japanese spurge (*Pachysadra terminalis*) and Himalayan sweet box (*Sarcococca hookeriana var. humilis*), all belonging to the *Buxaceae* family. In the United States, this disease is caused only by the fungal pathogen *Calonectria pseudonaviculata* while in Europe it is also caused by an additional species, *Calonectria henricotiae*. According to the Horticultural Research Institute, the most

[99] Batdorf, *Boxwood handbook : a practical guide to knowing and growing boxwood*.
[100] Batdorf, *Boxwood handbook : a practical guide to knowing and growing boxwood*.

common first symptoms are light to dark brown, circular leaf spots with dark boarders, followed by rapid defoliation (particularly in the lower canopy) and black streaks on affected stems.[101] If left untreated, boxwood blight leads to plant death.

The boxwood blight pathogens produce infectious spores (conidia) that are incredibly sticky and can be easily spread via contaminated garden tools, clothing, shoes, and animals. Boxwood blight thrives in temperatures ranging from 64°F to 77°F (18 to 25° C) and wet conditions. Specifically, the blight pathogens require water to produce spores and to germinate and cause infection. Boxwood blight can also be spread through its microsclerotia that survive in soil and plant debris. Landscaping tools that can become vectors for the disease include pruners, saws, rakes, hoses, equipment, tarps, gloves, vehicles, and any other maintenance or installation accessories used in the garden. Boxwood blight can also be spread long-distance by introducing infected boxwood to existing plantings.[102]

History

Boxwood blight was first reported in the United States in 2011 and has since spread to many southern, eastern, midwestern, and western states.[103] The first reports of boxwood blight were from the United Kingdom and New Zealand in the mid-1990's, followed by other countries in Europe and western Asia.[104] The disease is especially damaging to the southern landscape as the pathogen thrives in the wet, cool climate that is characteristic of late fall and early spring in

[101] Marc Cubeta et al., *Best Management Practices: Boxwood Health Production and Landscape Management* The Horticultural Research Institute (Columbus, Ohio, 2020).
[102] Cubeta et al., *Best Management Practices: Boxwood Health Production and Landscape Management* ; Chuan Hong, "Saving American Gardens from Boxwood Blight," *The Boxwood Bulletin* 58, no. 3 (2019), https://boxwoodsociety.org/uploads/58_3_2019_Spring.pdf.
[103] Ivors, "Prevention and Management of Boxwood Blight." ; Hong, "Saving American Gardens from Boxwood Blight."
[104] Dart, Hansen, and Bush, "Boxwood Blight: A New Disease of Boxwoods Recently Found in Southeastern U.S.."

the Southeastern United States.[105] Because of the climate, the Southern US experiences year-round infection periods making disease pressure great. Historic gardens, both public and private, are particularly being targeted due to the pathogen's highly transferrable nature as well as the type of boxwood present in historic landscapes. Particularly susceptible to boxwood blight are the dwarf English boxwood (*B. sempervirens* 'Suffruticosa') and the American boxwood (*B. sempervirens*).[106] The English and American boxwood are the most common boxwood planted in historic American gardens.

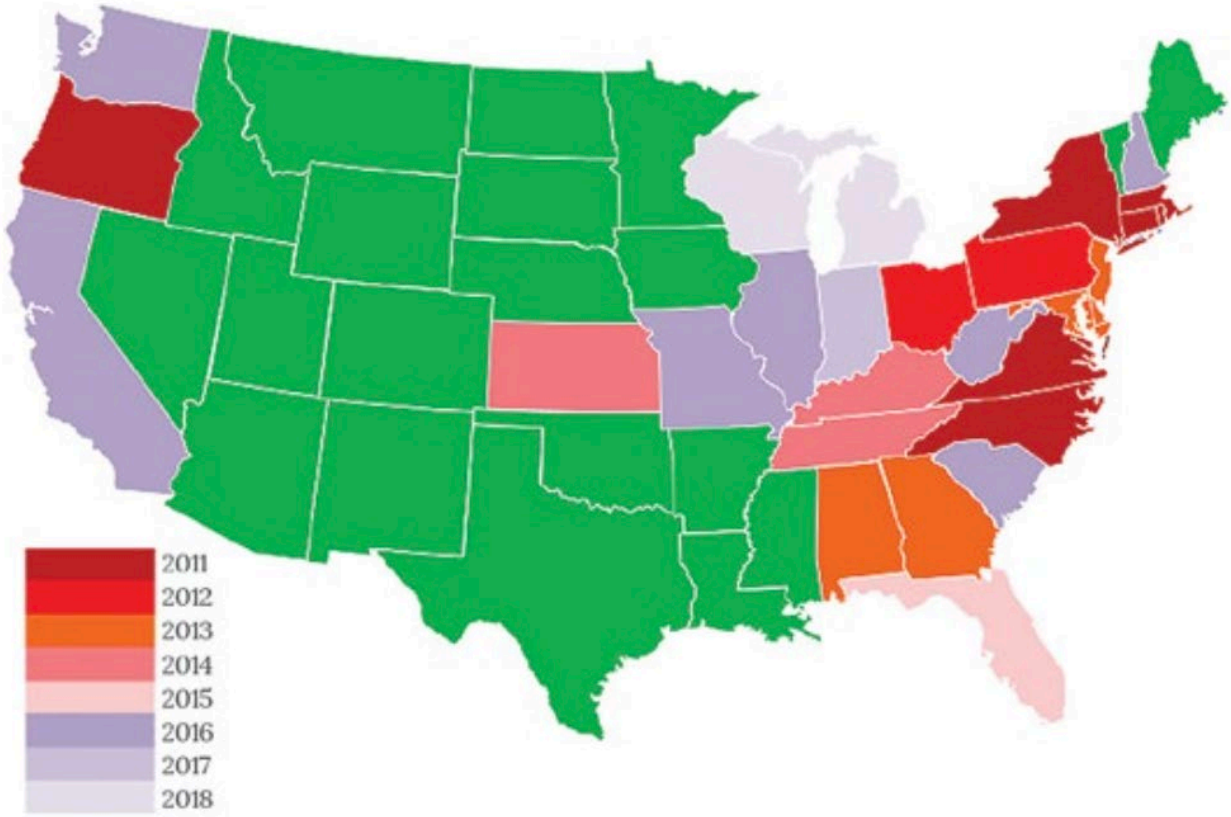

Figure 8 Boxwood blight tracker showing the spread of the disease from 2011 to 2018, noting that the green states have no data as of 2018.

[105] Virginia Cooperative Extension, "Expanding on the Boxwood Blight Management Decision Guide."
[106] Ganci, Ivors, and Benson, *Susceptibility of Commercial Boxwood Cultivars to Boxwood Blight*.

Contemporary Guidance

Guidance on boxwood blight BMPs are steadily being updated and published as new research and findings are available. Research-based publications outlining boxwood blight BMPs are published through extension agencies such as the University of Georgia Cooperative Extension, Purdue Extension, and Virginia Cooperative Extension. One of the leaders in publishing the most current guidance regarding all aspects of boxwood blight BMPs for the ornamental horticultural industry is the international USDA funded Horticultural Research Institute Boxwood Blight Insight Group (BBIG). BBIG is a group of scientists working on a USDA National Institute of Food and Agriculture – Specialty Crop Research Initiative project. The four-year program, which began in 2020, is the largest federally funded research initiative ever conducted on boxwood.[107]

The most current and comprehensive guidance for boxwood blight BMPs was published by the Horticultural Research Institute (HRI) in 2020. Their document discusses BMPs for both nursery production and landscape management and is a "voluntary industry recommended Best Management Practices for Boxwood Health."[108] Their suggested BMPs follow the Connecticut Agricultural Experiment Station (CAES) and the Virginia Polytechnic Institute and State University recommendations, and are backed by the horticultural industry, research authorities, and administrative executives. The HRI's guidance builds upon the BMPs outlined by the Virginia Cooperative Extension, BBIG guidance, and many other horticultural industry publications. The BMPs were established by a select group of experts assembled by the HRI and was reviewed by the National Plant Board (NPB) and a specialized review team. For this thesis,

[107] "Boxwood Blight Insight Group ", Horticultural Research Institute 2022, https://www.boxwoodhealth.org/.
[108] Cubeta et al., *Best Management Practices: Boxwood Health Production and Landscape Management* 4

the HRI's boxwood blight BMPs are considered the most current guidance involving boxwood blight BMPs.[109]

A summary of the Horticultural Research Institute's boxwood blight BMPs is listed below:

1. Train personnel for disease scouting and biology, sanitation, and management.
2. Purchase plant material from reputable suppliers who adhere to a boxwood blight compliance agreement.
3. When installing new boxwood, select varieties tested and known to be more tolerant and less susceptible to boxwood blight.[110]
4. Mulch boxwood plantings.
5. Sanitize tools, equipment, shoes, clothing between plantings. 70% alcohol and other products are recommended sanitizers.
6. Shearing boxwood is not recommended. Pruning to encourage air flow is ideal. Avoid flat surfaces. Remove lower branches that touch the ground.
7. Avoid working in boxwood plantings when foliage is wet.
8. All infected plant material should be double bagged and disposed of in an approved landfill, burned, or buried at least 10" below the soil surface.
9. Do not compost infected plant material.
10. Fungicides are preventive only and will not cure an infected plant.[111]

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[109] Cubeta et al., *Best Management Practices: Boxwood Health Production and Landscape Management*

[110] There are currently three boxwood breeders who are involved with breeding for boxwood blight resistance including Saunders Genetics in Piney River, Virginia, USA, Dr. Fred Gouker at USDA in Beltsville, Maryland, USA, and Didier Hermans at Herplant in Beerse, Belgium.

[111] Cubeta et al., *Best Management Practices: Boxwood Health Production and Landscape Management* pg.17

Summary of known applications of boxwood blight BMPs for historic gardens and landscapes

While there are many publications available regarding boxwood blight BMPs which continue to become more updated and comprehensive as the disease becomes increasingly understood, guidance regarding BMPs which focus specifically on historic gardens and landscapes has not been outlined. Dealing with boxwood blight at historic sites differs from non-historic public and private sites, especially regarding the HRI boxwood blight best management practices #3, #4, and #6. Regarding BMP #3, non-historic properties can easily remove and replace boxwood blight diseased boxwood and install with a new boxwood; however, for historic sites, removal and new installation is the last resort due to the aged, historically significant, and irreplaceable boxwood at these sites and the resultant effect on the properties' historic integrity. For BMP #4, some historic sites are unable to mulch their boxwood because of the historical inaccuracy. And lastly, for BMP #6, boxwood maintained at historic sites as edging and *parterre*s, amongst other forms, must be sheared to keep their historical appearance. From a horticultural perspective, the age of boxwood and the garden is not a consideration for boxwood blight BMPs; however, because this thesis deals with landscape architecture, horticulture, and historic preservation, it does have to be stated that BMPs specifically for historic sites does not exist and that, from a historical perspective, the age of the boxwood and garden does matter when considering the recommended BMPs for boxwood blight. Thus, this thesis research aims to fill the gap in understanding what BMPs are being implemented in historic American gardens and how they affect the significance and integrity of the landscape.

Summary of Takeaways from Horticulture and Boxwood

A plant's fundamental cultivation requirements, which are crucial to its survival, health, and longevity, are often overlooked. If the basic cultivation requirements of a plant have been met, BMPs can help to increase the longevity of a plant and reduce its susceptibility to pest and disease. Boxwood has long been a beloved garden ornamental for its ease of maintenance, drought tolerance, and longevity; however, cultivation concerns and improper care and maintenance contribute to its decline, when not addressed. Incorrect site conditions along with improper managing and caring for boxwood can lead to a weakened, disease-susceptible plant. Thus, maintaining a healthy boxwood by meeting its basic cultivation needs along with maintaining optimal BMPs can decrease the likelihood of disease and pest concerns. Boxwood pest and diseases can be easily managed but can become a serious issue if not addressed. Boxwood blight is one of those devastating diseases that is highly transferable and difficult to eradicate. Until an effective treatment is found, boxwood blight BMPs, along with the fundamental cultivation requirements, are the primary tools in reducing the spread of boxwood blight and managing the disease. Boxwood blight BMPs are aimed towards landscape professionals, homeowners, and public gardens but no BMPs are specific to historic gardens and gardeners. This is an issue for historic American gardens because many of these properties maintain old, historic, and cherished boxwood that would be devastating to the landscape design and historic integrity if lost. Thus, compiling boxwood blight BMPs that address historic gardens and landscapes' integrity and authenticity issues are needed.

2.3 Historic Preservation and Cultural Landscapes

This section introduces the field of historic preservation and how heritage resources in the United States are identified, recognized, and evaluated for nomination to the National Register of Historic Places. Further, there is a brief overview of the field of landscape preservation, how that field evolved out of traditional conservation of architecture and archaeological resources, and how historic and cultural landscape resources have influenced traditional preservation practice by insisting that dynamic natural processes be acknowledged as historic resources.

Historic Preservation

The National Trust[112], a United Kingdom conservation charity, defines historic preservation as:

> *"the process of identifying, protecting, and enhancing buildings, places, and objects of historical and cultural significance. This process embraces many phases including the survey and evaluation of historical, architectural, and cultural resources in an area; the development of planning and legal measures to protect these resources; the identification of public and private funding sources applicable to preservation projects; the design for the restoration, rehabilitation, and/or adaptive use of historic structures; and the ongoing maintenance of these resources."*[113]

Simply put, historic preservation is the conservation, preservation, and protection of historically significant places. The field of historic preservation employs a wide variety of professionals encompassing archeologists, architects, curators, historians, landscape architects, and other cultural resource experts.[114] Many authoritative organizations focusing on historic

[112] "About the National Trust," National Trust, accessed 10/19/2022, https://www.nationaltrust.org.uk/features/about-the-national-trust.
[113] "What is Historic Preservation?." https://www.tempe.gov/home/showdocument?id=16769.
[114] "What is Historic Preservation?," National Park Service, accessed 10/19/2022, https://www.nps.gov/subjects/historicpreservation/what-is-historic-preservation.htm.

preservation exist throughout the world, established to protect precious historic resources. In the United States, the National Park Service (NPS) is the federal authority on historic preservation and provides guidance and direction to other federal agencies, state historic preservation offices, preservation professionals, city planners and managers, cultural resource management firms, and many others in the field. Additionally, the NPS provides broad guidance on a variety of preservation topics, including legal regulations, grant funding opportunities and processes, technical guidance, and many other facets of the profession.

In 1966, the National Historic Preservation Act (NHPA) was passed in response to overwhelming negative impacts on historic resources from federally funded transit development and urban renewal programs. The NHPA outlines the tasks, processes, and legal requirements governing historic preservation in the U.S. The overall mission of historic preservation is to identify, create awareness of, advocate for, and physically preserve cultural resources according to the Secretary of the Department of the Interior's Historic Preservation Standards. [115]

The 1966 NHPA act established the National Register of Historic Places (NRHP), a federally managed list of historically significant buildings, structures, objects, sites, and districts considered worthy of preservation.[116] Note the term landscape is not one of the five approved NRHP historic resource types that can be nominated; hence landscapes are typically nominated as sites or districts. According to the NPS, the NRHP "is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America's historic and archeological resources."[117]

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[115] "The Secretary of the Interior Professional Qualifications Standards," U.S. Department of the Interior, accessed 10/19/2022, https://www.doi.gov/pam/asset-management/historic-preservation/pqs.
[116] "National Historic Preservation Act," National Park Service, accessed 10/19/2022, https://www.nps.gov/subjects/historicpreservation/national-historic-preservation-act.htm.
[117] "National Register of Historic Places," National Park Service accessed 10/19/2022, https://www.nps.gov/subjects/nationalregister/index.htm

Since 1966, the discipline of historic preservation has philosophically evolved becoming more inclusive of the breadth of historic resources that should be acknowledged as such, for example ethnographic resources, cultural landscapes, and intangible heritage. Currently the NPS acknowledges *architecture, archaeology, cultural landscapes, ethnographic resources, and museum collections as historic artifacts.* [118]

To be nominated to the National Register, the historic place must meet an age threshold of 50 years old or older; the historic significance must be justified by meeting at least one of four evaluation criteria; and the historic resource must reveal its integrity or authenticity. Aside from these requirements, a written document, with accompanying maps and photographs, is entered into a standard National Register nomination form and submitted to the state and federal level review process.

The historic *significance* of a resource recognizes the importance of that resource while the *integrity* "is a property's historic identity evidenced by the survival of physical characteristics from the property's historic or pre-historic period." When combined with historic research, documentation of existing conditions, and analysis of the resource, significance and integrity can assist in decisions involving the future of the resource.[119]

There are four National Register evaluation criteria used to assess the *significance* of a historic resource. The resource must be shown to have at least one of the four Criteria in order to be eligible for evaluation.[120]

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[118] "Director's Order #28: Cultural Resource Management ", National Park Service, 1998, https://www.nps.gov/policy/DOrders/DOrder28.html.
[119] Charles A. Birnbaum, "Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes," Brief *Preservation Brief 36* (September 1994 1994), https://www.nps.gov/tps/how-to-preserve/briefs/36-cultural-landscapes.htm.10
[120] "How to Apply the National Register Criteria for Evaluation," *National Register Bulletin* (1990). https://www.nps.gov/subjects/nationalregister/upload/NRB-15_web508.pdf 11

The Criteria for Evaluation are as follows:

- Criterion A (Event) “a property must be associated with one or more events important in the defined historic context.”.[121]
- Criterion B (Person) “applies to properties associated with individuals whose specific contributions to history can be identified and documented.”[122]
- Criterion C (Design/Construction) is “the distinctive characteristic of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.”[123]
- Properties can be eligible for nomination under Criterion D (Information Potential) “if they have yielded, or may be likely to yield, information important in prehistory or history.”[124]

Although a historic resource being nominated to the National Register must meet at least one of the historic significance evaluation criteria, more is better as it makes a stronger justification for the historic resource’s value.

The National Register uses seven aspects of *integrity* to determine whether the tangible historic resources that reveal the historic significance of the place retain authenticity. The seven aspects of integrity are:

1. *Location* “is the place where the historic property was constructed or the place where the historic event occurred.”[125]

[121] "How to Apply the National Register Criteria for Evaluation."12
[122] "How to Apply the National Register Criteria for Evaluation."pg 14
[123] "How to Apply the National Register Criteria for Evaluation."pg 17
[124] "How to Apply the National Register Criteria for Evaluation."pg 21
[125] "How to Apply the National Register Criteria for Evaluation." 44

2. *Setting* "is the physical environment of a historic property."
3. *Design* "is the combination of elements that create the form, plan, space, structure, and style of a property."[126]
4. *Workmanship* "is the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory."
5. *Materials* "are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property."[127]
6. *Feeling* "is a property's expression of the aesthetic or historic sense of a particular period of time."
7. *Association* "is the direct link between an important historic event or person and a historic property." [128]

There is no rule as to the number of integrity aspects that a historic resource being nominated to the National Register must have, but the general approach is the more aspects of integrity a historic resource has, the more intact it is and hence more able to reveal history of that place.

Justifying integrity can be both direct and challenging. In general, it is expected that the historic resource being considered for nomination to the National Register will be in its original location. However, in many cases the setting is the integrity aspect that has changed the most, as the physical context around a historic resource tends to change over time. Design, materials, and workmanship are aspects of integrity typically discussed together because if a historic resource reveals its original design, in most cases it probably contains the original or historically replaced

[126] "How to Apply the National Register Criteria for Evaluation."pg 44
[127] "How to Apply the National Register Criteria for Evaluation." pg 45
[128] "How to Apply the National Register Criteria for Evaluation." pg 45

materials, and hopefully also reveals the original workmanship. In general, it is suggested that if a physical feature has its location, and some design, materials, and workmanship, and the setting hasn't changed that much, then it probably meets the threshold for successfully meeting the feeling and association integrity aspects. However, each historic resource type (building, structure, object, site, and district) can vary in the aspects of integrity that are relevant to that type of historic resource. For example, for a battlefield, the integrity aspects of design and workmanship aren't as relevant as the other five aspects of integrity, whereas for a building, or historic district many of the aspects of integrity are relevant to be able to tell the story of the identified historic significance criteria.

Cultural Landscapes

Historic architecture and archaeology dominated the thought processes of historic preservation for over a century, as the only valued historic resources. Landscapes, in the form of designed gardens or settings for buildings, were somewhat acknowledged, but mostly as a backdrop or setting for architecture or because a garden had a lot of architecture in them, never for their own value. Although negative impacts of human development on the aesthetics of landscapes and destruction of natural places and beauty were acknowledged in the 1960s[129], it was not until 1982 that the Florence Charter acknowledged historic gardens as heritage resources and that vegetation was considered a historic material.[130] Simultaneous to when vegetation was acknowledged as a historic material is also when it was understood to have dynamic – growing,

[129] "Recommendation concerning the Safeguarding of Beauty and Character of Landscapes and Sites," UNESCO, 1962, https://en.unesco.org/about-us/legal-affairs/recommendation-concerning-safeguarding-beauty-and-character-landscapes-and.
[130] ICOMOS-IFLA International Committee for Historic Gardens, Historic Gardens (The Florence Charter) (Florence, Italy: International Council on Monuments and Sites, 1981); ICOMOS-IFLA International Committee for Historic Gardens, Short Historic Gardens (The Florence Charter)

dying, replanting, pruning – and the process of life and death was acknowledged as a historic process.

It was around this time that the National Park Service began to work in earnest on defining cultural landscape terms and types, as well as creating processes for identifying, analyzing, evaluating, and managing cultural landscapes, and guidance documents for practitioners working in the discipline. Because this thesis deals directly with boxwood used in historic landscapes, the NPS defined historic resource type that is important to understand for this research is the *cultural landscape*.

The NPS defines a cultural landscape as "a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values." [131] Cultural landscapes are important places that help us understand the development of our past through their configuration and characteristics and utilization.[132] The NPS defines four types of cultural landscapes: *historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes*. A historic site denotes a landscape associated "with a historic event, activity, or person."[133] The NPS defines a historic designed landscape as "a landscape that was consciously designed or laid out by a landscape architect, master gardener, architect, or horticulturist according to design principles, or an amateur gardener working in a recognized style or tradition. The landscape may be associated with a significant person(s), trend, or event in landscape architecture; or illustrate an important development in the theory and practice of landscape

[131] Birnbaum, "Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes." pg. 1
[132] Birnbaum, "Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes." pg. 1
[133] Birnbaum, "Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes." pg. 3

architecture."[134] Historic vernacular landscapes are landscapes that were shaped by the lifestyle of the people who occupied it while an ethnographic landscape is a "landscape containing a variety of natural and cultural resources that associated people define as heritage resources."[135] Because this research will be looking at landscapes where boxwood are intentionally planted, this thesis will focus on *historic designed landscapes*.

When the NRHP process for creating National Register nominations was created its frame of reference was architecture and archeology as the kinds of resources that would be nominated. As other types of historic resources became acknowledged over time, like cultural landscapes, it was up to the advocates for those new kinds of historic resources to figure out how to fit their new historic resource into the confines of the existing National Register nomination process. This is how the concept of landscape characteristics was developed.

The Cultural Landscapes Program of the NPS established an inventory and evaluation system using Landscape characteristics to describe the intangible and tangible characteristics of a cultural landscape from each historic period(s). Landscape characteristics are a way to deconstruct a complex landscape into its component natural and cultural parts, so that a determination of the cultural landscape's historic significance can be identified and determine if it retains authenticity.[136] The NPS has defined 13 landscape characteristics as follows: *natural systems and features, spatial organization, land use, cultural traditions, cluster arrangement, circulation, topography, vegetation, buildings and structures, views and vistas, constructed*

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[134] Birnbaum, "Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes."pg.2

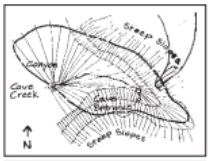
[135] Birnbaum, "Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes."pg. 2-3

[136] Susan A. Dolan, *A Guide to Cultural Landscape Reports: Contents, Process, and Techniques* (Washington, D.C.: National Park Service U.S. Department of the Interior, Park Historic Structures and Cultural Landscape Program, 1998), https://irma.nps.gov/DataStore/DownloadFile/501621.pg. 1

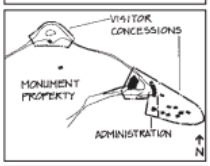
water features, small-scale features, and archeological sites. Landscape characteristics assist in understanding the natural and cultural value of a cultural landscape and thus if the landscape has historic significance and retains integrity. Landscape characteristics are unique to each landscape, as some characteristics may be present in one landscape but not present in another.

Overview of Landscape Characteristics

Landscape characteristics include tangible and intangible aspects of a landscape from the historic period(s); these aspects individually and collectively give a landscape its historic character and aid in the understanding of its cultural importance. Landscape characteristics range from large-scale patterns and relationships to site details and materials. The characteristics are categories under which individual associated features can be grouped. For example, the landscape characteristic, vegetation, may include such features as a specimen tree, hedgerow, woodlot, and perennial bed. Not all characteristics are always present in any one landscape. The following landscape characteristics may be documented in a CLR.



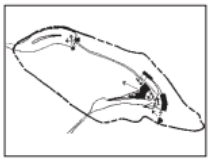
Natural Systems and Features
Natural aspects that often influence the development and resultant form of a landscape.



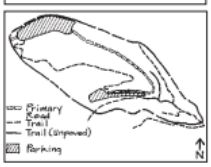
Spatial Organization
Arrangement of elements creating the ground, vertical, and overhead planes that define and create spaces.

Land Use
Organization, form, and shape of the landscape in response to land use.

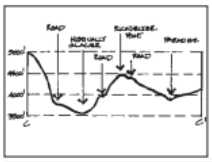
Cultural Traditions
Practices that influence land use, patterns of division, building forms, and the use of materials.



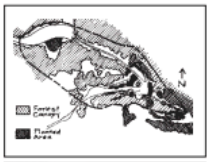
Cluster Arrangement
The location of buildings and structures in the landscape.



Circulation
Spaces, features, and materials that constitute systems of movement.

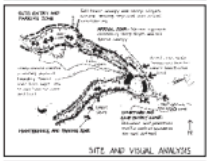


Topography
Three-dimensional configuration of the landscape surface characterized by features and orientation.



Vegetation
Indigenous or introduced trees, shrubs, vines, ground covers, and herbaceous materials.

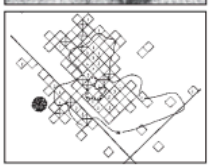
Buildings and Structures
Three-dimensional constructs such as houses, barns, garages, stables, bridges, and memorials.



Views and Vistas
Features that create or allow a range of vision which can be natural or designed and controlled.

Constructed Water Features
The built features and elements that utilize water for aesthetic or utilitarian functions.

Small-Scale Features
Elements that provide detail and diversity combined with function and aesthetics.



Archeological Sites
Sites containing surface and subsurface remnants related to historic or prehistoric land use.

Figure 9 Short descriptive definitions of each landscape characteristic as outlined by the NPS provide a basic reference which can be used when identifying specific qualities for a cultural landscape.

Nominating cultural landscapes to the National Register follows the same process as outlined above. The only difference is the additional use of the landscape characteristics to assist the process. The process can be challenging, as in most cases detailed historical research on landscapes has not been undertaken and hence makes the process of defining historic significance a little more complex. Landscape characteristics provide a framework by which research can be undertaken to understand each historic development period, then each period can be compared to one another, to determine if and how many tangible elements may remain today, and thus the landscape, and its elements, may retain integrity.

Evaluating the integrity of a historic designed landscape can be simple and at the same time complex. However, using landscape characteristics as part of the evaluation to assist in understanding change over time helps the process be much more straightforward. Comparison of historic and current conditions allows one to understand what historic features may remain from a historic period. This comparison can assist in determining integrity of individual landscape features. The NPS advises, when evaluating the integrity of a historic designed landscape, to ask three questions: 1) To what degree does the landscape convey its historic character; 2) To what degree has the original fabric been retained; 3) Are changes to the landscape irrevocable or can they be corrected so that the property retains integrity? Some features that are characteristic of historic designed landscapes include, but are not limited to, *spatial organization, vegetation, views & vistas,* and *circulation*.[137]

The landscape characteristic *vegetation* is a particularly important feature of the historic designed landscape. Vegetation is not constant but dynamic as it is growing and ever-changing.

[137] Timothy J. Keller and Genevieve Keller, "How to Evaluate and Nominate Designed Historic Landscapes " *National Register Bulletin # 18*. https://www.nps.gov/subjects/nationalregister/upload/NRB18-Complete.pdf.pg 2-7

Per the study of historic preservation, vegetation has been considered a historic material since the 1982 Florence Charter where it was recognized as a dynamic, living and dying material that is integral to the historical integrity and authenticity of cultural landscapes. The NPS advises that any aspect of integrity for the historic designed landscape should be analyzed in terms of survival, condition, and appropriateness. For integrity of vegetation, evaluating the survival and condition is imperative. Vegetation evolves over time due to seasonality, growth, maintenance (or lack of), environmental change, etc. It is important to note that, even if one aspect of integrity is not exactly as it was historically, other aspects can preserve the integrity of the landscape. For example, the NPS guides that, for vegetation, "The originality of plant materials can increase integrity, but absence of original materials does not automatically disqualify a designed landscape. The absence of original vegetation may not diminish integrity, for example, if the same or similar species of appropriate size have been replanted to replace dead, diseased, or mature specimens."[138] When situations necessitate the replacement of vegetation in a historic designed landscape, a major factor in determining suitable replacement vegetation should be guided by the original design intent of the historic landscape.

Design intent refers to the original designer's specifications of how a landscape should appear physically, as well as the historic purpose and role of the landscape, and its component parts, which was planned by the designer. Thus, in order to preserve the integrity, the physical management and maintenance of the garden, encompassing features like circulation, layout, and vegetation is imperative. For vegetation, this encompasses how the plant is pruned, what height it is kept at, whether it is mulched or not, etc. all determined by identifying the historic design intent. Additionally, design intent determines the selection of replacement vegetation.

[138] Keller and Keller, "How to Evaluate and Nominate Designed Historic Landscapes ".7

In selecting replacement vegetation, the plant's physical characteristics should be compared to that of the historic plant, as well as the plant's purpose and role in the garden. For example, if it is necessary to replace a medium sized, dying evergreen tree in a historic designed landscape whose historic function was to provide color to the garden in the winter months and dense shade in the summer months, selecting a small sized deciduous tree to replace the historic tree would not be appropriate. Selecting appropriate replacement plants with the historic design intent in mind is imperative to preserving the integrity of the landscape. Similar replacement philosophy should be used for other landscape components of an original design.

The physical condition of the vegetation is also significant in evaluating the integrity of the landscape. "Plant materials that are diseased, overmature, or have been subjected to excessive pruning or other improper treatment as well as areas where there is extensive soil erosion may diminish a landscape's integrity."[139] Such conditions also apply to integrity assessment of buildings in poor condition. Thus, it is critical to understand the historic design intent from both a large- and small-scale point of view –the overall designed garden and details like vegetation – in order to ensure the preservation of integrity. This can be done through selecting appropriate replacement plants and providing proper management and maintenance.

Summary Takeaways of Historic Preservation and Cultural Landscapes

The profession of historic preservation aims to conserve, preserve, and protect buildings, places, landscapes, and objects that are historically significant. The National Park Service, the leader of the historic preservation profession in the US, oversees the National Register of Historic Places, the official list of historically significant resources which are considered worthy

[139] Keller and Keller, "How to Evaluate and Nominate Designed Historic Landscapes ".7-8

of preservation and protection. Cultural landscapes are amongst those historic resources which can be nominated to the National Register. A resource must be considered historically significant and retain integrity, per NPS definitions and processes. Because this research is involved with boxwood planted in historic gardens, the thesis is focused on the *historic designed landscape*, looking specifically at the significance and integrity of vegetation and historic design intent.

2.4 Chapter Summary

The vast history of the use of boxwood in American gardens from Colonial to contemporary times, influenced by European predecessors, establishes the enduring value of boxwood in the United States. While there are plenty of horticulture-industry publications outlining best management practices for boxwood blight, this research found minimal information regarding how the devastating disease is being managed in historic American gardens, and what best management practices are being utilized.[140] As such, Chapter 3 will introduce the reader to survey content and results that will assist in bridging the research gaps.

[140] Logan Ward, "Boxwood Blues," (April/May 2019 2019). https://gardenandgun.com/articles/boxwood-blight/; Katie Mobley, "Ensuring the Longevity of Our Boxwood " (Janurary 12, 2021 2021). https://longwoodgardens.org/blog/2021-01-12/ensuring-longevity-our-boxwood.

CHAPTER 3

NEED FOR SURVEYS, SURVEY METHODOLOGY, AND RESULTS

Having completed background research on the history of boxwood use in American Gardens from Colonial times to present, horticultural standards for treating boxwood blight, and an overview of historic preservation and cultural landscape standards and processes to begin to answer the research questions, it was determined that there was a gap in knowledge. Throughout the available materials reviewed, limited information was found regarding how boxwood blight is being managed in historic gardens[141] and no information was found regarding if historic significance and authenticity play a role in boxwood blight decision-making.

Chapter 3 provides an overview of the need for a survey and its intent, the survey methodology, content, and results. Survey need and intent defines the need for different surveys to fill in gaps in knowledge from different discipline perspectives, while survey methodology describes the process of the identification and selection of survey sites and individuals to interview, along with chosen communication means and processes. Survey content details the format and creation of three surveys for unique interviewee categories, while survey results discuss the collective responses (sites and individuals) to each question.

3.1 Survey Need and Intent

Guidance for boxwood blight BMPs have been continually published and updated by the horticultural industry since the disease's discovery in the United States in 2011. However, these

[141] Mobley, "Ensuring the Longevity of Our Boxwood "; Ward, "Boxwood Blues."

BMPs are geared towards all landscapes generally. The BMPs do not address the constraints of historic preservation, cultural practices, and managerial factors (lack of staff, time, funding, financing, tourism) that encompass the operations of a historic site. Chapter 3 aims to answer the following research questions that Chapter 2 was unable to address: *What management and maintenance are boxwood receiving at historic sites? What are their cultivation conditions? Do historic sites know about boxwood blight? Are boxwood blight best management practices being applied to historic gardens? If so, what BMPs are they implementing and have they worked? What role does historic preservation play at these sites and does that affect boxwood cultivation?*

It was decided that surveying knowledgeable individuals who represent different disciplines involved with boxwood blight in historic gardens would be the best way to attain the answers to the research gaps noted from Chapter 2. The first group identified was historic site managers/lead horticulturalists as they would be able to provide firsthand knowledge regarding the implementation of boxwood blight BMPs and information on the role of preservation at the site. After spending considerable time undertaking surveys of the historic sites through those historic site managers/lead horticulturalists, it was further determined useful to survey businesses and individuals with experience working with cultural landscapes containing boxwood to establish a holistic understanding of how boxwood blight has affected the historic garden industry. Hence, three additional groups were identified to survey: landscape designers who work with historic gardens and have a solid horticulture background, landscape architects who have historic preservation expertise and careers addressing the needs of various periods of historic gardens and landscapes, and horticulture industry professionals who specialize in boxwood nursery production and/or breeding for genetic improvements to boxwood. Because of

the limited time to identify and survey these three additional groups, fewer numbers in each group were interviewed.

3.2 Survey Methodology

Surveys were created for each category of interviewees: historic site managers/lead horticulturalists, historic landscape experts, landscape designers, and horticulture industry professionals. The methodology for identifying each group of interviewees is described below.

Historic Sites Managers/Lead Horticulturalists

It was decided that the best way to learn what historic gardens are doing about boxwood blight, was to ask them; but who to ask? Initially, a list of known historic gardens containing boxwood, along the Eastern Seaboard states, was outlined. That list of 20 gardens was wide ranging and included gardens that represented historic periods from Colonial-to-Colonial Revival. After reviewing that initial list, it was decided that a clearly defined list of criteria was necessary to both limit and identify case study sites which fully represented the breadth of historic gardens that were potentially both historically accurate by preservation standards and may be battling boxwood blight.

Initial criteria focused on location of the site and how boxwood is used in the garden design; later managerial parameters and staff information, amongst a few other subjects, were added. The final list of criteria for case study sites and hence survey selection is as follows:

a. Must have boxwood and/or boxwood gardens (*parterre*, hedging, edging, foundational planting, specimen, topiary, etc.).
b. Must be a good representation of a historic property with boxwood gardens that embodies garden design and use of boxwood from Colonial, antebellum, post-bellum, and/or Colonial Revival time periods (1780-1930s).
c. Must have a garden manager, horticulturalist, or other employee whose primary position is the care of the garden.
d. May have boxwood stress and/or known boxwood blight.

e. Should have a plant management/maintenance plan for the site.
f. Should have a historic management plan for the site.
g. Should represent different ownership types (private, state, federal, non-profit).
h. Represents the regions of the East Coast – New England, Atlantic States, Southern States.

Sixteen sites were selected using the above criteria. Categorized by state, the sites are as follows: *Georgia*: Hills and Dales, Founders Memorial Garden, Barnsley Resort Gardens, and Swan House; *South Carolina*: Middleton Place and Robert Mills House and Garden; *North Carolina*: Biltmore, Reynolda, Carl Sandburg Home National Historic Site, and Wing Haven & Elizabeth Lawrence House & Gardens; *Virginia*: Montpelier, Mount Vernon, Colonial Williamsburg, and Stratford Hall; *Massachusetts*: Peace field and Longfellow House National Historic Site.

The sixteen historic sites were contacted of which eleven responded and were surveyed. Categorized by state, the eleven survey sites are as follows: *Georgia*: Hills and Dales (LaGrange), Founders Memorial Garden (Athens), and Swan House (Atlanta); *North Carolina*: Biltmore (Asheville) and Carl Sandburg Home National Historic Site (Flat Rock); *Virginia*: Montpelier (Montpelier Station), Mount Vernon (Mount Vernon), Colonial Williamsburg (Williamsburg), and Stratford Hall (Stratford); *Massachusetts*: Peace field (Quincy) and Longfellow House National Historic Site (Cambridge).

Three of the eleven survey sites are in the Southern States, six are in the Atlantic States, and two are located in New England. The sites are good examples of garden design from their respective time periods, which span from the Colonial period to Colonial Revival. Five of the sites are good examples of Colonial era garden design, two are good examples of antebellum garden design, three are good examples of Colonial Revival, and one is a good example of post-bellum garden design. The process of selecting these sites began with identifying the above listed

criteria that guided the site selection. The two most limiting criteria, which had an influential role in selecting which gardens would be suitable for surveying, were criterion two and three: identifying sites that were good examples of their respective era of garden design, while also having a garden manager, horticulturalist, or other employee whose primary position is the care of the garden. There are many gardens that are *good* examples of the selected historic garden design eras, but it was soon realized that they lacked the management aspect that was critical for this research. Without the management, there would be no way to identify what BMPs were being applied, if any. The most easily applied criteria were criterion one and eight. Identifying gardens that contained boxwood in the New England Region, Atlantic States, and Southern States was relatively straightforward and many gardens would have been suitable for this study, if not for the constraints of criterion two and three.

Horticulture Industry Professionals

Horticulture industry professionals were surveyed to establish their perspective on the issue of boxwood blight. Because of their horticultural knowledge and boxwood expertise, understanding the relationship between the horticulture industry's experience with historic sites and boxwood blight was imperative in establishing a holistic view of the issue.

Three criteria were created to identify suitable horticulture industry professionals to survey:

a. Must have nursery and/or horticulture industry expertise that is focused on boxwood.
b. Must maintain a respectable reputation in the horticulture industry.
c. Must have horticulture industry recognition and associated credentials.

Three horticulture industry professionals were selected using the criteria and are as follows: Saunders Brothers located in Piney River, Virginia, AJF Design located in Pottersville, New Jersey, and George Bridge Landscape Design located in Greenwich, Connecticut.

Established in 1915, Saunders Brothers is a nationally respected family-owned wholesale nursery operation that specializes in boxwood production.[142] Saunders Genetics, a Saunders Brothers' sister company, focuses on plant genetics, breeding, and trialing which has produced the NewGen Boxwood series, a line of boxwood that have been bred to have greater disease and pest resistance, including boxwood blight resistance.[143] Bennett Saunders is the General Manager of NewGen Boxwood and has been working for Saunders Brothers since his childhood. Bennett Saunders began propagating boxwood at the age of six and has held many roles in the Saunders Brothers company, including Orchard Manager and Field Growing Manager. Saunders was selected to survey because of his involvement with boxwood nursery operations, industry knowledge, and boxwood expertise.

Founded by Andrea J. Filippone in 2008, AJF Design is a landscape design firm that specializes in the use of boxwood in their designs.[144] Filippone, with a background in architecture, became interested in boxwood to create green architecture and garden rooms in the landscape. As a result, she became very involved in the boxwood industry and landscape design, including historic garden design. Early in her career Filippone established a boxwood nursery, under the mentorship of Paul Saunders, and attended boxwood exploration trips to Macedonia to understand boxwood in nature. Her boxwood nursery is managed organically, based on her observations of boxwood in the wild. She is currently on the board of the European Boxwood

[142] Saunders Brothers, "About Us: Celebrating 100 Years - 1915-2015."
[143] "Research," Saunders Genetics, LLC., accessed 10/25/2022, https://www.newgenboxwood.com/research.
[144] "AJF Boxwood," AJF Design, accessed 10/25/2022, https://www.ajfdesign.com/boxwood.html

and Topiary Society and is the President of the American Boxwood Society. Filippone was selected to survey under the Horticulture Industry Professional category because of her boxwood nursery operation as well as in the Landscape Designer group because of her specialization in boxwood for her landscape design practice.

George Bridge Landscape Design (GBLD) is a landscape design company and nursery operation out of Greenwich, Connecticut.[145] GBLD specializes in the installation of mature and antique plant specimens, including boxwood. They have two nursery farms, in Virginia and Maryland, which contain American boxwood ranging from 40-80+ years old.[146] George Bridge Landscape Design was selected to survey because of their boxwood nursery operations specializing in mature *B. sempervirens*.

These horticulture industry professionals were identified because of their expertise and reputation in the nursery and green industry.

Landscape Designers & Cultural Landscape Experts

Landscape designers and landscape architects with expertiese in historic gardens and cultural landscapes were surveyed to understand the role of historic preservation and traditional horticulture in their respective practices as it relates to boxwood, as well as to understand the effects of boxwood blight in their profession. In identifying good representatives for the landscape designers and cultural landscape experts, it was important to select individuals based on the types of projects they have worked on, as well as their prominence and recognition in their field of work.

[145] "George Bridge Landscape Design," George Bridge Landscape Design, accessed 10/25/2022, https://www.georgebridgeboxwood.com/copy-of-res-4.
[146] "Boxwood," George Bridge Landscape Design, accessed 10/25/2022, https://www.georgebridgeboxwood.com/copy-of-projects-2.

Two landscape designers were selected because of their reputations specializing in garden design and horticulture. They are Andrea Filippone of *AJF Design* and Chip Callaway of *Callaway & Associates*. Andrea Filippone is a graduate of the Harvard University School of Design and has been involved with historic landscape design encompassing private residential and public projects, including the restoration of the historic Dumbarton Oaks Boxwood Walk. A graduate of the Master of Landscape Architecture program at the College of Architecture at N.C. State University, Chip Callaway has been designing both contemporary residential and historic gardens over the past forty years in his career as a landscape architect. Two of his projects are the garden at the Alexander Graham Bell house (Washington, D.C.) and the restoration of the gardens at the Robert William Roper House (Charleston, SC).[147]

Two additional landscape architects were selected because of their regional and national reputations specializing in historic landscape preservation as applied to cultural landscapes. The two cultural landscape experts selected were Spencer Tunnell of *Tunnell & Tunnell Landscape Architecture* and Will Rieley of *Rieley & Associates Landscape Architects.*

Having received graduate degrees in both landscape architecture and architectural history from the University of Virginia[148], Spencer Tunnell established Tunnell & Tunnell Landscape Architecture firm in the 1980's, specializing in historic landscape preservation. Of the numerous preservation projects that he has been involved with, the Swan House, Goodrum House, and Olmsted Linear Park are three notable historic preservation projects in Atlanta, Georgia.

[147] Barbara Sullivan, "The Education of a Gardener: How Chip Callaway has established himself among the elite garden designers of America," *Salt: The Art & Soul of Wilmington*, 2019, https://issuu.com/saltmagazinenc/docs/salt_apr2019.
[148] "About Us," Tunnell & Tunnell Landscape Architecture, accessed 10/25/2022, https://tunnell-tunnell.com/about-us/.

Will Rieley received his Master of Landscape Architecture from the University of Virginia in 1980 and went on to established Rieley & Associates.[149] Rieley has worked with numerous historic sites, including Stratford Hall (Stratford, VA), Monticello (Charlottesville, VA), Bruton Parish Church (Williamsburg, VA), and the Vanderbilt Mansion Historic Site (Hyde Park, NY).[150] Rieley has served as Landscape Architect for the Garden Club of Virginia for the past forty years. He has received the Merit Award for Historic Research from the American Society of Landscape Architects and the Award for Historic Preservation from The Garden Club of America.

With the historic sites, horticulture industry professionals, landscape designers and cultural landscape experts identified, survey questions pertaining to each group was then created.

3.3 Survey Process and Content

Survey Process

There are many options to create and implement a survey, including online surveys and mail-in hardcopy surveys. The chosen survey format can influence the way the survey content is created. Because the survey will collect both quantitative and qualitative data, it was decided that phone interviews and zoom meetings would be the most effective way of obtaining the most information in a short amount of time.[151]

Potential interviewees in each category were initially contacted by either email or phone with a request to interview them, providing information regarding the research and survey process, as well as general questions that would be asked, to allow them to determine if they

[149] "Will Rieley," LinkedIn, accessed 10/25/2022, https://www.linkedin.com/in/will-rieley-752b2430.
[150] "Our Work ", Rieley & Associates Landscape Architects, accessed 10/25/2022, https://www.rieleyandassociates.com/our-work/.
[151] Deming and Swaffield, *Landscape Architecture Research Inquiry, Strategy, Design*.pgs. 72-77

wanted to participate. Upon positive response, a meeting date, time, and method (phone or zoom call) was determined, and an Outlook Calendar Event confirmation was sent. Each survey occurred for approximately 60-90 minutes per interviewee. A list of questions was used as a baseline from which this author could maintain consistency across all the phone or zoom calls, with some tailored questions pertaining to the individual's group. Each interview session was recorded while this author took supplemental notes. The surveys were completed between July 14 – September 9, 2022, with the majority occurring in July.

For those that did not respond to the initial request for participation, they were contacted at least 2-3 more times by both email and phone, before placing those potential interviewees into the category of unsuccessful contact.

Survey Content

Each group's survey content consisted of the same baseline organization and questions arranged into one of four categories: *personal background, landscape management, historic preservation, and horticulture*. One additional category, titled *site details,* was included for the historic sites' surveys, and focused on questions pertaining to visitation and boxwood garden use. Generally, each category of questions contained a few standard questions along with custom questions. Standard questions were asked across all groups while custom questions were tailored to the knowledge base of the respective interviewee group. Of the custom questions generated, the largest set was for the historic sites. These custom questions differed from the other interviewee group's custom questions, as it was necessary to include technical horticulture and landscape maintenance-based questions, as well as questions pertaining to the historic site. Descriptions of the questions, per category, are described below.

Historic Sites

To create insightful survey questions for the historic site managers, it was critical to understand the historic site first. As a part of the survey process, contextual research, pertaining to each historic site, was conducted.

The focus of the contextual research was to establish an understanding of the historic site to assist in creating intentional survey questions, as well as to address case study site criterion b, g, and h. Basic information regarding site location, age, and size was determined using google maps and websites for the historic sites, when applicable, meeting criteria h. Both historic and current site photos, as well as current and historic site maps, found on the site websites and in gardening publications, were useful for establishing the general use and location of the boxwood, which helped to address criteria b. Current ownership of the property was investigated when obtainable, identifying if the site was public, private, federal, etc. Ownership type was often found on the historic site websites and/or journal articles and this addressed criteria g. More detailed context research was conducted, when feasible, which involved diving into site-specific garden books. The garden books revealed more detailed information regarding the history of the site and the evolution of the garden design and boxwood, also helping to address criteria b. This portion of the contextual research was limited to those sites with official publications such as *The General in the Garden*, *The Biltmore Nursery*, and *The Gardens of Colonial Williamsburg*. While the contextual research produced baseline information regarding the site, and in some cases more detailed site information, the survey questions were created to further optimize the research and produce more detailed knowledge and understanding of the site.

For the historic site surveys, the personal background questions were asked first to establish the interviewees understanding and knowledge of landscape management, horticulture,

and historic preservation topics. The personal background set of questions were followed by site details, historic preservation, and horticulture question categories.

Personal Background

The following list of personal background questions were asked of each historic site representative:

What is your experience in preservation, horticulture, and/or landscape management?
Have you always been in this field of work?
Do you have any special training or certifications preservation, horticulture, and/or landscape management?
How long have you been at this site?
What roles have you held at this site and what is your current role?

Site Details

Questions created for site details include:

What is your visitation rate annually?
Where is the boxwood located in the garden?
How is the boxwood used in the garden?

Landscape Management

The following list of questions was created for landscape management:

How many horticultural staff do you have?
Is your staff divided into specialist groups? If so, what are the groups?
Are there specific staff in charge of boxwood care?
Have you had any issues with the health/performance of the boxwood?
What is the current health of the boxwood?
Have you had to replace the boxwood? If so, why?
How often and when is the boxwood maintenance performed?
Are your staff trained and educated on boxwood blight?

Horticulture

Do you propagate the boxwood?
Do you have any special care/management specific to the boxwood?/ What kind of maintenance do the boxwood need?
Do you protect the boxwood from winter damage?
How much sun does the boxwood receive?

Is the soil well-drained?
Do you ever need to supplement water?
Have you tested the soil pH?
Do you fertilize the boxwood? If so, what do you fertilize with and how often?
Are the boxwood mulched? If so, what mulching material is used and approximately how thick is the mulch layer?
Do you know about boxwood blight?
What is your understanding of boxwood blight?
Have you had boxwood blight, and/or do you currently have boxwood blight?
Did you or an outside professional confirm boxwood blight?
When did you first notice boxwood blight?
How bad has it/had it intruded?
What actions have been taken?
How are you controlling the spread of boxwood blight in the garden?
Have you replanted the area?
What will you replant with?
Are you managing/taking preventative measures for boxwood blight?
Do you have a plan in place for if you get boxwood blight? If so, what BMPs are you planning on implementing?
Are you in communication with other historic gardens managers about their boxwood blight protocols and BMPs?
How are you staying updated and educated on boxwood blight news?

Historic Preservation

What is the mission/vision of the historic site?
How old is the boxwood on property?
Have you been able to find the same boxwood used historically? And/or What historic boxwood is currently on site?
Does the quantity of visitation impact what you choose to do at the garden? If so, what change has been implemented in the garden/landscape to accommodate visitation?

Horticulture Industry Professionals

For the horticulture industry professionals, the personal background questions were similar but incorporated questions that were tailored to the horticulture industry. The landscape management, horticulture, and historic preservation questions were adjusted to reflect the nature of the horticulture profession. Inherently, there were less questions asked in the landscape management, horticulture, and historic preservation categories than that of the historic sites due to the number of detailed questions pertaining to boxwood maintenance and cultivation.

Personal Background

What is your experience in preservation, horticulture, design, and/or the green industry?
Have you always been in this field of work?
Do you have any training in preservation, horticulture, or landscape management?
What roles have you held at your current company and what is your current role?
Have you provided boxwood for historic properties? If so, what properties and when? Small-scale or large-scale sites?

Landscape Management

Where are you sourcing your boxwood?
How is the boxwood that you are selling typically being used by historic properties/ how is the boxwood laid out in design? (*parterre*s, edging, hedges, etc.)
Do you install the boxwood? Do you maintain the boxwood after installation?

Horticulture

Do you have any special care/management specific to the boxwood after installation? And/or do you have any special recommendations for installation pertaining to boxwood blight BMPs?
Do you receive calls about boxwood blight from historic property owners? If so, how have you guided them to prevent and/or manage boxwood blight?
Are you in communication with other companies about their boxwood blight protocols?
How are you staying updated and educated on boxwood blight?

Historic Preservation

How old is the boxwood you usually work with/provide for historic properties?
What are you recommending for boxwood replacements for historic properties and why?

Landscape Designers & Cultural Landscape Experts

The same personal background questions asked of the horticulture industry professionals were asked of the landscape designers and cultural landscape experts.

Personal Background

What is your experience in preservation, horticulture, landscape management, and/or landscape design?

Have you always been in this field of work?
Do you have any training and/or certifications in preservation, horticulture, or landscape management?
What roles have you held at your current company and what is your current role?

Landscape Management

Where are you sourcing your boxwood?
How is boxwood typically laid out in your designs?
Who typically installs the design and who manages the garden after installation?

Horticulture

Do you know about boxwood blight?
Are you managing/taking preventative measure for boxwood blight at your historic sites?
Do you receive calls from your clients about boxwood blight?
How do you guide your clients when they call about blight?
Are you in communication with other companies and/or firms about their boxwood blight protocols?
Are you staying updated and educated on boxwood blight news?

Historic Preservation

Have you worked with/or designed for historic properties?
What kind of boxwood are you generally installing for your designs?
Do you typically use boxwood in your landscape designs for historic properties?
And/or when designing for historic properties, do you use the historic variety?

3.4 Survey Results

The survey results are organized first by category of survey respondents (Historic Sites, Horticulture Industry Professionals, and Landscape Designers and Cultural Landscape Experts), survey response rate, and then category question content (personal background, landscape management, horticulture, historic preservation). Please note these responses combine answers of all the interviewees for each question

Historic Sites

Survey Response Rate

Sixteen historic sites were contacted, of which eleven responded and agreed to be surveyed, with a response rate of 68%. The historic sites that were surveyed encompassed a variety of levels of recognition: three survey sites are nationally recognized public gardens [Biltmore (NC), Mount Vernon (VA), Colonial Williamsburg (VA)]; six are distinguishable public gardens at the state-level [Hills and Dales & Swan House (GA), Montpelier & Stratford Hall (VA), and Peace field & Longfellow House (MA)]; and two are locally reputed public gardens [Founders Memorial Garden (GA) and Carl Sandburg Home (NC)]. Seven of the survey sites have historic designations: three survey sites are listed on the National Register of Historic Places (Swan House, Colonial Williamsburg, and Longfellow House) and four sites are listed as National Historic Landmarks (Biltmore, Montpelier, Mount Vernon, and Stratford Hall).

The eleven historic sites comprised an assortment of ownership types: three are federally owned and managed by the National Park Service (Carl Sandburg Home, Peace field, and Longfellow House), one is owned by the State of Georgia (Founders Memorial Garden) although managed by the University of Georgia College of Environment and Design, while the remaining seven are privately owned (Hills and Dales, Swan House, Biltmore, Montpelier, Mount Vernon, Colonial Williamsburg, and Stratford Hall). The surveyed sites encompassed a breadth of design-eras which resulted in varied answers regarding boxwood use and cultivation. Of the eleven historic sites surveyed, one is a good example of Colonial-era garden design (Mount Vernon), two are good examples of antebellum-era garden design (Hills and Dales & Carl Sandburg Home), two are good examples of post-bellum/Colonial Revival era garden design (Biltmore & Swan House), one is a good example of Colonial Revival era garden design (Founders Memorial

Garden), and five exhibit both Colonial and Colonial Revival eras of garden design (Montpelier, Colonial Williamsburg, Stratford Hall, Peace field, and Longfellow House).

Most of the sites that did not respond were of the Colonial Revival era of garden design and located in either the Southern States or Atlantic States. These potential surveys would have provided more information on the current use and maintenance of boxwood from that design era, however, the five survey sites with both Colonial and Colonial Revival eras of garden design gave ample information on the specifics of their Colonial Revival landscapes. A few of the gardens that did not respond were of the antebellum era which would have provided more variance in survey results of the two antebellum era gardens that were surveyed. Of the four post-bellum era historic sites that were contacted, two responded. Surveying four post-bellum gardens could have resulted in more information regarding the comparison of cultivation practices, management, and preservation goals. Although six of the sites did not respond, the eleven that were surveyed fulfilled criteria a, b, c, g, and h, by having boxwood and/or boxwood gardens, diversity in periods of garden design, an employee whose primary position is garden care, a variation of recognition at the national, state, and local levels, contrast in historic designations, range of ownership types, as well as representation of different regions of the East Coast.

Personal Background

1. *What is your experience in preservation, horticulture, and/or landscape management?*

Of the eleven sites surveyed, ten interviewees held bachelor's degrees – five in horticulture, with the other five in non-related professions. The five interviewees with non-horticulture degrees, along with the one with no professional degree, all have certifications in

horticulture or a related field, and/or have had professional training in horticulture, and/or have received on-the-job training in horticulture. Of the eleven interviewees, one individual (Peace field) had training in historic preservation, specifically from the NPS Olmsted Center for Landscape Preservation. Although many of the other sites had no official historic preservation training, many implied they felt they understood historic preservation because they are horticulturalists working in a historic garden. It is unknown what kind of preservation training is offered at these historic sites. None of the interviewees indicated any official training in landscape management, however, because of the supervisory and management roles they have at their sites, many interviewees again implied they understood landscape management.

The sites with staff that have the most experience in horticulture and landscape management are Mount Vernon, Biltmore, Colonial Williamsburg, Hills and Dales, Carl Sandburg, Stratford Hall, Swan House, Peace field, and Founders Memorial Garden. The sites with the least amount of experience in horticulture and landscape management are Longfellow House and Montpelier. Overall, the eleven sites all have professional experience in horticulture, with no professional training in historic preservation or landscape management. It was discovered that horticulture takes management priority over preservation by managers and staff regarding experience and knowledge of managers and staff at the sites.

2. *Have you always been in this field of work?*

Six out of eleven of the survey sites respondents answered yes to this question. Of the six that answered yes, one half have been in the horticulture profession for over 20 years. Of the five sites that answered no, there was a vast variety in prior career experience which encompassed the restaurant industry, retail industry, economics, healthcare, and education.

3. *Do you have any special training or certifications preservation, horticulture, and/or landscape management?*

None of the survey site interviewees had specialized training in preservation, horticulture, or landscape management. Of the eleven survey participants, the five with bachelor's degrees in horticulture answered that they had no other specialized training or certification aside from their bachelor's degrees in horticulture and hands-on training. Seven of the eleven interviewees answered that they had on-the-job training and/or training in preservation and horticulture from attending conferences, symposiums, and/or workshops. Three of the ten answered that they have training in preservation, horticulture, and landscape management from attending conferences, symposiums, and/or workshops. It is unknown if any preservation training is offered on site for staff.

4. *How long have you been at this site?*

The average years on site for the eleven survey site interviewees was fourteen years. Of the eleven surveyed, three had twenty-plus years, and six had under 10 years. Fifty-three years is the most years, held by Dean Norton, Director of Horticulture at Mount Vernon, with the shortest being six months at Longfellow House by Chris Norris, Gardener.

5. *What roles have you held at this site and what is your current role?*

This question was asked in order to meet criterion c, which states that the site must have a garden manager, horticulturalist, or other employee whose primary position is the care of the garden. While the titles of the previous and current roles of the persons interviewed varied their current role/positions are all similar and can be described as the primary person overseeing the care, maintenance, and management of the garden. Of the eleven interviewees, five held previous roles at the site while six were hired in their current position. A few of the titles of currently held roles for larger sites with more than two horticultural employees include Director of Horticulture,

Horticulture Manager, and Director of Landscapes. Titles of currently held roles for smaller sites with two or less horticultural employees include Garden Supervisor and Safety Coordinator, Gardener, and Horticulturalist.

Site Details

1. *What is your visitation rate annually?*

Annual visitation rates vary significantly, with the most visitors being 1.4 million per year at Biltmore Estate in Asheville, North Carolina and the least number of annual visitations being roughly 5,000 at Founders Memorial Garden in Athens, Georgia. This extreme variation in annual visitation is influenced by many factors including location, size, and recognition. Additionally, annual visitation rates vary because of differences in site-use. Some sites function as both an event-venue and historic house and garden, which increases visitation rates significantly due to inclusion of event-guests in visitation rates.

2. *Where is the boxwood located in the garden?*

Of the eleven survey sites, ten have boxwood located near the historic home of the site, generally maintaining a centrally located or prominent position in the garden, with some outlying boxwood depending on the size of the site. Biltmore is the only survey site where boxwood is solely located in an outlying position from the core house and garden area.

3. *How is the boxwood used in the garden?*

This question was asked in order to meet criterion a, which states that the historic site must have boxwood and/or boxwood gardens (parterres, hedging, edging, foundational planting, specimen, topiary, etc.). Seven of the eleven survey sites have boxwood used in multiple ways on site including a combination of boxwood edging, hedges, *parterre*, and/or specimen/foundational plantings. Four of the sites use boxwood in only one way including

boxwood edging, hedges, or specimen/foundational plantings. The most common way boxwood is used at the survey sites is as boxwood edging. Overall, six of the ten survey sites have boxwood edging, five have specimen plantings, four have hedges, and three have *parterres*. Hills and Dales Estate was the only survey site to have boxwood used in containers and espaliers, with Montpelier in Virginia being the only site to use boxwood as topiary and planted in an alleé.

Landscape Management

1. *How many horticultural staff do you have?*

Biltmore, the largest of the survey sites, boasts seventy-five-plus acres of designed landscape and has sixty full and/or part time employees, including four seasonal interns. The smallest of the survey sites, having one horticultural employee, is Longfellow House which is approximately one-hundred and fifty feet long by seventy-five feet wide. The survey sites can be organized into small (less than 3 acres) and large gardens (greater than three acres). The size of the survey site garden directly relates to the number of staff needed to care for it. Of the eleven survey sites, six have three or less horticultural staff, including the primary garden director/manager/gardener, while five have three or more horticultural staff. The average size of the six survey sites with three or less staff is less than three acres, while the other five survey sites with three or more staff being greater than three acres. Number of staff could also be influenced by site location and size, workforce availability and credentials, as well as seasonal need and garden maintenance requirements.

2. *Is your staff divided into specialist groups? If so, what are the groups?*

Of the eleven survey sites, five have their staff divided into specialized groups. These five survey sites have more than three horticultural staff and have groups typically divided based on specific areas with similar maintenance requirements or a specific garden/landscape area. The

six survey sites with three or less horticultural staff do not have the luxury of dividing the garden into maintenance areas, focusing more on day-to-day tasks in the garden.

3. *Are there specific staff in charge of boxwood care?*

Boxwood care at ten of the eleven survey sites falls under the primary person in charge of the garden, like the Horticultural Director or Horticulturalist, and/or the specialized group in which boxwood is in their area of maintenance. Colonial Williamsburg is the only site with a specific staff member in charge of boxwood care, their Integrated Pest Management Technician.

4. *Have you had any issues with the health/performance of the boxwood?*

This question, in addition to the following question, were asked in order to meet criterion d, which states that the historic site may have boxwood stress and/or known boxwood blight. Nine of the eleven survey sites have pest and disease issues, the majority listing boxwood decline, leaf miner, Volutella, and spider mites as the primary issues. Three of the ten survey sites have cultivation issues which contribute to boxwood stress. Longfellow House and Peace field, two of the northernmost survey sites, have seasonal issues with winter damage which negatively impacts boxwood health. Longfellow House is the only survey site to list staffing issues which has negatively impacted overall boxwood health and performance due to limited care. Biltmore was the only survey site with no boxwood issues, most likely because of the boxwood garden's secluded location.

5. *What is the current health of the boxwood?*

The boxwood at eight of the eleven survey sites are in good health. The Stratford Hall boxwood are in declining health due to their age while the boxwood at Swan House and Hills and Dales Estate are in poor health because of continued boxwood blight. The boxwood planted in 2021 at Longfellow House are dying and/or dead due to cultivation issues.

6. *Have you had to replace the boxwood? If so, why?*

Six of the eleven survey sites have had to replace and/or will replace boxwood because of cultivation issues, boxwood decline, and/or pest and disease pressures. Two of the eleven survey sites have not had to replace boxwood. Three sites will not replace boxwood because of boxwood blight and/or cultivation constraints.

7. *How often and when is the boxwood maintenance performed?*

Four of the survey sites perform boxwood maintenance once per year in the spring, typically scheduling maintenance for February until March. Mount Vernon and Hills and Dales perform boxwood maintenance three times per year in the spring, summer, and late summer/early fall. Montpelier begins boxwood maintenance twice in July and once in mid-December while Peace field performs boxwood maintenance once in early to mid-July. Three of the survey sites do not perform regular boxwood maintenance.

8. *Are your staff trained and educated on boxwood blight?*

Five of the eleven survey sites have formally trained and educated staff on boxwood blight, most importantly on how to identify blight. These sites have more than three horticultural staff while the six sites with no boxwood blight-trained or educated staff have three or less staff along with assistance from seasonal interns and volunteers. The seasonal interns and volunteers are aware of the disease but have not received boxwood blight training or education.

Horticulture

1. *Do you propagate the boxwood?*

Six of the eleven sites propagate their own boxwood from historic boxwood plants on site.

2. *Do you have any special care/management specific to the boxwood?/ What kind of maintenance do the boxwood need?*

The two most common boxwood care and management tasks were the implementation of monitoring/scouting and thinning. Of the eleven sites, five implement monitoring/scouting and six thin regularly. Peace field and Mount Vernon perform regular boxwood shearing. IPM is part of the boxwood maintenance at Peace field and Longfellow House. Watering is included as part of the boxwood maintenance and care at Peace field and Hills and Dales. At Founders Memorial Garden and Swan House, spot pruning is part of their daily boxwood care regime. At Swan House, daily inspections of the boxwood and spot pruning are implemented to remove any boxwood blight diseased foliage, moving from the healthiest looking boxwood to the sickliest. Colonial Williamsburg is limiting their interaction with boxwood because of the presence of boxwood blight on the property. Carl Sandburg and Biltmore allow their boxwood to grow to their natural form.

3. *Do you protect the boxwood from winter damage?*

Of the eleven survey sites, three actively protect boxwood from winter damage. Of the eight sites that do not use winter protection, four gave reasonings behind not implementing winter protection. Stratford Hall and Montpelier stated that they have implemented winter damage protection in the past but no longer do so due to labor and time constraints. Swan House and Hills and Dales, the two Southern-most survey sites, do not protect from winter damage because it is not an issue in their area.

4. *How much sun does the boxwood receive?*

Most of the survey sites have boxwood in areas with differing sun coverage, resulting in a combination of sun and shade exposure in the garden. Thus, this question was often answered as an overall estimate of the entire sun coverage the boxwood receive. Of the eleven survey sites,

five have plantings of boxwood in full sun to partial shade, five have plantings of boxwood in full sun, and one has plantings of boxwood in full sun, full sun to partial shade, and shade.

5. *Is the soil well-drained?*

Of the eleven survey sites, eight have well-drained soils, two have well-drained soils with a few areas with drainage issues, and one site does not drain well due to its flat topography.

6. *Do you ever need to supplement water?*

Of the eleven survey sites, eight supplement water during the dry/hot summer months and/or during seasonal drought events. Three of the seven sites that supplement water do so only by hand watering, three overhead irrigate[152], one implements soaker hoses, and one uses a combination of drip irrigation, soaker hoses, and overhead irrigation. Three of the eleven survey sites do not supplement water.

7. *Have you tested the soil pH?*

Ten of the survey sites have tested for soil pH. Of the ten sites that tested for soil pH, two were very acidic at or slightly under 6.0, two have lower acidity ranging in the high 6s around 6.5-6.7, and five were unsure of the current soil pH.

8. *Do you fertilize the boxwood? If so, what do you fertilize with and how often?*

Of the eleven survey sites, five fertilize their boxwood. Mount Vernon lightly applies fertilizer as a top dress in the fall covered with manure. Colonial Williamsburg uses lime and granular plant tone every two to three years, and Hills and Dales lightly applies morganite and an aggregate 8-8-8 twice per year with an annual application of lime. Montpelier lightly applies plant tone along with a 50/50 compost mulch blend yearly while Founders Memorial Garden

[152] Of the sites with boxwood blight, Hills and Dales and Colonial-Williamsburg use over-head irrigation. At Colonial Williamsburg, over-head irrigation is used at the Governor's Palace.

applies a granular 34-0-0 in early March and late July. Peace field applies a compost top dress every other year.

9. *Are the boxwood mulched? If so, what mulching material is used and approximately how thick is the mulch layer?*

Of the eleven survey sites, seven do not mulch and/or limit mulching due to historical inaccuracy. Of the seven, four maintain a few areas with 1" leaf litter, 1" compost, and/or 1" pine straw as top dressings, while three do not mulch at all. Of the three sites that do mulch, Swan House maintains a one-inch-thick mulch of pine nuggets, Biltmore keeps around one inch of leaf litter for mulch, and Founders Memorial Garden applies a two-inch-thick mulch of pine straw. Stratford Hall does not mulch due to time and labor cost.

10. *Do you know about boxwood blight?*

All eleven survey sites answered yes, they are aware of boxwood blight.

11. *What is your understanding of boxwood blight?*

The answers for this question were highly varied. However, the best answer to this question was from Jo Phillips, Horticulture Manager at Hills and Dales in which she explained how boxwood blight is a fungal organism where the infection starts as a brief leaf spot stage that turns into severe defoliation of boxwood which can develop into stem lesions. She went on to describe how the fallen foliage serves as the inoculate for the disease until the boxwood puts out new leaves, allowing the inoculate to splash onto the new boxwood leaves to create a continual cycle of infection. The sites that were most familiar with boxwood blight were Mount Vernon, Colonial Williamsburg, Hills and Dales, Swan House, and Montpelier. Biltmore, Carl Sandburg, Stratford Hall, Longfellow House, and Founders Memorial Garden were less familiar with the disease.

12. Have you had boxwood blight, and/or do you currently have boxwood blight?

This question was asked in order to meet criterion d, which states that the historic site may have boxwood stress and/or known boxwood blight. Of the eleven survey sites, five have had blight and/or currently have blight while six have not had boxwood blight and do not currently have blight. Of the five sites that have had and/or currently have blight, Hills and Dales, Colonial Williamsburg, and Swan House have had blight in the past and currently have blight, while Carl Sandburg and Mount Vernon have had blight in the past but do not currently have blight.

13. Did you or an outside professional confirm boxwood blight?

Of the five sites that have had boxwood blight and/or currently have blight, Mount Vernon's Director of Horticulture Dean Norton, confirmed boxwood blight on that site, while the other four sites (Carl Sandburg, Hills and Dales, Colonial Williamsburg, and Swan House) sent samples to pathology labs and/or the county extension service for confirmation.

14. When did you first notice boxwood blight?

Of the five sites that have had boxwood blight and/or currently have blight, Swan House has the oldest case of boxwood blight which was first noticed in early 2015/2016. Hills and Dales' first case of blight was found in winter of 2020, with the first case of blight at Carl Sandburg found in late winter/early spring of 2021. The most recent first case infections of boxwood blight were found at Mount Vernon in late spring of 2021 with Colonial Williamsburg having discovered their first case of blight in July of 2021.

15. How bad has it/had it intruded?

The boxwood blight found at Mount Vernon, Colonial Williamsburg, and Hills and Dales was caught in the earlier stages, with Carl Sandburg scouting blight once it had already affected

larger branch areas. Since their discovery of blight in 2015/2016, Swan House has experienced the continual spread of boxwood blight. Boxwood blight at Carl Sandburg spread to every boxwood on the property over the course of one year. Because Mount Vernon caught the disease in its early stages and performed a removal, it was contained and has not spread. Boxwood blight has continued to spread in the gardens of Colonial Williamsburg, possibly due to the size of the site, the number of gardens, and number of boxwood, as well as management choices. Hills and Dales has experienced continued blight spread.

16. What actions have been taken?

The five sites that have had boxwood blight and/or currently have blight have taken action in generally the same way, with some differences regarding specific additional management practices. First, the infected boxwood and/or infected plant material was removed while wearing protective Tyvek gear. Next, the plant debris was bagged and hauled off site. Four of the five sites burned the ground after selective or complete boxwood removal. Mount Vernon and Carl Sandburg have removed all boxwood. Colonial Williamsburg, Hills and Dales, and Swan House followed all recommended remediation practices and still have boxwood blight. Regarding specific management differences, they range from quarantining the garden to planting plants that will act as a fumigant. Further detail on management choices made are provided in Chapter 4 under each historic site.

17. How are you controlling the spread of boxwood blight in the garden?

Colonial Williamsburg, Hills and Dales, and Swan House implement fungicide regimes, sanitation, and scouting to control the spread of boxwood blight.[153] Carl Sandburg attempted to

[153] Colonial Williamsburg applies fungicides, including Daconil, in the early spring. The application rate and occurrence was not asked. Swan House has an outside contractor apply fungicides every 21 days rotating Daconil with other fungicides. Hills and Dales Estate is applying fungicides every 2-3 weeks, depending on weather conditions.

control the spread of blight by scouting and removing boxwood if it reached a 3% infection threshold, ultimately having to remove all the historic boxwood due to continued blight infection. Mount Vernon scouts daily but does not implement tool sanitation or fungicide applications. Colonial Williamsburg, Hills and Dales, and Swan House have followed all recommended best management practices, but sill experience continued boxwood blight spread.

18. Have you replanted the area?

Mount Vernon, Colonial Williamsburg, Hills and Dales, and Carl Sandburg have not replanted where boxwood was removed, but intend to replant. Swan House is the only site that has replanted areas where boxwood was removed. Mount Vernon, Colonial Williamsburg, Hills and Dales, and Carl Sandburg have plans to replant.

19. What will you replant with?

Swan House has replanted areas with *B. sempervirens*, *Ilex* 'Emerald Colonnade', and a historical era-appropriate *Camellia* sp. Mount Vernon will replant with 'Green Beauty' boxwood in Fall 2022. Hills and Dales is uncertain if they will replant the area with their historic propagated boxwood or if they will outsource their boxwood. Colonial Williamsburg hopes to replant with boxwood species, currently unspecified. Carl Sandburg has not decided a replacement.

20. Are you managing/taking preventative measures for boxwood blight?

Montpelier, Biltmore, and Peace field do not allow any new boxwood, including holiday greenery, on site and have implemented routine scouting. Montpelier and Longfellow House are preventing blight though sanitation and off-site plant debris disposal. Stratford Hall's only method of blight prevention is not allowing volunteers to bring their own garden tools when working in the garden. In addition to sanitation and proper debris disposal, Longfellow House

performs inner pruning to allow air and light into the interior of the boxwood. Founders Memorial Garden focuses on boxwood health as a preventative measure for blight in addition to daily scouting.

21. Do you have a plan in place for if you get boxwood blight? If so, what BMPs are you planning on implementing?

Biltmore, Longfellow House, and Founders Memorial Garden do not have a plan outlined in preparation for boxwood blight. Longfellow House and Founders Memorial Garden are in the process of starting a boxwood blight plan of action. Stratford Hall and Peace field plan on removing boxwood if blight is found. Additionally, Peace field plans on seeking assistance from more knowledgeable persons and researching BMPs. Montpelier has created a fungicide regime which will be applied after the boxwood is removed and soil is burned, along with close monitoring.

22. Are you in communication with other historic gardens managers about their boxwood blight protocols and BMPs?

Four of the eleven survey sites are not in communication with other historic garden managers regarding boxwood blight best management practices and protocols. Of the seven sites that are in communication with other managers, three have spoken with Dean Norton, Director of Horticulture at Mount Vernon.

23. How are you staying updated and educated on boxwood blight news?

Six of the eleven survey sites are staying updated and educated on boxwood blight news through industry, university, and/or state extension publications. A few industry groups that were mentioned include the Boxwood Blight Task Force (Mount Vernon), Boxwood Blight Insight Group (Colonial Williamsburg), Saunders Brothers (Montpelier), and American Boxwood

Society (Montpelier). The remaining five survey sites are staying updated through personal research and/or conversations with other landscape professionals.

Historic Preservation

1. *Does the quantity of visitation impact what you choose to do at the garden? If so, what change has been implemented in the garden/landscape to accommodate visitation?*

Three of the eleven survey sites answered yes to the first half of this question, all having implemented hardscaping in historic parts of the garden to accommodate visitor foot-traffic. Of the eight survey sites that answered no to the first half of this question, four went on to explain that the garden is represented to a specific historic period no matter how many visitors they receive.

2. *What is the mission/vision of the historic site?*

The mission and vision of ten of the eleven survey sites is the maintenance and preservation of the site, focusing on a particular family and/or person(s) and the specific period(s) in which they lived. Montpelier is the only site to not include preservation in their mission statement, instead focusing on the interpretation of a particular person's life and the specific time period(s) in which they lived.

3. *How old is the boxwood on property?*

Four of the survey sites have boxwood that are under ten years old, three have boxwood that are ten to fifty years old, and two have boxwood that are fifty to one hundred years old. Seven of the survey sites have one- to two-hundred-year-old boxwood while three of the survey sites have boxwood that are over two hundred years old.

4. *Have you been able to find the same boxwood used historically? And/or what historic boxwood is currently on site?*

Mount Vernon, Colonial Williamsburg, Hills and Dales Estate, Stratford Hall, and Founders Memorial Garden all have historic English boxwood, *B. sempervirens* 'Suffruticosa', growing on site with Carl Sandburg having 'Suffruticosa' as propagated cuttings. Biltmore, Montpelier, and Stratford Hall have historic *B. sempervirens* 'Arborescens' planted on site. Hills and Dales Estate is the only survey site with historic Korean boxwood planted, *B. microphylla.* Swan House, Peace field, and Founders Memorial Garden have historic Common boxwood, *B. sempervirens*, planted on site. Longfellow House is the only site without historic boxwood grown on site.

It must be stated that both criterion e, stating that the historic site should have a plant management/maintenance plan, and criterion f, stating that the historic site should have a historic management plan, were not addressed in the historic site interview questions. Although the intention was to create questions that would address these two criteria, they were unfortunately overlooked during the question development process due to the breadth of information that the questions needed to encompass.

Horticulture Industry Professionals

Survey Response Rate

Interviewing professionals in horticulture, landscape design, historic preservation, and/or cultural landscapes was decided after completing the historic site interviews. It was determined that other professionals involved with historic sites could help further answer boxwood blight management questions. Three horticulture industry professionals were contacted, with a response rate of 100%.

Personal Background

1. *What is your experience in preservation, horticulture, design, and/or the green industry?*

Bennett Saunders holds a degree in agricultural economics, with a minor in horticulture and has a lifetime of experience working in various positions in the boxwood nursery industry. Andrea Filippone has a graduate degree in architecture, later pursuing garden design, becoming self-taught in horticulture, and establishing her own boxwood nursery. Katie Shapiro has gained experience in design and horticulture through working at George Bridge Landscape Design (GBLD).

2. *Have you always been in this field of work?*

Saunders has always been in the nursery industry while Filippone and Shapiro have had changes in career trajectories.

3. *Do you have any training in preservation, horticulture, or landscape management?*

None of the three industry professionals had additional training in preservation, horticulture, or landscape management aside from their educational background and hands-on experience.

4. *What roles have you held at your current company and what is your current role?*

Saunders is the current General Manager of NewGen Boxwood and has been with Saunders Brothers since 1980, holding various positions within the boxwood nursery operations. Filippone is the founder and principal designer of her landscape design firm AJF Design which she established in 2008. Shapiro is the Operations Manager of GBLD, having been with the company for seven years.

5. *Have you provided boxwood for historic properties? If so, what properties and when? Small-scale or large-scale sites?*

All three industry professionals have provided boxwood for historic properties. Saunders Brothers has provided boxwood for Mount Vernon, Colonial Williamsburg, and recently, the 2020 White House Rose Garden Restoration. AJF Design has provided boxwood for both large and small historic gardens, including Dumbarton Oaks. GBLD has provided boxwood for the Lincoln Memorial and many private historic properties in Virginia.

Landscape Management

1. *Where are you sourcing your boxwood?*

All three industry professionals source their boxwood from their own boxwood nurseries.

2. *How is the boxwood that you are selling typically being used by historic properties/ how is the boxwood laid out in design? (*parterres*, edging, hedges, etc.)*

For all three industry professionals, how the boxwood is being used by historic properties depends on the client. The boxwood are commonly used as topiary, *parterres*, hedges, edging, etc.

3. *Do you install the boxwood? Do you maintain the boxwood after installation?*

Saunders Brothers does not install or maintain boxwood. AJF Design and GBLD do installation and maintenance, depending on the client and project.

Horticulture

1. *Do you have any special care/management specific to the boxwood after installation? And/or do you have any special recommendations for installation pertaining to boxwood blight BMPs?*

Depending on the clients, Saunders and Filippone try to educate and advise their clients on boxwood blight BMPs. For Saunders, this is guiding them to the NewGen and Saunders Brothers website for BMP recommendations. Filippone recommends BMPs based on her

relationship with boxwood blight professionals as well as her first-hand knowledge of boxwood. Additionally, Filippone seeks to educate clients regarding proper boxwood cultivation and cultivation conditions. GBLD recommends the boxwood healthcare plan by True Nature, a local maintenance company, which focuses on cultivation conditions like soil and moisture, in addition to TopBuxus products.

2. *Do you receive calls about boxwood blight from historic property owners? If so, how have you guided them to prevent and/or manage boxwood blight?*

The three industry professionals receive calls about boxwood blight. Saunders is guiding them to the BMPs on the Saunders Brothers website, in addition to their Boxwood Guide for general care and maintenance. Filippone guides clients on a case-by-case basis, focusing on boxwood blight BMPs and proper boxwood cultivation. Shapiro points clients to True Nature and TopBuxus products.

3. *Are you in communication with other companies about their boxwood blight protocols?*

Saunders and Filippone are in communication with other companies, but Shapiro is not.

4. *How are you staying updated and educated on boxwood blight?*

Saunders and Filippone are both in contact with boxwood blight scientists and researchers across the country. Saunders also attends conventions, webinars, and any other resource he can find. Filippone also looks to Saunders Brothers, American Boxwood Society, and Boxwood Blight Insight Group. Shapiro attends educational seminars and looks to the University of Maryland extension service for news.

Historic Preservation

1. *How old is the boxwood you usually work with/provide for historic properties?*

Saunders Brothers provides boxwood that are five years old up to fifteen, all are ball and burlap. AJF Design provides boxwood that are at least ten years old, all ball and burlap. GBLD provides only *B. sempervirens* that are anywhere from forty to one hundred years old.

2. *What are you recommending for boxwood replacements for historic properties and why?*

For Saunders Brothers and AJF Design, the type of boxwood depends on the project. Saunders Brothers focuses on the variety in addition to boxwood blight BMPs. Boxwood that Saunders Brothers recommends currently includes 'Jim Stauffer' for a large box, NewGen Independence and Freedom for a medium sized boxwood, and 'Little Missy' or 'Nana' for smaller box.[154] AFJ Design is recommending boxwood cultivars that have a naturally open habit in order to avoid the tightly clipped boxwood balls that restrict light and air and increase blight susceptibility. GBLD only grows *B. sempervirens.*

Landscape Designers & Cultural Landscape Experts

Survey Response Rate

Two landscape designers and two landscape architects with expertise in applying preservation practice to historic garden design and cultural landscapes were contacted, with a response rate of 100%. All four individuals surveyed have a specific area of design interest and expertise. Although most of the interviewees have experience with historic garden design and/or

[154] It is important to note that each of the recommended boxwood have differing susceptibility to boxwood blight. Of the three recommended boxwood, 'Little Missy' has a lower susceptibility rating, followed by 'Nana', then 'Jim Stauffer'. Matthew Kramer, Yonghong Guo, and Margaret Pooler, "Ranking Resistance of Buxus Cultivars to Boxwood Blight - an Integrated Analysis. ," *Journal of Enviornmental Horticulture* 38, no. 2 (June 2020 2020), https://irp.cdn-website.com/217658e5/files/uploaded/2020_Kramer.pdf.

cultural landscapes, the survey results were quite varied considering each person's background and design values. Thus, the survey of the four designers provides diversity in approach and value system, as well as shared context of boxwood blight and historic garden design.

Personal Background

1. *What is your experience in preservation, horticulture, landscape management, and/or landscape design?*

All four landscape designers have professional degrees in design and experience in historic preservation, horticulture, and landscape management. Spencer Tunnell and Will Rieley have a strong preservation background in landscape design while Andrea Filippone and Chip Callaway have a solid horticultural landscape design background.

2. *Have you always been in this field of work?*

Spencer Tunnell and Will Rieley have always been in the historic landscape preservation field of work while Andrea Fillipono and Chip Callaway have had career changes to landscape design.

3. *Do you have any training and/or certifications in preservation, horticulture, or landscape management?*

The four designers have had informal training in historic preservation, horticulture, and landscape management gleaned from their education, background, and various jobs. Spencer Tunnell, Will Rieley, and Chip Callaway are registered landscape architects, with Callaway also being a registered landscape contractor. Aside from these registrations, the designers had no additional formalized training and/or certifications.

4. *What roles have you held at your current company and what is your current role?*

All four designers founded their own design firms as the president and/or principle and currently work in that role.

Landscape Management

1. *Where are you sourcing your boxwood?*

Filippone and Callaway source their boxwood from their own boxwood nurseries. Tunnell does not specify where his boxwood are sourced, relying on the contractors to source. Rieley sources young boxwood from Saunders Brothers, and older, larger boxwood from private properties.

2. *How is boxwood typically laid out in your designs?*

Tunnell and Rieley design boxwood layout depending on the project, influenced by historic research of the site, evidence of previous boxwood design and layout, and the context of the site. For Filipono and Callaway, boxwood layout depends on the client and project and is not focused on the historic research and existing evidence of the site like Tunnell and Rieley.

3. *Who typically installs the design and who manages the garden after installation?*

Fillipono, Callaway, Tunnell, and Rieley will install their designs depending on the project, client, and location, with Fillipono and Callaway also providing management depending on the same factors. Rieley and Tunnell's designs are maintained by property staff and/or maintenance companies. All four designers will contract their work when not installing and maintaining.

Horticulture

1. *Are you managing/taking preventative measure for boxwood blight at your historic sites?*

All four designers are involved in boxwood blight prevention at their historic site projects. Filippone, Tunnell, and Rieley have similar management and prevention measures by recommending and encouraging clients to operate using boxwood blight BMPs.[155] Filippone is

[155] Filipone recommends BMPs including mulching, tool sanitation, good drainage, not overwatering, and thinning to improve circulation and sunlight. These BMPs are based on her experience with boxwood.

also focused on educating her clients on boxwood care to further reduce the possibility of blight. Callaway is taking preventative measures for blight by not designing with boxwood and/or taking out boxwood and replanting them with yaupon holly until more is known about blight.

2. *Do you receive calls from your clients about boxwood blight?*

Filippone and Callaway receive calls about boxwood blight from clients. Tunnell will receive calls depending on the project. Rieley does not receive calls.

3. *How are you guiding your clients when they call about blight?*

Filippone guides on a case-by-case basis, focusing on the recommendation of BMPs. In strong contrast, Callaway guides his clients to take out the boxwood and replace them with dwarf yaupon holly or the NewGen boxwood by Saunders Brothers. Tunnell guides his clients to the North Carolina extension publication for boxwood blight BMPs.[156]

4. *Are you in communication with other companies and/or firms about their boxwood blight protocols?*

Both Filippone and Callaway are in communication with other landscape architects about boxwood blight protocols. For Tunnell, it depends on the project, but he is in communication with his contractors. Rieley is somewhat in contact.

5. *Are you staying updated and educated on boxwood blight news?*

Because of her position as the President of the American Boxwood Society, Filippone is in contact with leading boxwood blight researchers and scientists, including Saunders Brothers and the BBIG. Callaway stays updated through continuing education hours, while Tunnell continues to look towards North Carolina extension publications. Rieley is staying moderately updated and educated.

Tunnell refers clients to the NC State Extension publications outlining BMPs. Rieley encourages properties to monitor the boxwood and sterilize tools.

[156] Ivors, "Prevention and Management of Boxwood Blight."

Historic Preservation

1. *Have you worked with/or designed for historic properties?*

Filippone and Callaway both have experience designing large and small historic properties. Tunnell and Rieley have decades of experience specializing in historic and cultural landscape design.

2. *What kind of boxwood are you generally installing for your designs?*

For Filippone and Tunnell, the kind of boxwood depends on the client and project. Callaway is currently designing with *Ilex* sp. as boxwood substitutes but will use NewGen if necessary. In contrast, Tunnell does not believe that *Ilex* sp. is a proper substitute for boxwood, installing Vardar Valley and other Korean cultivars for his projects, but ultimately the type of boxwood depends on the project, the historical research and evidence of the property, as well as the context of the site. Rieley will install new cultivars from Saunders Brothers.

3. *Do you typically use boxwood in your landscape designs for historic properties? And/or When designing for historic properties, do you use the historic variety?*

The use of boxwood and use of the historic variety is dictated by the project and client for Filippone, Tunnell, and Rieley. However, Filippone and Tunnell will not install 'Suffruticosa'. Callaway is not using boxwood unless it is necessary for the design.

3.5 Chapter Summary

Having identified gaps in knowledge from Chapter 2, this author determined that conducting survey interviews across selected groups from a variety of professions, along with historic site managers, would best address the outstanding questions. Historic sites, horticulture industry professionals, and landscape designers and cultural landscape experts were identified and selected to survey using defined criteria for each group. Survey questions were organized

into four categories that included standard and custom questions for each group. The survey responses provided knowledge regarding how boxwood blight is affecting historic gardens and how it is being addressed, ultimately establishing a holistic understanding of boxwood blight across historic sites, horticulture industry professionals, and landscape designers & cultural landscape experts.

Chapter 3 aims to answer the following research questions that Chapter 2 was unable to address. *What management and maintenance are boxwood receiving at historic sites?* At historic sites, boxwood are currently being pruned and sheared to specific heights, forms, and shapes. Boxwood are not often fertilized and, at most of the historic sites, boxwood are receiving supplemental water. This author found that mulching boxwood depends on the site's use of historically accurate maintenance techniques, as mulching was not often utilized during Colonial and Colonial Revival garden design eras. *What are their cultivation conditions?* The majority of the historic sites have boxwood planted in full sun, in well-drained soil, with non-optimal pH ranges. *Do historic sites know about boxwood blight?* All eleven historic sites know of boxwood blight, however, the level of understanding of the disease was quite varied and can be categorized as high, moderate, or low familiarity. Sites with low familiarity know that boxwood blight is a highly transferable fungal disease with minimal remediation options and can limitedly describe certain symptoms. Sites with moderate familiarity understand aspects of disease spread, symptoms, and identification of the disease. The highly familiar sites are knowledgeable on all aspects of disease spread, symptoms, identification, and pathogen lifecycle. It was determined that six sites were highly familiar, two were moderately familiar, and three had low familiarity. *Are boxwood blight best management practices being applied to historic gardens? If so, what BMPs are they implementing and have they worked?* This author found that ten of the eleven

historic sites implement boxwood blight best management practices which are being implemented to prevent or manage boxwood blight. Seven sites are utilizing BMPs for prevention and do not currently have boxwood blight while three historic sites are implementing BMPs for management of current boxwood blight on site. *What role does historic preservation play at these sites and does that affect boxwood cultivation?* The interview results showed that the role of historic preservation was not uniform across all sites. Some sites include historic preservation in their mission/vision statement while others do not. Regardless, the role of preservation at each site does not directly relate to boxwood cultivation and that boxwood are seemingly cultivated in a similar way across all historic sites. While this chapter provides a summary of the survey question results, Chapter 4 reveals specific information from each historic site.

CHAPTER 4

HISTORIC SITE CASE STUDIES

Reflecting on both the background research results in Chapter Two, and the survey results in Chapter 3, it became apparent that most of the research questions had been answered, except for the question regarding integrity. As a part of the National Register evaluation process, cultural landscape integrity assessments typically happen by evaluating identified landscape characteristics or features of a historic site or garden against the seven aspects of National Register integrity. To begin to address integrity assessment, Chapter 4 contains case studies of the eleven historic sites that were surveyed. Each historic site was better understood after the surveys were completed because those responses contributed to the contextual research that was conducted prior to the surveys. The case studies presented in this chapter provide a comprehensive overview of each historic site contextually, with specific survey findings integrated into the text.

4.1 Case Study Methodology

The case studies will be discussed in the order in which the sites were surveyed: Mount Vernon, Biltmore, Colonial Williamsburg, Hills and Dales Estate, Carl Sandburg Home National Historic Site, Montpelier, Stratford Hall, Swan House, Longfellow House, Peace field, and Founders Memorial Garden. Within each case study the following topical areas will be discussed: Brief *History and Description of Garden/Landscape Areas Containing Boxwood, Existing Landscape Characteristics, Landscape Management, Cultivation of Boxwood, and*

Boxwood Blight. History and Description provides information regarding the historic site's age, design, ownership, mission, and preservation and helps to answer the portion of the research question that deals with historic American gardens and landscape authenticity/integrity. *Existing Landscape Characteristics* discusses the relevant landscape features and elements by which that case study's historic landscape can be understood and is the primary tool which will be used to assess the integrity of the landscape, thus answering that portion of the research question. *Landscape Management* discusses the garden's primary manager, staffing, and organization, addressing information which will help to answer the portion of the research question that relates to garden management and care. *Cultivation of Boxwood* deals directly with boxwood age, location, care, maintenance, and use in the garden. This topical area will assist in answering the portion of the research question that deals with boxwood, current best management practices, and BMP application. Lastly, *Boxwood Blight* covers information regarding current boxwood blight best management practices and their implementation at the historic site.

4.2 Case Studies

Mount Vernon

Brief History and Description of Garden/Landscape Areas Containing Boxwood

Mount Vernon is the 18th century estate of Founding Father and first President of the United States of America George Washington and his wife, Martha. Mount Vernon is located in Mount Vernon, Virginia overlooking the Potomac River and, historically, encompassed 8,000 acres of land of which 500 are preserved today. After the Revolutionary War, Washington designed the grounds and gardens of his estate with the intention of it serving as "pleasure grounds" for his family and guests. The formal ornamental gardens, including other site features such as the Bowling Green, were a stark departure from the utilitarian and functional gardens that were common prior to the Revolutionary War. As such, this Colonial era of garden design, makes Mount Vernon unique and rare amongst the gardens of its time.[157] Washington designed four distinct gardens: Upper Garden, Lower Garden, Botanical Garden, and Fruit Garden and Nursery. The Upper Garden contains a greenhouse with gravel and packed clay walkways

Figure 10 An aerial view of the Upper Garden at Mount Vernon showing the vegetable beds and intricate boxwood *parterre* gardens.

[157] Andrea Wulf et al., *The General in the Garden: George Washington's Landscape at Mount Vernon*, ed. Susan P. Schoelwer (Mount Vernon, Virginia Mount Vernon Ladies' Association, 2015).

delineating six individual garden beds edged in boxwood containing fruit trees, vegetables, and ornamental flowers. The Lower Garden was laid out as a traditional kitchen garden with various types of productive vegetables and fruit trees. Washington kept a private Botanical Garden where he experimented with plants to determine their suitability for the Virginia landscape. The Fruit Garden and Nursery is a four-acre plot where larger edible plants are grown, including vegetables and fruit trees.[158]

Today, the estate is owned by the Mount Vernon Ladies' Association and has been open for public visitation since their purchase of the property in 1860. The mission of the Mount Vernon Ladies' Association is:

> *"to preserve, restore, and manage the estate of George Washington to the highest standards and to educate visitors and people throughout the world about the life and legacies of George Washington, so that his example of character and leadership will continue to inform and inspire future generations."*[159]

Mount Vernon is one of the premier historic sites in the US, receiving over one million visitors per year.[160] According to Dean Norton (Director of Horticulture), despite the high visitor footprint, the gardens at Mount Vernon are represented historically to Washington's design specifications and have not been altered to accommodate modern-day visitors. Visitation does come with its issues—soil compaction due to foot traffic and some cases of vandalism due to a lack of respect from younger visitors.

[158] "The Four Gardens at Mount Vernon," George Washington's Mount Vernon, 2022, accessed Saturday, October 18, 2022, https://www.mountvernon.org/the-estate-gardens/gardens-landscapes/four-gardens-at-mount-vernon/.
[159] "About Mount Vernon," George Washington's Mount Vernon, accessed 10/25/2022, (https://www.mountvernon.org/about/.
[160] Ibid.

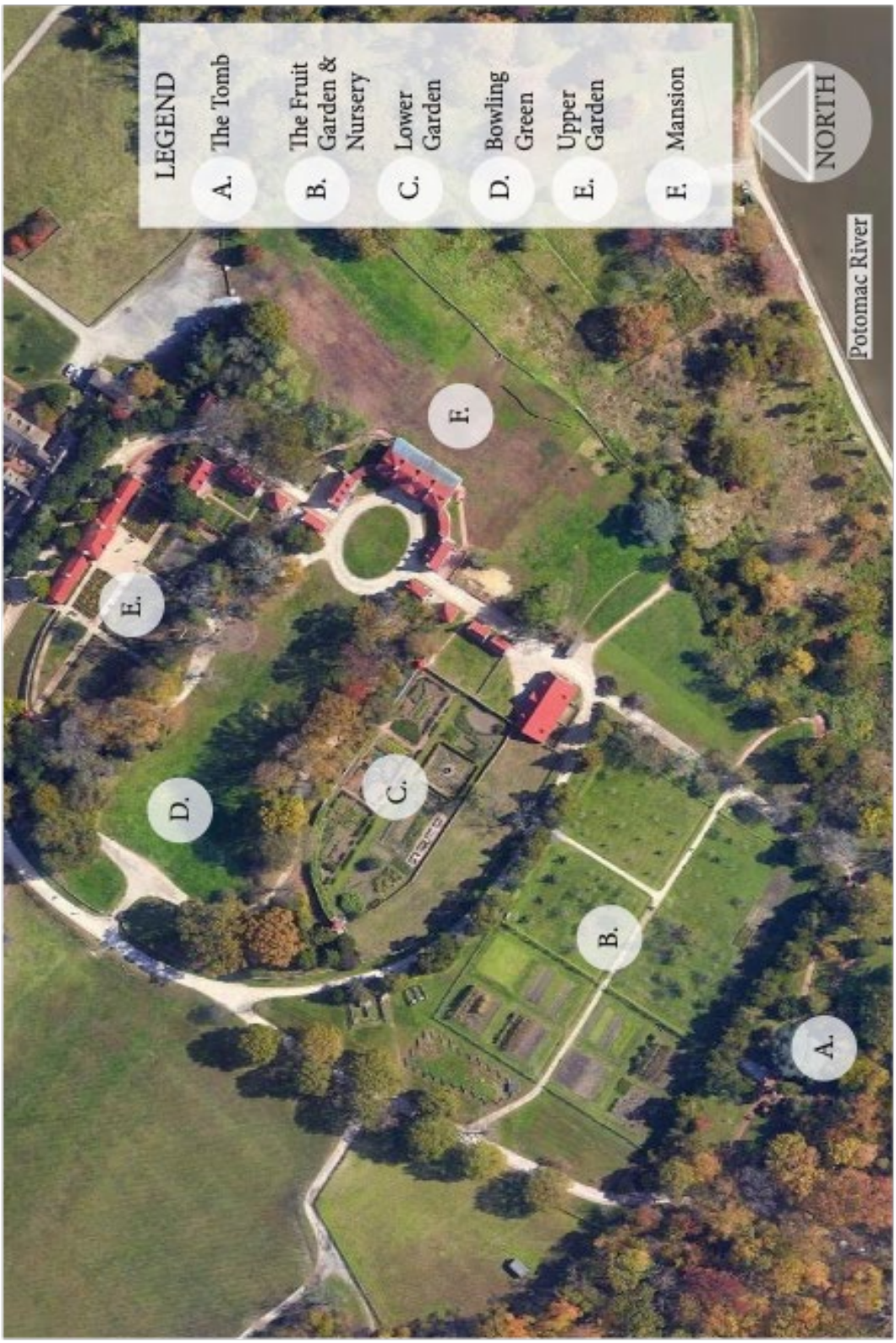


Figure 11 Site map of Mount Vernon.

Existing Landscape Characteristics

Although there are 13 landscape characteristics defined by the National Park Service, those discussed below are the most relevant for Mount Vernon's cultural landscape. The landscape characteristics not addressed were: land use, cultural traditions, archaeological sites, small-scale features, and constructed water features. Landscape characteristics were identified and assessed for the Upper Garden, the Bowling Green, and the Tomb landscape, all areas where boxwood are located.

Natural Systems and Features & Topography – The natural aspects of the site that may have influenced its development are the gradually, and steeply, sloping hillside descending to the Potomac River. The mansion sits on top of a hill with its rear façade facing southeast overlooking the Potomac River. The Bowling Green and Upper Garden take advantage of the flat terrain on top of the hill northwest of the front façade of the mansion while additional gardens, as well as the Tomb, utilize the steeply sloping hillside to the southwest of the mansion.

Spatial Organization, Cluster Arrangement, & Buildings and Structures – The northwestern-facing front façade of the rectangular-shaped mansion, whose long side parallels the river, overlooks the Bowling Green, with the Upper Garden located to the north and the Lower Garden located to the south. The Tomb is located to the southwest of the mansion and is situated at the bottom of the steeply sloping hillside. The Upper Garden is asymmetrically yet geometrically arranged as an individual garden room. There is a rectangular-shaped glass greenhouse in the Upper Garden with its front-facing façade oriented in a southwestern direction overlooking the garden. The Bowling Green is placed on axis with the front façade of the mansion and is symmetrically arranged. The mansion has two small rectangular-shaped

outbuildings flanking its sides which are connected by covered walkways. A small outbuilding in the Bowling Green is placed near the mansion.

Circulation – The gravel and clay garden paths in the Upper Garden are geometrically organized to reinforce the planting beds. They are linear, perpendicular, as well as parallel to one another. The Bowling Green exhibits a curvilinear gravel garden path.

Vegetation – Existing vegetation includes boxwood, shrubs, mature trees, fruit trees, and ornamental flowers. There have been boxwood replacements in the Upper Garden with sympathetic boxwood species. The boxwood at the Tomb have been removed.

Views and Vistas – Being on perpendicular axis with the front door of the mansion, there are views and vistas of the vegetation-framed Bowling Green and property entrance from the front of the mansion. Behind the vegetation framing of the Bowling Green lie the various designed gardens. Because views and vistas can be multi-directional, there are also views and vistas of the Bowling Green, mansion, and associated outbuildings from the western end of the Bowling Green furthest from the house. From the rear southeastern facade of the house there are also views of the Potomac River. In the Upper Garden there are views framing the *parterre* and greenhouse from the northeast as well as views of the planting beds from the southeast and northwest ends of the garden.

From this brief overview of the history of the site and identification of existing landscape characteristics, the following summary tables compare the landscape characteristics to the National Register aspects of integrity to determine overall integrity of the cultural landscapes or gardens within which the boxwood plantings lie. See Tables 1-2.

Table 1 The integrity of the existing landscape characteristics of the boxwood-containing gardens (Upper Garden, Bowling Green, the Tomb landscape) at Mount Vernon.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Natural Systems and Features, Spatial Organization, Cluster Arrangement, Circulation, Topography, Vegetation, Buildings and Structures, Views and Vistas	Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Did not address land use.	Did not address cultural traditions.	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)

Integrity of Topography	Integrity of Vegetation	Integrity of Buildings and Structures	Integrity of Views and Vistas	Integrity of Constructed Water Features	Integrity of Small-Scale Features	Integrity of Archeological Sites
Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials (some boxwood replacements with sympathetic boxwood species), Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Feeling, and Association (4)	Did not address constructed water features.	Did not address small-scale features.	Did not address archaeological sites.

Table 2 Assessment of the overall integrity of the boxwood and boxwood-containing gardens (Upper Garden, Bowling Green, the Tomb landscape) at Mount Vernon.

Integrity of Location	Integrity of Setting	Integrity of Design	Integrity of Materials	Integrity of Workmanship	Integrity of Feeling	Integrity of Association	Overall Integrity
The gardens are in their historic locations and the boxwood are planted in their historic location(s) within the gardens.	The gardens and boxwood are surrounded by their historic contextual setting, generally.	The gardens maintain their historic designs. The boxwood are planted in their historical design(s).	Bowling Green boxwood is a genetic clone of the original boxwood. The historic boxwood in the Upper Garden and at The Tomb have been replaced with a sympathetic boxwood species.	Aside from the use of modern tools and equipment, the boxwood are maintained as they would have been historically.	The garden and boxwood retain integrity of feeling.	The garden and boxwood retain integrity of association.	The garden and boxwood retain overall integrity

Landscape Management

Dean Norton has worked at Mount Vernon for fifty-three years, with the past forty years employed as the Director of Horticulture. With a degree in horticulture from Clemson University, his first horticultural-based position at Mount Vernon was as the Boxwood Gardener. His knowledge of boxwood cultivation and management is extensive. Norton directs a staff of eleven horticulturalists who are divided into groups following the eighteenth-century practice of *one gardener per one acre*. His horticultural staff are each assigned one principal garden—Upper Garden, Lower Garden, or Fruit Garden and Nursery. One "swing" gardener cares for miscellaneous gardens, along with two landscape gardeners that round out his staff and take care of landscapes and non-historic gardens. There are no specific staff charged with boxwood care, as this task falls to whoever is assigned to the Upper Garden, the Bowling Green, and the Tomb, which are the areas where boxwood are planted at Mount Vernon.

Cultivation of Boxwood

A specimen planting of *B. sempervirens* with a unique weeping habit is planted in the Bowling Green and is possibly a genetic clone of a Washington-era boxwood and is in good condition. A specimen/foundational planting of *B. sempervirens* at the Tomb was removed in 2021 because of boxwood blight;[161] this boxwood was possibly 100 years old. In the Upper Garden, boxwood is planted in a *parterre* design and edging for flower beds. Historically, the boxwood *parterre* and edging would have been planted with *Buxus sempervirens*, however, the historic boxwood were removed following a twenty-year struggle with boxwood decline. After first removing the historic boxwood, Norton and his staff continued to replant with *B. sempervirens* 'Suffruticosa'. Mount Vernon aims to be as historically accurate as possible, but

[161] Boxwood wreaths have often been brought by visitors to the Tomb to honor the deceased. The boxwood wreaths may have been a mean of boxwood blight introduction at the Tomb.

the time and labor constraints of trying to keep the heritage boxwood alive under boxwood decline conditions proved senseless. Therefore, Norton opted to replant with improved boxwood cultivars that have proven to thrive at Mount Vernon, specifically *B. microphylla* var. japonica 'Green Beauty'. The *parterre* interior boxwood were replanted with *B. microphylla* var. japonica 'Morris Dwarf' around thirty years ago, and the edging of the *parterre* design was recently replanted with *B. microphylla* var. japonica 'Green Beauty' around three to four years ago. Although the historic boxwood in the Upper Garden was removed, the garden was not entirely negatively impacted, as Mount Vernon was able to perform archeology on the undisturbed soil underneath the removed boxwood. The archaeology proved valuable for understanding the historical design and appearance of the Upper Garden. Norton and his staff at Mount Vernon have propagated cuttings from the *B. sempervirens* 'Suffruticosa' from the boxwood at the Tomb and at the Bowling Green and continue to propagate the historic boxwood.

The boxwood at Mount Vernon are in good health and receive full sun to partial shade to full shade, depending on their location. The flat topography of the Upper Garden presents some drainage issues during rain events; however, drainage has not been an issue for the boxwood. The boxwood receive supplemental water indirectly because of over-head irrigation for the nearby perennials and herbs. Norton estimates that the pH sits around 6.5-6.7, roughly based on previous years' testing. The boxwood receive a light top dressing of manure in the fall of every year to encourage root growth, and ground leaves along with compost to create a mulch layer of a one-quarter to a one-half inch thick.

The boxwood edging and *parterre* in the Upper Garden must be sheared on a regular basis due to its formal design. Norton explained how critical it is to thin the boxwood when they are maintained in such a restricted form to allow air and light penetration in the interior of the

plant. Gas powered shears are used to shear the boxwood while thinning is done via hand. The boxwood are sheared three times per year, typically in late May/June with the final shearing occurring in September/October to avoid a late flush of new tender foliage that could be damaged by winter weather; however, thinning the boxwood occurs at any time. No sanitation regime follows shearing the boxwood. During his time as the Boxwood Gardener, Norton would protect the boxwood from winter damage by covering the boxwood with burlap. Because this is a time consuming and laborious task, Norton does not currently implement winter protection. Instead of focusing his efforts on protecting the foliage from winter damage, Norton uses mulch to regulate soil temperature to protect boxwood roots from freezing and ultimately avoid foliage desiccation.

Boxwood Blight

Norton has an intimate understanding and knowledge of boxwood blight having served on the Virginia Tech Boxwood Blight Task Force when it was first established. The *B. sempervirens* 'Suffruticosa' planted at the Tomb was confirmed to be infected with boxwood blight in 2021 around April/May. This boxwood had ongoing issues since the 1980s. The infection was further along than Norton would have expected as his staff are all educated in boxwood blight scouting. The boxwood was removed in the morning hours, with his staff dressed in Tyvek suits, they bagged up the boxwood and took the debris off site. Nothing has been done to the soil since the boxwood removal. The historic boxwood will be replaced in the fall of 2022 with *B. microphylla* var. japonica 'Green Beauty', sourced from Saunders Brothers Nursery, because of its success in the Upper Garden. There are no preventative treatments that are being implemented at Mount Vernon but daily scouting for boxwood blight is routine. Additionally, boxwood wreaths, commonly brought to the Tomb out of reverence, have been

prohibited from the property. Norton continues to look to the Virginia Tech Boxwood Blight Task Force for updated information on boxwood blight.

Biltmore Estate

Brief History and Description of Garden/Landscape Areas Containing Boxwood

Tucked into the Blude Ridge Mountains of Asheville, North Carolina, Biltmore Estate (Biltmore) is the 1895 estate of George Vanderbilt. Biltmore is a privately owned working estate where the mission is focused on the preservation of the site as it would have been during George Vanderbilt's time. In 1888, Vanderbilt began acquiring land in Asheville to create his country estate, employing Richard Morris Hunt to design and construct the mansion and Frederick Law Olmsted to design the grounds and gardens. Of the 125,000 acres of land that Olmsted designed, 75 acres are designed formal gardens which exist around the house as well as a three-mile Approach Road with naturalistic plantings. The house and grounds were open for tourism in 1930 to increase revenue for the preservation of the estate in response to the Great Depression.[162] Today, Biltmore receives 1.4 million visitors per year and is designated a National Historic Landmark. While Olmsted designed the grounds and gardens for

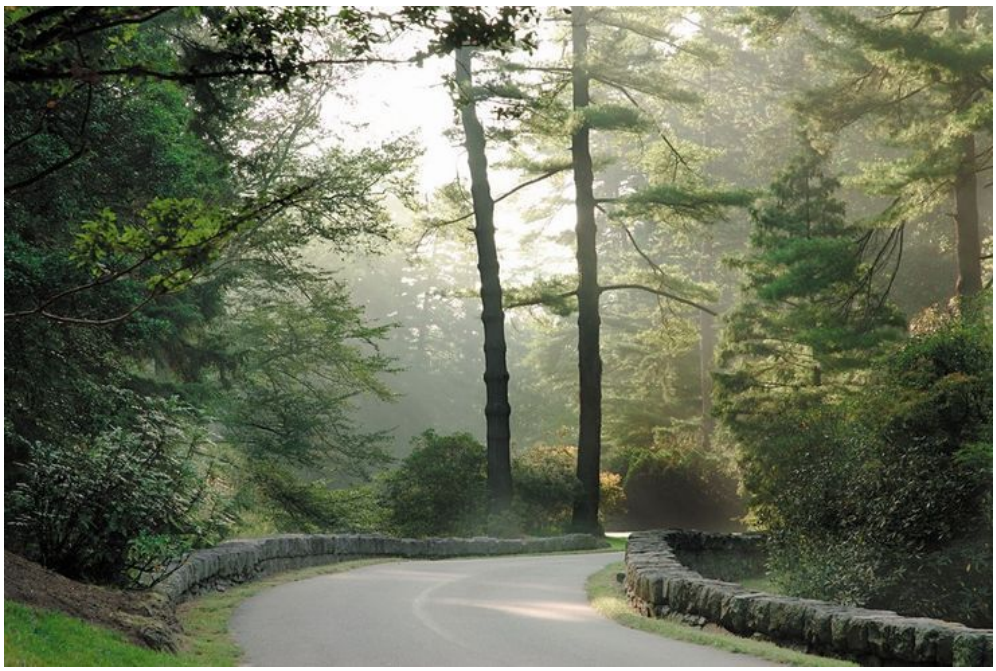


Figure 12 The scenic view of the three-mile approach road at Biltmore Estate boasting naturalistic plantings.

[162] "Estate Timeline," The Biltmore Company (https://www.biltmore.com/our-story/biltmore-history/estate-timeline/.

Vanderbilt, his family, and his friends with the intent of some visitors, the visitation scale that the estate attracts today could not have been perceived in the site's infancy. Because of the quantity of modern visitation, as well as environmental change, necessary alterations to the garden have been implemented. A few hardscaped walkways have been constructed where historically there would have been a turf grass path. Additionally, plants are selected based on the historic design intent of the garden while considering new cultivar improvements that are more suited to the modern growing environment. Aside from these changes, the gardens are kept as they were historically.

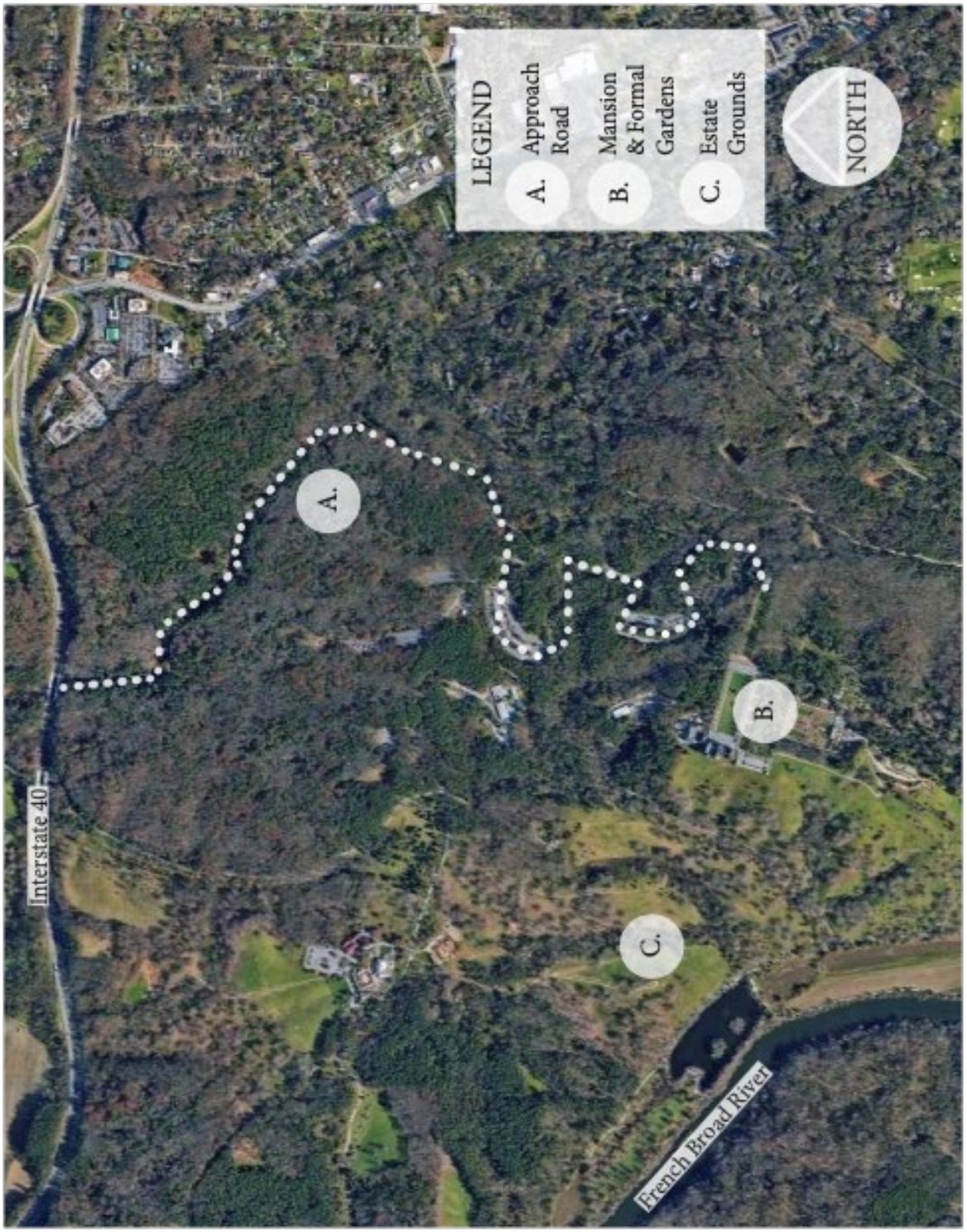


Figure 13 Site map of Biltmore Estate.

Existing Landscape Characteristics

Although there are 13 landscape characteristics defined by the National Park Service, those discussed below are the most relevant for Biltmore's cultural landscapes. The landscape characteristics not addressed were: land use, cultural traditions, constructed water features, small-scale features, and archeological sites. Please note that the landscape characteristics were assessed for the Biltmore Approach Road where boxwood is located.

Natural Systems and Features & Topography – The natural aspects of the estate that may have influenced the development of the mansion and approach road include the Blue Ridge Mountains, including the views and rolling hill terrain. The location of the mansion allows views of the mountains. The Approach Road takes advantage of the curving mountainous terrain which creates suspense and anticipation for arrival at the mansion.

Spatial Organization, Cluster Arrangement, Buildings & Structures –The expansive rectangular-shaped mansion is located on a high point of the property. The Approach Road is located to the north of the mansion and was designed in a naturalistic, curvilinear arrangement which utilizes the sloping mountain terrain. The Approach Road leads visitors to the south-eastern facing front façade of the mansion.

Circulation –The paved Approach Road is curvilinear and organically shaped.

Vegetation –The Approach Road is a heavily planted with now mature woodland of understory trees and shrubs, including boxwood and flowering shrubs.

Views and Vistas – There are views and vistas along the Approach Road of the naturalistic plantings and scenery. There are also views and vistas which frame the mansion when arriving from the Approach Road.

From this brief overview of the history of the site and identification of existing landscape characteristics, the following summary tables compare the landscape characteristics to the National Register aspects of integrity to determine overall integrity of the cultural landscapes or gardens within which the boxwood plantings lie. See Tables 3-4.

Table 3 The integrity of the existing landscape characteristics of the boxwood-containing Approach Road at Biltmore.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Natural Systems and Features, Spatial Organization, Cluster Arrangement, Circulation, Topography, Vegetation, Buildings and Structures, Views and Vistas	Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Did not address land use.	Did not address cultural traditions.	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7) -	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Did not address constructed water features.	Did not address small-scale features.	Did not address archaeological sites.

Table 4 Assessment of the overall integrity of the boxwood and boxwood-containing Approach Road at Biltmore.

Integrity of Location	Integrity of Setting	Integrity of Design	Integrity of Materials	Integrity of Workmanship	Integrity of Feeling	Integrity of Association	Overall Integrity
The garden (approach road) is in its historic location and the boxwood are planted in their historic location(s) in the garden.	The garden and boxwood planted on the approach road are surrounded by their historic contextual setting, generally.	The garden exhibits its historic design. The boxwood are planted in their historical design.	The garden is planted with the original boxwood.	Aside from the use of modern tools and equipment, the boxwood are maintained as they would have been historically.	The garden and boxwood retain integrity of feeling.	The garden and boxwood retain integrity of association.	The garden and boxwood retain overall integrity

Landscape Management

Parker Andes is the Director of Horticulture at Biltmore Estate. With a degree in Horticulture from West Virginia University, Andes has worked at Biltmore Estate for 22 years. As the Director of Horticulture, Andes oversees sixty full and part time employees, including four seasonal interns. Working under supervisors, the Biltmore horticultural staff is divided into groups which are geographically organized based on areas that require similar maintenance and care.

Cultivation of Boxwood

Boxwood are planted on the three-mile naturalistic designed Approach Road at Biltmore. The historic *B. sempervirens* 'Arborescens' are possibly 100-120 years old and are in very good health. Planted in part sun and part shade, the boxwood at Biltmore require minimal care and maintenance. The boxwood are allowed to grow to their natural shape, and only occasionally require regenerative pruning. The regenerative pruning is done using hand saws in February/March. The soil is well drained where the boxwood are planted, with a pH ranging from 5.8-6.1. The boxwood are not fertilized but do retain a leaf mulch of less than 1 inch.

Boxwood Blight

While there have not been any boxwood blight cases at Biltmore, Andes and his horticultural team are implementing preventative BMPs to control the introduction of the disease which includes scouting weekly and/or biweekly during the growing season and prohibiting the introduction of new boxwood plants on site. Although there is no formal plan of action for the estate if boxwood blight were to spread on the property, Andes is certain that they would do everything possible to keep the historic boxwood. His staff are educated on boxwood blight as they have attended conferences and monthly IPM training sessions with the local extension

agent. Andes himself is staying updated on boxwood blight news through industry publications and has been in contact with Carleton Woods, Director of Hills and Dales Estate in LaGrange, Georgia on their boxwood blight protocol.

Colonial Williamsburg

Brief History and Description of Garden/Landscape Areas Containing Boxwood

Colonial Williamsburg is a restored eighteenth-century city located in Williamsburg, Virginia. The cities' restoration was envisioned in 1926 by the rector of Bruton Parish Church, Dr. W.A.R. Goodwin, and funded by John D. Rockefeller, Jr., American financier and philanthropist. Owned and operated by The Colonial Williamsburg Foundation, a private not-for-profit group, Colonial Williamsburg boasts eighty-eight restored and/or preserved buildings, with numerous historic gardens.[163] Very minimal evidence of Colonial-era gardens were evident in the beginning of the restoration in the 1920's. This necessitated painstaking research on eighteenth century gardens that would guide accurate garden reconstruction at Colonial Williamsburg. Research encompassed public and private records, archaeological excavations, and historical maps to further understand the layout, design, and plants that would have been characteristic of that era. As a result of continued research today, it is understood that many of the re-created gardens at Colonial Williamsburg are not accurate depictions of the functional and plain gardens of the Colonial era. The gardens were restored through the lens of the Colonial Revival era which focused on an idealized vision of American Colonial days. Today, in lieu of the surmounting research on gardens of the eighteenth century, the gardens of Colonial Williamsburg are depicted as historically accurate as possible, focusing on the accuracy of the layout and design as well as its authenticity. The mission of Colonial Williamsburg is "so the future can learn from the past". According to Joanne Chapman (Director of Landscapes) for the

[163] "About Colonial Williamsburg ", The Colonial Williamsburg Foundation, (https://www.colonialwilliamsburg.org/learn/about-colonial-williamsburg/.

gardens, this means that they are represented in the way in which the historic individual would have designed it.[164]

While a detailed history and narrative of the forty plus gardens at Colonial Williamsburg has yet to be published, in 2018 the Colonial Williamsburg Arboretum created an online collection titled the *Iconic Gardens of Colonial Williamsburg* which compiles selected photographs and short descriptions/narratives for the gardens at Colonial Williamsburg. [165]

[164] Brinkley and Chappell, *The gardens of Colonial Williamsburg / by M. Kent Brinkley and Gordon W. Chappell ; photography by David M. Doody ; additional photography by Tom Green and the staff of the Colonial Williamsburg Foundation*.

[165] The collection did not include Providence Hall and, due to the lack of information and photo documentation of the site, a narrative of Providence Hall cannot be provided.

Ludwell Paradise House

"Surveys and archeological studies from the early 1930s show the existence of diagonal walks from the kitchen to the privy and well. These were incorporated into S[h]urcliff's 1931 landscape plans for this lot."[166]

Figure 14 Flowering Crape Myrtles highlight the kitchen at the Ludwell Paradise House.

Figure 15 Aerial view of the Ludwell Paradise House and gardens.

[166] "Iconic Gardens of Colonial Williamsburg " Iconic Gardens of Colonial Williamsburg, Plants Map, Inc. , 2022, https://www.plantsmap.com/organizations/25281/collections/33477/sub_collections/36577.

St. George Tucker House

"In addition to his many professional accomplishments, St. George Tucker was an avid gardener with and extensive fruit and nut tree collection. Modern archeological methods revealed the current placement of the walkways, fencing, and French drains. Planting holes on 6' and 10' centers were also discovered and used by Hopkins in this recreation of those gardens." [167]

Figure 16 View of the St. George Tucker House from West Nicholson Street.

Figure 17 Aerial view of the St. George Tucker House and gardens.

[167] "St. George Tucker House Garden," Iconic Gardens of Colonial Williamsburg, Plants Map, https://www.plantsmap.com/organizations/25281/collections/33477/sub_collections/33498.

Figure 18 Bird's eye view of the Governor's Palace and gardens.

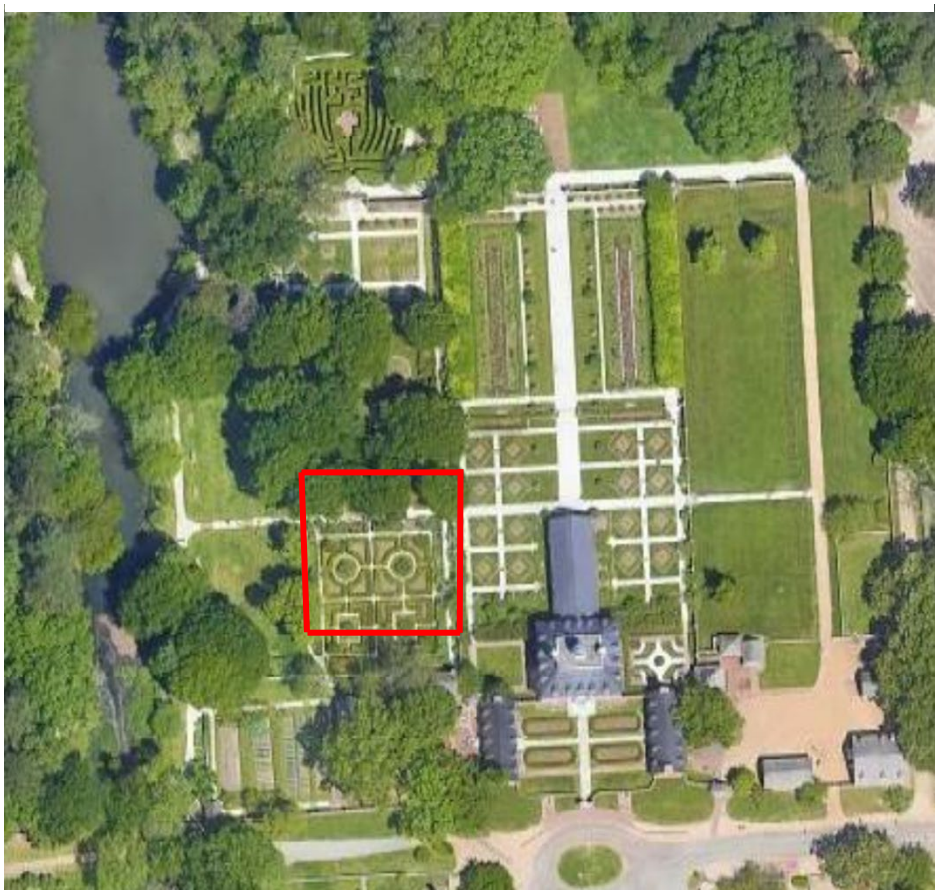


Figure 19 Aerial view of the Governor's Palace with the boundaries of the West Privy Garden outlined in red.

Governor's Palace West Privy Garden

"The Act of 1710 authorized the competition of the Palace and gardens. Today's 10-acre complex of gardens resembles English country estates during the reign of King William III and Queen Mary II. Three original features from the 18th century remain: the falling gardens (terraces), the ice mound, and canal. The brick wall surrounding the orchard is depicted on the 1782 Frenchman's Map." [168]

[168] "Governor's Palace Gardens," Iconic Gardens of Colonial Williamsburg, Plants Map, https://www.plantsmap.com/organizations/25281/collections/33477/sub_collections/33505.

Figure 20 Blooming purple shrub at the Bush-Everard House with a view of the historic mature boxwood beyond the white picket fence.

Figure 21 Aerial view of the Bush-Everard House and gardens.

Bush-Everard House

"Archaeological on the site revealed the original brick paving behind the house. The pleasure garden behind the house contains the uncommon medlar fruit trees and mature English boxwoods. Dendrochronological analysis suggests that the oldest of these English boxwoods date to around 1830." [169]

[169] "Thomas Everard House Garden," Iconic Gardens of Colonial Williamsburg, Plants Map, https://www.plantsmap.com/organizations/25281/collections/33477/sub_collections/33504.

Figure 22 View of the circular planting beds with white tulips in full bloom at the Palmer House Garden. Note the mature boxwood hedges surrounding the garden.

Figure 23 Aerial view of the Palmer House and garden.

Palmer House Garden

"Tucked beside the house is symmetrically designed around a central sundial. Oyster shell pathways define four circular beds planted with perennial bulbs and shade-loving perennials. Surrounded by boxwood hedges, the garden offers passersby a secluded spot to spend a lazy afternoon." [170]

[170] "Palmer House Garden," Iconic Gardens of Colonial Williamsburg, Plants Map, 2022, https://www.plantsmap.com/organizations/25281/collections/33477/sub_collections/33499.

Moody House

"Designed by Shurcliff in 1938/40, minor alterations were made in 1977 by the landscape[r] architect at that time, Donald Parker. The changes involved an expanded garden reshaped from the earlier rectangular plan to an oval, together with two garden benches, in the south garden area." [171]

Figure 24 The oval boxwood hedged garden at Moody House.

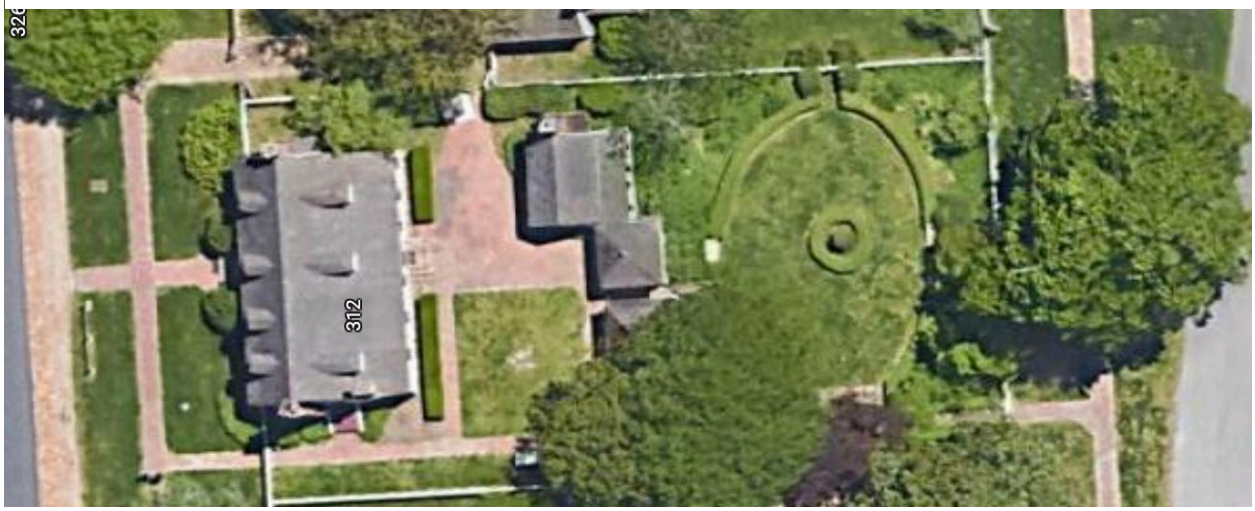


Figure 25 Aerial view of the Moody House and garden.

[171] "Moody House Garden," Iconic Gardens of Colonial Williamsburg, Plants Map, 2022, https://www.plantsmap.com/organizations/25281/collections/33477/sub_collections/36578.

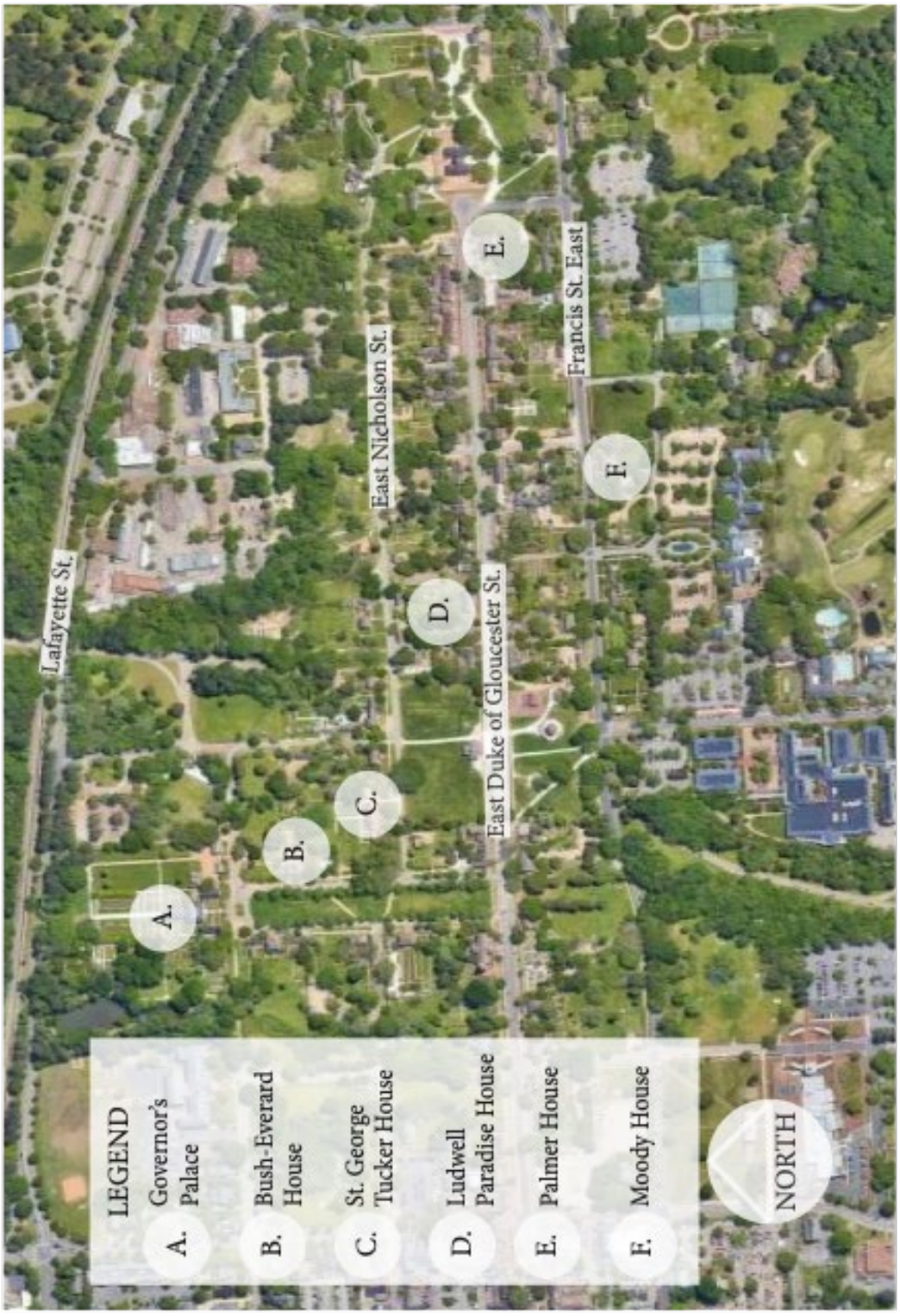


Figure 26 Site map of Colonial Williamsburg.

Existing Landscape Characteristics

Although there are 13 landscape characteristics defined by the National Park Service, those discussed below are the most relevant for Colonial Williamsburg's cultural landscapes. The landscape characteristics not addressed were: natural systems & features, topography, land use, cultural traditions, small-scale features, and archeological sites. Please note that the landscape characteristics were assessed for the gardens discussed in this section[172] which includes the Ludwell Paradise House, St. George Tucker House, Governors Palace West Privy Garden, Bush-Everard House, Palmer House, and Moody House where boxwood is located.

Spatial Organization, Cluster Arrangement, & Buildings and Structures –

Ludwell Paradise House

The front façade of the rectangular-shaped Ludwell Paradise House faces south towards East Duke of Gloucester Street with its geometric and symmetrical gardens located to the north-facing rear of the residence. There are square-shaped outbuildings which are located to the north of the residence in various locations throughout the garden which include a kitchen, privy, and well.

St. George Tucker House

The front façade of the elongated rectangular-shaped St. George Tucker House faces south towards West Nicholson Street and exhibits a formal geometric garden located in the north-facing rear. The garden, being on axis with the north-facing façade, is geometrically arranged in rectangle and square shaped planting beds.

[172] Because of the lack of literature and documentation on Providence Hall, the author was unable to identify landscape characteristics for this site.

Governors Palace

At the Governors Palace, the gardens are geometrically and symmetrically organized on various axes with the rectangular and square-shaped palace whose front façade faces south towards the Palace Green. The south façade of the palace is flanked by two rectangular outbuildings. The West Privy Garden exhibits *parterre* planting beds of various geometric shapes.

Bush-Everard House

The Bush-Everard House gardens are geometrically and symmetrical organized on a perpendicular axis with the rear east-facing façade. The front façade of the rectangular-shaped residence faces west towards Spotswood Street overlooking the Palace Green. There are two large rectangular- shaped outbuildings which are located to the rear east-facing façade of the residence which flank the western end of the garden closest to the house.

Palmer House

The square-shaped Palmer House gardens exhibit strong symmetrical and geometric organization featuring circular garden patterns which are on a perpendicular axis with the east facing façade of the residence. The front façade of the Palmer House faces east towards East Duke of Gloucester Street. There are square outbuildings located to the south of the residence.

Moody House

The oval, geometric garden at the Moody House exhibits symmetrical arrangement and perpendicular alignment with the south- facing rear façade of the house. The front façade of the Moody House faces north towards Francis Street East and the gardens are located to the south of the residence.

Circulation –

Ludwell Paradise House

The garden paths at Ludwell Paradise House are diagonal brick walkways as well as geometric and linear gravel and turf paths laid perpendicular and parallel to each other. There is a primary linear garden path which cuts through the middle of the garden.

St. George Tucker House

At St. George Tucker, the geometric and linear garden paths are made of gravel and laid perpendicular and parallel to one another.

Governors Palace

The Governor's Palace Gardens exhibit highly formal, linear and geometric walks which reinforce the designed garden.

Bush-Everard House

At the Bush-Everard House, the linear and geometric garden walks are made of brick and gravel and laid perpendicular and parallel to one another.

Palmer House

The symmetrical and geometric oyster shell paths at Palmer House follow the form of its circular and geometric planting beds.

Moody House

It appears that there are no formal garden paths at Moody House as the garden is dominated by turf lawn.

Vegetation –

Ludwell Paradise House

The Ludwell Paradise House garden contains flowering trees. All boxwood have been removed because of boxwood blight.

St. George Tucker House

The St. George Tucker House exhibits boxwood, flowering vines, and trees.

Governors Palace

The Governor's Palace Gardens contain orchards, ornamental flowers, and boxwood edging. The West Privy Garden has had some boxwood removed.

Bush-Everard House

Flowering shrubs, large boxwood, and fruit trees are characteristic of the Bush-Everard House garden.

Palmer House

At the Palmer House garden, four circular planting beds contain perennial bulbs and shade plants along with boxwood.

Moody House

The Moody House garden contains oval boxwood hedges and topiary planted in a spacious turf lawn.

Constructed Water Features – The Governor's Palace Gardens contains a constructed water feature in the form of a canal location to the western portion of the property. No other garden contains a constructed water feature.

From this brief overview of the history of the site and identification of existing landscape characteristics, the following summary tables compare the landscape characteristics to the National Register aspects of integrity to determine overall integrity of the cultural landscapes or gardens within which the boxwood plantings lie for the Colonial Revival garden design. See Tables 5-11.

Table 5 The integrity of the existing landscape characteristics of the Ludwell Paradise House garden.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Spatial Organization, Cluster Arrangement, Circulation, Vegetation, Buildings and Structures	Did not address natural systems & features	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address land use.	Did not address cultural traditions.	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Did not address topography.	Does not retain integrity of vegetation because the boxwood have been removed (0)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address views and vistas.	NA	Did not address small-scale features.	Did not address archaeological sites.

Table 6 The integrity of the existing landscape characteristics of the St. George Tucker House garden.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Spatial Organization, Cluster Arrangement, Circulation, Vegetation, Buildings and Structures	Did not address natural systems & features	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address land use.	Did not address cultural traditions.	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Did not address topography.	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address views and vistas.	NA	Did not address small-scale features.	Did not address archaeological sites.

Table 7 The integrity of the existing landscape characteristics of the Governor's Palace West Privy Garden.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Spatial Organization, Cluster Arrangement, Circulation, Vegetation, Buildings and Structures	Did not address natural systems & features	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address land use.	Did not address cultural traditions.	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Did not address topography.	Location, Setting, Design, Materials (some boxwood have been removed), Workmanship, Feeling, and Association (7)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address views and vistas.	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Did not address small-scale features.	Did not address archaeological sites.

Table 8 The integrity of the existing landscape characteristics of the Bush-Everard House garden.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Spatial Organization, Cluster Arrangement, Circulation, Vegetation, Buildings and Structures	Did not address natural systems & features	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address land use.	Did not address cultural traditions.	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Did not address topography.	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address views and vistas.	NA	Did not address small-scale features.	Did not address archaeological sites.

Table 9 The integrity of the existing landscape characteristics of the Palmer House garden.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Spatial Organization, Cluster Arrangement, Circulation, Vegetation, Buildings and Structures	Did not address natural systems & features	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address land use.	Did not address cultural traditions.	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Did not address topography.	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address views and vistas.	NA	Did not address small-scale features.	Did not address archaeological sites.

Table 10 The integrity of the existing landscape characteristics of the Moody House garden.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Spatial Organization, Cluster Arrangement, Circulation, Vegetation, Buildings and Structures	Did not address natural systems & features	Location, Materials, Workmanship, Feeling, and Association (5)	Did not address land use.	Did not address cultural traditions.	Location, Design, Materials, Workmanship, Feeling, and Association (6)	NA

Integrity of Topography	Integrity of Vegetation	Integrity of Buildings and Structures	Integrity of Views and Vistas	Integrity of Constructed Water Features	Integrity of Small-Scale Features	Integrity of Archeological Sites
Did not address topography.	Location, Setting, Materials, Workmanship, Feeling, and Association (6)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address views and vistas.	NA	Did not address small-scale features.	Did not address archaeological sites.

Table 11 Assessment of the overall integrity of the boxwood and boxwood-containing gardens at Colonial Williamsburg.

Integrity of Location	Integrity of Setting	Integrity of Design	Integrity of Materials	Integrity of Workmanship	Integrity of Feeling	Integrity of Association	Overall Integrity
The gardens are in their historic locations. The boxwood are planted in their historic location(s)	The gardens and boxwood are not surrounded by their historic contextual setting.	The gardens and boxwood retain integrity of the design.	Ludwell Paradise does not retain integrity of materials. The other gardens are planted with original boxwood and retain integrity.	Aside from the use of modern tools and equipment, the boxwood are maintained as they would have been historically.	The gardens retain integrity of feeling.	The gardens and boxwood retain integrity of association.	The gardens and boxwood retain overall integrity for the Colonial Revival era design.

Landscape Management

Joanne Chapman is the Director of Landscapes at Colonial Williamsburg and has been with the site for six years. Chapman had a career in education prior to pursuing horticulture. She has experience in garden retail as well as ornamental horticulture, having worked at a golf course for almost a decade prior to her employment at Colonial Williamsburg. Chapman has gained experience with historic preservation through her position at Colonial Williamsburg. Chapman oversees sixteen full time employees and four seasonal interns. She also corresponds with outsourced landscape contractors who maintain mowing and leaf removal operations at the site. The horticultural staff are divided into groups, the West group, East group, arboriculture, and integrated pest management (IPM). These groups maintain the historic gardens in the historic areas of Colonial Williamsburg, which is approximately 360 acres. There are two growers at the Colonial Williamsburg production nursery that produce flowers and vegetables for the gardens and site. Landscape managers Melissa Shariffi and Jonathan Lack, as well as IPM Technician David Stull, and Lead Arborist Charles Gardener were included in the survey with Joanne Chapman.

Cultivation of Boxwood

The boxwood at Colonial Williamsburg are all historic. When Colonial Williamsburg was being restored in the 1930s and 1940s, boxwood were sourced from South Carolina plantations as mature boxwood shrubs. There are close to 10,000 boxwood at Colonial Williamsburg, planted in *parterre*s, edging, hedges, and topiary. However, due to boxwood blight, they have lost 2,000 historic boxwood.

Because of the age of the boxwood on property, Chapman and her team have dealt with a plethora of boxwood issues like boxwood dieback, root rot, leaf miner, spider mites, Volutella,

and boxwood blight. Despite these issues, the boxwood are overall in good condition. The Colonial Williamsburg boxwood are propagated from the *B. sempervirens* 'Suffruticosa' at the Thomas Everrard Garden, which are the oldest boxwood on site. *B. sempervirens* is also propagated. Due to the impact and pressures of boxwood blight, Chapman and her team are opting to leave the boxwood alone as much as possible and taking as much precaution as needed with their maintenance and care. Boxwood maintenance is performed in early spring with gas powered trimmers. The boxwood are then finished with hand pruners. Some boxwood are sprayed with Vapor Gard and Aqualock in the winter to prevent desiccation, especially on those with southern exposure. These sprays prevent desiccation and may act as a barrier for boxwood blight. However, most of the boxwood are planted in protected areas near buildings and structures and don't require winter protection. While the site is quite large, being made up of individual historic gardens and grounds, the majority of the boxwood receive more shade than sun and are all planted in well-drained soil on level ground. The boxwood receive supplemental water via drip irrigation and soaker hoses during drought occasions. Chapman and her team are currently working towards improving the soil pH due to current levels being on the acidic side. The boxwood receive lime and Espoma plant tone, a granular fertilizer, every 2-3 years. Most Colonial Williamsburg boxwood are not mulched because hardwood mulch is not historically accurate. The select few that are mulched use pine straw and leaf mulch as much as possible.

Boxwood Blight

Colonial Williamsburg has had ongoing cases of boxwood blight since 2021. Blight was confirmed by the horticultural staff and state pathologist. The gardens at Colonial Williamsburg that have been infected by boxwood blight include the Ludwell Paradise House, Providence Hall, St. George Tucker House, Governors Palace West Privy Garden, Bush-Everard House, Palmer

House, and Moody House. All of the infected boxwood have been *B. sempervirens*. Chapman has opted to trial different methods to manage blight to analyze what methods are most effective. Each garden infected with blight has been addressed on a case-by-case basis with each garden being managed individually.

The first case of boxwood blight was found at the Ludwell Paradise House on July 28, 2021. The ten-to-twelve foot tall and twenty-five-foot-wide hedge of three hundred boxwood was found to be completely infected in the defoliation stage. Chapman and her team performed a complete removal of the boxwood, including roots. The removed boxwood were placed in a chipping machine that was engineered with a sprinkler system to catch any particles that could spread via wind to other gardens. The boxwood debris and chipped boxwood was buried off site. The remaining vegetation on the property was cut to the ground and the ground was burned. The team spread a few layers of topsoil to cover any possible remaining spores. The site was planted with mustard which will be tilled into the ground. Chapman and team believe the mustard may act as a fumigant.

On August 2, 2021, boxwood blight was identified at Providence Hall on one of the foundational boxwood plantings. This blight case was scouted in the greasy leaf spot stage, which is characteristic of the early stages of the disease. The infected spot was the size of a softball on the bottom of the plant. Chapman and team performed a selective removal which involved removal of the infected portion of the boxwood using extreme sanitation measures, including Tyvek suits and sanitation of all tools. A poly tarp was placed underneath the plant as the pruning removal occurred to capture any infected falling debris. A 2’ buffer of growth was removed surrounding the site of infection on the box, then the infected growth was pruned out, moving from non-symptomatic vegetation to symptomatic. The poly tarp, along with the debris,

was rolled up and thrown away as waste. All tools were sanitized post-removal, and the boxwood and surrounding box were sprayed with antidesiccant and fungicide. A deer fence was placed around the boxwood to protect the plant from birds and other wildlife. The boxwood was found reinfected with blight on July 7, 2022 and was completely removed on July 11, 2022.

St. George Tucker House was the next site to become infected with boxwood blight. On August 8, 2021, two separate sites of infection were found on the boxwood which happen to be the largest boxwood left at Colonial Williamsburg. One part of the infection was found on the interior of the plant while the other was on the exterior. Chapman and her team sprayed the box with a sterilant first, then preformed selective removal where two to four feet of vegetation surrounding the infection was removed, working again from non-symptomatic to symptomatic vegetation. Chapman and team continued to sterilize all tools as they performed the removal. The ground was covered with poly tarp to catch all debris. After the removal, the debris was bagged up and thrown out. The ground beneath the plants was burned and treated with sterilant.

On August 30, 2021, boxwood blight was found at the Governors Palace West Privy Garden in the defoliated stage. Chapman believes that this could have been a human mechanical transfer based on the location of infection at the top of the plant. The engineered trailer system was used to chip the boxwood, this time leaving the stumps and roots. After boxwood removal, Chapman and team burned and torched the pea gravel around the property and then planted mustard. The ground was sealed with plastic which will solarize the soil. Chapman is planning on replanting with two sentinel *B. sempervirens* to detect if and/or when blight returns to the garden.

At the Bush-Everard House, a very small boxwood blight infection was found on September 14, 2021. Before it was confirmed as boxwood blight, the boxwood was treated using

a sterilant spray; however, two weeks after it was found it was confirmed as boxwood blight and Chapman and team performed a selective removal, working from non-symptomatic vegetation to symptomatic and capturing all debris in trash bags. The garden was then closed off to the public.

On September 14, 2021, two small sites of boxwood blight infection was found at the Palmer House and the Moody House. At the Palmer House, a selective removal similar to the Bush-Everard House removal was performed. Chapman and team removed the infected vegetation, bagged up the debris, and closed the garden. At the Moody House, another selective removal was performed where the boxwood was treated with a fungicide and netted for protection after severely pruning the plant down to stumps. Because of the location of symptomatic branches, this was possibly mechanically transferred blight. Chapman noted that some *B. sempervirens* surrounded the infected *B. sempervirens* 'Suffruticosa' but did not get blight. The stumps have not re-flushed with new growth.

In terms of controlling the spread of blight to other gardens, the Colonial Williamsburg horticulture team have been applying fungicides, scouting, and sanitizing. All staff received a bucket sanitation kit once the first case of blight was confirmed as well as formal training in boxwood blight, including scouting and identification. Considering that fungicides last for around seven to ten days, it is not feasible to implement a fungicide regime for the entirety of Colonial Williamsburg due to the number of gardens, number of staff, and the reentry time for spray applications. For now, Chapman and team are using fungicides in the early spring followed by the antidesiccant Vapor Gard to further protect the boxwood. The fungicides are applied for a few months to the new boxwood growth in the spring followed later in the season by Vapor Gard, then treated with fungicides again in the fall. Chapman and team are experimenting with this regime to see how much they can control blight. Additionally, they use the Forecasting Risk

Model[173] to help determine when scouting for blight is critical but continue to scout for blight every day. Chapman sends out reminders to sanitize tools on days where the risk level is high to make sure staff take sanitation seriously. All tools are sanitized after working with the boxwood, including sanitizing the contractors' mowers. Chapman hopes to replant with boxwood sourced from Saunders Brothers Nursery. The horticulture team is staying updated and educated on blight news through the Boxwood Blight Insight Group[174] as well as conferences.

[173] The Forecasting Risk Model can be found online using the URL: https://uspest.org/risk/boxwood_app?sta=
[174] Horticultural Research Institute, "Boxwood Blight Insight Group ".

Hills and Dales Estate

Brief History and Description of Garden/Landscape Areas Containing Boxwood

Located in LaGrange, Georgia, Hills and Dales Estate (Hills and Dales) is the legacy of the Callaway family, a 35-acre landscape amidst rolling hills and shady dales for which it was named. The gardens of the estate have been designed and nurtured by three generations of women, beginning with Sarah Ferrell. Sarah began designing the historic Ferrell Gardens in 1841 and over her lifetime created six descending terraced gardens boasting boxwood hedges, mazes, and *parterre*s: the Upper Terrace, Sentinel Avenue, Bower Avenue, Labyrinth Avenue, Magnolia Avenue, and the Valley.[175] After Sarah's death, the property was purchased in 1911 by Fuller E. Callaway, who had since childhood shared a special relationship with "Miss Sarah" and her gardens. The garden's second steward was Fuller's wife, Ida Cason Callaway, who expanded and cared for the garden until her death in 1936. The Callaways hired the popular Neel Reid & Hal Hentz to design the grand classical-inspired house, which was modeled to complement the garden. After his parents' death, Fuller E. Callaway Jr. and his wife Alice Hand Callaway inherited the property. Alice spent much of her

Figure 27 View of the mansion and boxwood hedges from the third terrace.

[175] Staci L. Catron and Mary Ann Eaddy, *Seeking Eden: A Collection of Georgia's Historic Gardens* (University of Georgia Press 2018).

life devoted to the restoration and care of the garden. The estate opened to the public in 2004 and is now owned and operated by the Fuller E. Callaway Foundation.[176]

The mission of Hills and Dales Estate is "to preserve and share this historic home and garden for the instruction and enjoyment of the public through careful stewardship and engaging programs" with a vision "to welcome, inspire, and enrich all who visit".[177] With roughly ten thousand visitors per year, the horticultural staff at Hills and Dales has been able to maintain the gardens without significant wear and tear from visitation. The gardens have been preserved and maintained as they would have been during Sarah Ferrell, Ida Cason Callaway, and Alice Hand Callaway's time.

[176] "Hills & Dales Estate," Fuller E. Callaway Foundation, 2022, https://www.callawayfoundation.org/estate.php. "About Us," Hills & Dales Estate, 2022, (https://www.hillsanddales.org/plan-your-visit/about-us/.
[177] "Our Mission," Hills & Dales Estate, 2022, https://www.hillsanddales.org/explore-the-estate/our-mission/.

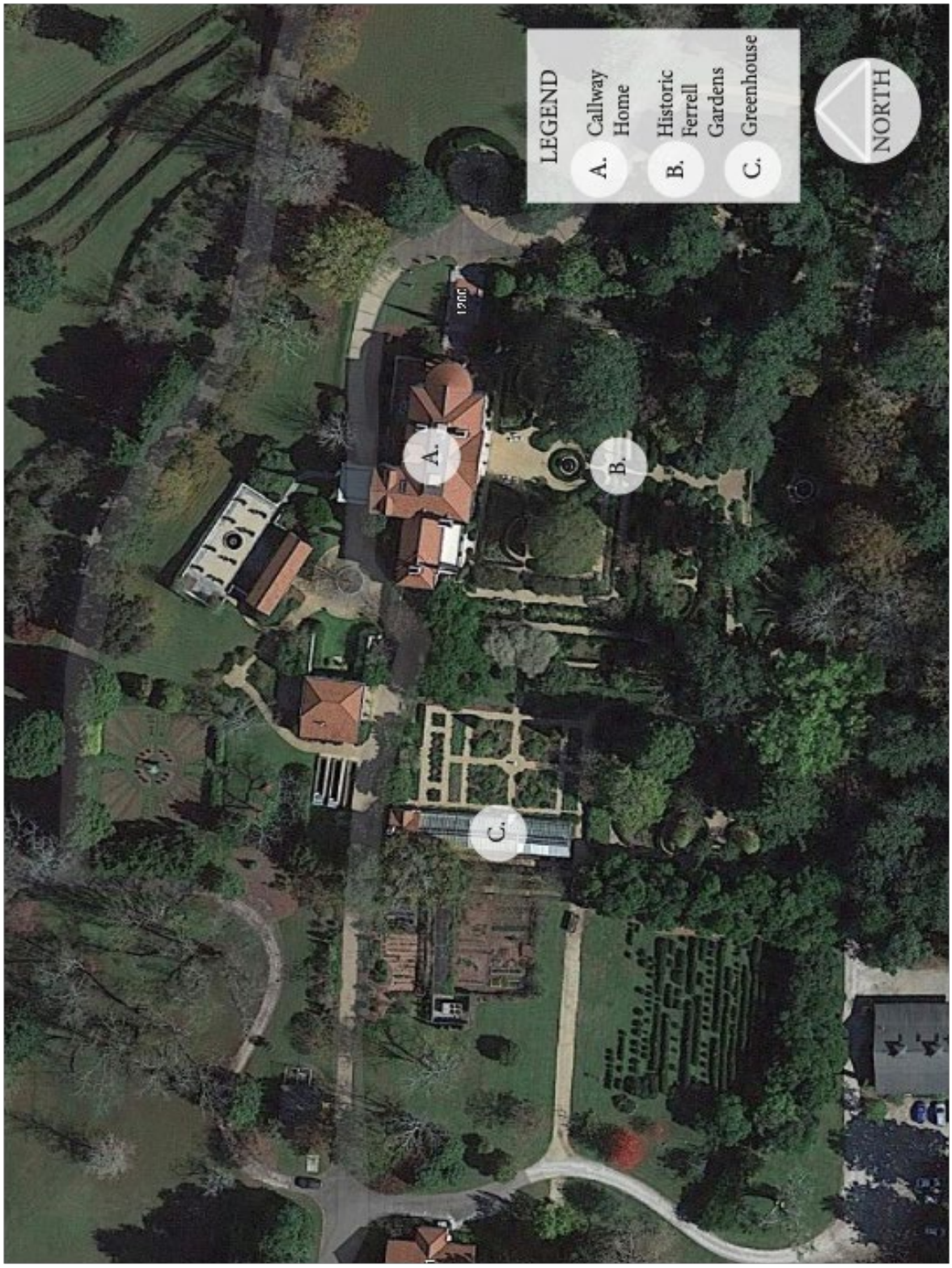


Figure 28 Site map of Hills and Dales Estate.

Existing Landscape Characteristics

Although there are 13 landscape characteristics defined by the National Park Service, those discussed below are the most relevant for Hills and Dale's cultural landscape. The landscape characteristics not addressed were: land use, cultural traditions, small-scale features, and archeological sites. Please note that the landscape characteristics were assessed for the Historic Ferrell Gardens where boxwood is located.

Natural Systems and Features – Natural aspects which may have influenced the development the site is the rolling topography which exhibits various hills and dales for which the property was named. The house is positioned on the highest point of the property with the gardens surrounding it. The Ferrell Garden takes advantage of the sites steeply sloping hillside to create a hierarchal and diverse landscape.

Spatial Organization, Cluster Arrangement, & Buildings and Structures – The front façade of the rectangular-shaped mansion faces south overlooks the downward sloping terraced Ferrell Garden. The mansion almost spans the entire length of the first terrace. The Ferrell Garden is situated to the south and southwest of the residence on the sloping hill towards a dale at the bottom. The garden is aligned on axis with the front façade of the mansion and are geometrically and symmetrically organized as individual terraced garden rooms. There is a rectangular-shaped glass greenhouse that is located to the east of the mansion and Ferrell Garden.

Circulation – The pea gravel garden paths exhibit both a geometric and linear organization conforming to the design of the terraces. A primary garden path divides the garden in half and is on axis with the southern façade of the house. Secondary garden paths radiate perpendicular to this primary path on each terrace.

Vegetation – Existing vegetation in the gardens includes boxwood, shrubs, and mature trees, as well as ornamental flowers. There have been boxwood replacements with sympathetic boxwood species as well as the addition of current ornamental flowers, both sympathetic and non-sympathetic.

Views and Vistas – There are views and vistas of the Ferrell Garden from the Upper Terrace looking downward at the sloping terraced garden towards the southern end of the garden, as well as views from each garden terrace. There are views of the *parterres* from the lower terraces. There are views and vistas from the southernmost terrace looking north into the Ferrell Garden which frames a view to the mansion.

Constructed Water Features – There is a large fountain located in the middle of the Upper Terrace.

From this brief overview of the history of the site and identification of existing landscape characteristics, the following summary tables compare the landscape characteristics to the National Register aspects of integrity to determine overall integrity of the cultural landscapes or gardens within which the boxwood plantings lie. See Tables 12-13.

Table 12 The integrity of the existing landscape characteristics of the Ferrell Gardens at Hills and Dales Estate.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Natural Systems and Features, Spatial Organization, Cluster Arrangement, Circulation, Topography, Vegetation, Buildings and Structures, Views and Vistas, Constructed Water Features	Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7) -	Did not address land use.	Did not address cultural traditions.	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials (some boxwood replacements with sympathetic boxwood species), Workmanship, Feeling, and Association (7)	Location, Setting, (original house has been replaced but is located in the same orientation and retains its historic setting) (2)	Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Did not address small-scale features.	Did not address archaeological sites.

Table 13 Assessment of the overall integrity of the Ferrell Gardens boxwood and the Ferrell Gardens at Hills and Dales Estate.

Integrity of Location	Integrity of Setting	Integrity of Design	Integrity of Materials	Integrity of Workmanship	Integrity of Feeling	Integrity of Association	Overall Integrity
The garden is in its historic location and the boxwood are planted in their historic location(s) within the garden.	The garden and boxwood are surrounded by their historic contextual setting, generally.	The garden maintains its historic design and the boxwood are planted in their historical design(s).	Some boxwood have been replanted with a sympathetic boxwood species. A few historic boxwood have been removed from the Church Garden.	Aside from the use of modern tools and equipment, the boxwood are maintained as they would have been historically.	The garden and boxwood retain integrity of feeling.	The garden and boxwood retain integrity of association.	The garden and boxwood retain overall integrity

Landscape Management

Jo Phillips has been with Hills and Dales Estate since 1994 when she was hired as part of the garden staff by Alice Callaway. She was promoted to Horticulture Manager in March of 2007 and has been with the estate for a total of twenty-eight years as she retired in July of 2022. Phillips holds a bachelor's degree in Horticulture from the University of Georgia and has years of on-the-job experience in horticulture and landscape management due to various jobs she has held in the field of horticulture. The Hills and Dales horticultural staff is divided into groups which include three maintenance staff for the outer landscaping and building, two staff caring for the formal garden, one part-time staff assisting around the home, one staff for the herb garden and propagation operations, and one staff caring for the greenhouse, perennial boarders, and cutting garden. As Horticulture Manager, Phillips oversees boxwood care.

Cultivation of Boxwood

The boxwood at Hills and Dales are planted in the 19th century Historic Ferrell Garden on the first terrace, the Upper Terrace, as two boxwood *parterre*s, on the second terrace named Sentinel Avenue as *parterre*s in symbolic shapes and forms, on Labyrinth Avenue, the fourth terrace, as edging for a winding maze walk, and on the fifth terrace named Magnolia Avenue, in a planting which spells out the word "GOD" and a *parterre* of clustered grapes. Additionally, a garden known as the Church Garden, or the Sanctuary, located to the west of the terraces, contains boxwood planted in various Christian religious symbolic shapes and forms, including a boxwood organ, pews, and pulpit, to name a few.[178] Boxwood is also planted on site as foundational plantings around the historic Callaway home, in the herb garden, in the ray garden, as well as specimen plantings, hedges, container plantings, and espaliers. The boxwood located

[178] Catron and Eaddy, *Seeking Eden: A Collection of Georgia's Historic Gardens*

on the Upper Terrace of the Ferrell Garden have been in decline prior to 1994. Decline became apparent after a few large trees were removed, exposing the plantings of boxwood to full sun conditions. The decline is pronounced in these plantings of box, especially during drought episodes. The boxwood in decline were replaced with 'Green Mountain' and 'Winter Gem' boxwood. The historic boxwood mottos have recently been replaced in 2008 on the west end of the Upper Terrace and east end in 2021 with outsourced 'Suffruticosa'. The mottos were historically planted with 'Suffruticosa' as well as 'Justin Brouwers'.

The boxwood range from one hundred to three hundred years old. Boxwood replacements have been necessary over the last twenty years, with *B. sempervirens* 'Suffruticosa' being the most difficult to replace in-kind. Phillips has had success within the last ten to twelve years with Hills and Dales propagated 'Suffruticosa' replacements. Hills and Dales propagates boxwood on site selected from healthy boxwood that have history at the site. *B. sempervirens* 'Suffruticosa' is the most propagated boxwood, with *B. sempervirens* and 'Justin Brouwers' boxwood also being propagated.

Phillips has had issues with the health and performance of the boxwood, owing the majority of the issues to the harsh growing conditions of the South. Amongst the various boxwood issues include boxwood decline, leafminer, Volutella, Macrophoma, nematodes, and boxwood blight. Phillips has worked over the years towards improving the pH level to optimal boxwood levels which has significantly increased the boxwood performance. The pH of the soil where boxwood are planted sits around a pH of 6. Overall, the boxwood at Hills and Dales are in good health, with many of the historic boxwood still thriving on site despite the challenges of the Southern climate.

The entire maintenance schedule for the gardens at Hills and Dales is reliant upon boxwood care as the primary focus of maintenance, which includes but is not limited to boxwood watering, fertilizing, and pruning. Depending on the location in the garden, the boxwood receive anywhere from full sun, part shade, to full shade and are planted in well drained soils. In the hot summer months, Phillips and her team supplement water based on the amount of rainfall that has occurred over a one-week interval, aiming for at least a half an inch over a two-week period. Phillips uses over-head irrigation for all supplemented water. The boxwood receive light applications of fertilizer as Phillips is focused on health and longevity rather than new growth. In late spring and fall, the boxwood receive light application of milorganite and an aggregate 8-8-8 to provide potassium and phosphorus. The boxwood are also limed annually. There are specific areas where boxwood are mulched with pine bark while other boxwood areas are not due to a few differing factors. Firstly, some of the boxwood on the lower terraces are growing underneath mature magnolia trees and are not mulch due to the constant raking up of dropped magnolia leaves which would incidentally result in the raking up of mulch, making these areas too labor and cost intensive to mulch. Secondly, there are areas of the garden where historically they would not have been mulched. Erosion has resulted in a few of these areas, but Phillips monitors erosion and remediates this issue by applying a top dressing of compost where mulch is not historically accurate.

The boxwood at Hills and Dales receive the largest trimming in February. The historic *B. sempervirens* and *B. sempervirens* 'Suffruticosa' are trimmed once per year using gas powered trimmers. There are some boxwood that require more frequent trimming and are trimmed three times during the growing season beginning with the February trimming, followed by a summer trim, and late summer trim. Protecting the boxwood from winter damage is not an issue because

of the estate's Southern location; however, Phillips consults the fifteen-day forecast prior to the February trim to ensure that freezing is not forecasted. All maintenance performed is followed by tool sanitation.

Boxwood Blight

The horticultural staff at Hills and Dales are very familiar with boxwood blight, having been battling the disease since December of 2020. Boxwood blight was first discovered at the leaf spot stage on the property at the Visitors Center, in December 2020 on a non-historic planting of 'Winter Gem' boxwood *parterre* edging that was planted in 2004. The boxwood were immediately removed. The second blight incident occurred in September 2021 and was found on another planting of non-historic boxwood planted at the rear of the Visitors Center. The boxwood were at the defoliation stage and were all removed, with horticultural staff wearing Tyvek suits. They bagged up the boxwood debris and hauled it off site to be burned. The soil was also burned, and all vehicles involved in the operation were sprayed down. Blight was again discovered at the leaf spot stage on historic boxwood in the Church Garden in October 2021. Phillips sent boxwood samples to the county agents office to confirm the blight, but they went ahead and took out the infected boxwood and burned the ground. They mulched the holes and began a fungicide regime immediately. The fungicide protocol involved applications once per month for the entire Church Garden beginning in October 2021 through spring 2022. Phillips consulted several university websites for BMPs, including West Virginia University, University of Georgia, and University of Connecticut. Additionally, she consulted the Saunders Brothers Website and compared all of the BMPs to select the most appropriate for Hills and Dales.

Currently, Phillips is trying to control the spread of blight through the fungicide program and quarantining the garden. Staff are only allowed to enter the garden to provide routine care,

sanitizing shoes, tools, etc. when entering and exiting the garden. All boxwood debris is hauled off site and burned. Additionally, Hills and Dales has provided shoe sanitation when entering the property at the Visitors Center to reduce the possibility of spread via shoe. The estate is open to having a preventative fungicide regime for all the boxwood at Hills and Dales, but this would not be feasible due to the number of staff and amount of boxwood on site. The Church Garden has not been replanted but will be replaced possibly with the historic propagated boxwood or outsourced boxwood.

Phillips and a few of the horticulture staff have attended classes offered by the Georgia Green Industry Association regarding insect and disease control in order to become more familiar with blight identification. Phillips stays updated on blight news through attending similar classes, personal research, and information that is being updated by the university circles. Hills and Dales has consulted various others on boxwood blight protocols including Dean Norton at Mount Vernon in Virginia, Chris Hastings out of Atlanta, Georgia, and Gordon Chappell, former Director of Landscapes at Colonial Williamsburg in Virginia.

Carl Sandburg Home National Historic Site

Brief History and Description of Garden/Landscape Areas Containing Boxwood

The Carl Sandburg Home National Historic Site was the farm and residence of famed American poet Carl Sandburg and his family and is located in Flat Rock, North Carolina. The Sandburgs moved to the property, known as Connemara, in 1945 where they began to establish their farming operations which focused on goat herding. The development and design of the landscape at Connemara began in the 1830's by Christopher Memminger which exhibits formal garden design elements characteristics of the antebellum era. Memminger constructed a dam which created a large lake at the front of the property he named "Front Lake". He built the residence on top of a hill overlooking Front Lake and developed an expansive lawn with a three-tiered fountain and pool in the front yard directly in front of the residence.

Figure 29 View of the Connemara landscape from the Front Lake.

He planted a tree-lined entry drive with *B. sempervirens* lining the upper entry drive. He also planted *B. sempervirens* to divide herb and vegetable gardens .[179] The landscape of Connemara was further developed by the following owners of the property, the Smyth family, in the early to mid 1900's. During the Smyth's residency, the landscape reflected early nineteenth century design ideals which exhibited vegetable and flower gardens, formally clipped boxwood, and boxwood-edged gardens. The boxwood at the upper entry drive were maintained in conical shapes during the Smyth residency. The Smyth's also designed formal gardens to the front and sides of the residence with gravel walks and flower beds edged with *B. sempervirens* 'suffruticosa'.[180] During the Sandburg's residency, the property was focused on farming and goat operations mostly. The family did not maintain the landscape as formally as its predecessors, opting for a more picturesque landscape rather than the highly formal management of the Symth's. For example, they clipped the upper entry drive boxwood occasionally to their Smyth-era conical shape which left them "rough-looking as little pruning took place".[181] The Sandburgs deconstructed the three-tiered fountain, leaving only the pool in the front of the residence. They planted flowering shrubs and annuals around the house informally, further transforming the once- formal landscape into a naturalistic scene.[182] The Carl Sandburg Home National Historic Site is owned and operated by the National Park Service and has an annual visitation rate of 90,000. The mission of the site is to maintain the landscape as it would have been during the time of Carl Sandburg's residence and to interpret that landscape for the public, with no alterations

[179] Susan Hart, Carl Sandburg Home National Historic Site: Cultural Landscape Report, (U.S. Department of 1993). pgs. 13- 19
[180] Hart, Short Carl Sandburg Home National Historic Site: Cultural Landscape Report.pgs. 19-26
[181] Hart, Short Carl Sandburg Home National Historic Site: Cultural Landscape Report. pgs. 29
[182] Hart, Short Carl Sandburg Home National Historic Site: Cultural Landscape Report.pgs. 26-29

being implemented due to visitation. The site is kept as historically accurate as possible to Sandburg's time.

Figure 30 Site map of Carl Sandburg Home National Historic Site.

Existing Landscape Characteristics

Although there are 13 landscape characteristics defined by the National Park Service, those discussed below are the most relevant for the Carl Sandburg Home cultural landscape. The landscape characteristics not addressed were: land use, cultural traditions, small-scale features, and archeological sites. Please note that the landscape characteristics were assessed for the landscape areas around the residence where boxwood is located as foundational and hedge plantings.

Natural Systems and Features & Topography– The property exhibits a rolling terrain, thus, it was logical to place the house and surrounding gardens on the top of a hill at a high point with flat terrain which takes advantage of the views overlooking the downward sloping pastureland and Front Lake.

Spatial Organization, Cluster Arrangement, & **Buildings and Structures** – The rectangular-shaped residence is situated on the top of a hill facing north towards the Front Lake and downward sloping pastureland. The organization of the vegetation around the house depict an informal, naturalistic relationship. There are rectangular and square-shaped outbuildings which are arranged on top of the hill near the southwest of the residence.

Circulation – It does not appear that garden circulation exists.

Vegetation – Existing vegetation surrounding the residence includes conical trees, flowering shrubs, and a tree-lined entry drive. There have been boxwood removal which has resulted in a few boxwood specimen plantings left in secluded areas near the residence.

Views and Vistas – There are views and vistas of the residence from the Front Lake as well as views and vistas of the pool, lawn, and Front Lake from the residence.

Constructed Water Features – The circular pool is located to the north in the front lawn directly in front of the residence.

From this brief overview of the history of the site and identification of existing landscape characteristics, the following summary tables compare the landscape characteristics to the National Register aspects of integrity to determine overall integrity of the cultural landscapes or gardens within which the boxwood plantings for the Carl Sandburg-era. See Tables 14-15.

Table 14 The integrity of the existing landscape characteristics of the boxwood-containing landscape areas at Carl Sandburg Home.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Natural Systems and Features, Spatial Organization, Cluster Arrangement, Circulation, Topography, Vegetation, Buildings and Structures, Views and Vistas, Constructed Water Features,	Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7) -	Did not address land use.	Did not address cultural traditions.	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	NA
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Location, Setting, Feeling, and Association (4)	Does not retain integrity of vegetation because the boxwood have been removed (except for a few secluded specimen) (0)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Did not address small-scale features.	Did not address archaeological sites.

Table 15 Assessment of the overall integrity of the boxwood and boxwood-containing landscape areas at Carl Sandburg Home.

Integrity of Location	Integrity of Setting	Integrity of Design	Integrity of Materials	Integrity of Workmanship	Integrity of Feeling	Integrity of Association	Overall Integrity
The garden (cultural landscape) is in its historic location and retains integrity but the majority of the boxwood have been removed and do not retain integrity of location.	The garden retains integrity of setting, but almost all of the boxwood have been removed and do not retain integrity of setting.	The garden does not retain integrity of design because the majority of the boxwood have been removed.	Because almost all of the boxwood have been removed, the garden does not retain integrity of materials.	The garden retains integrity of workmanship but because the boxwood have been removed, they do not retain integrity of workmanship.	The garden retains integrity of feeling but the removed boxwood do not retain integrity of feeling.	The garden retains integrity of association but the boxwood do not retain integrity of association.	The garden retains overall integrity, but does not retain integrity of boxwood.

Landscape Management

John McDade has been with the Carl Sandburg Home National Historic Site for two and a half years as the Program Manager for the Resources and Facilities Division. His background is in cultural resource management with training in historic preservation. McDade was surveyed for the site background and preservation survey questions while Irene Van Hoff, the Carl Sandburg Home National Historic Site's recently retired Biological Technician of twenty years, was surveyed with horticulture and landscape management questions, along with preservation questions. After working as a Registered Nurse for twenty-one years, Van Hoff received a technical degree in forestry management, along with a bachelor's degree in natural resource management and a master's in biology with a certificate in horticulture. Working with the National Park Service at the Carl Sandburg Home over the past twenty years has given her experience and training in cultural landscape management.

Cultivation of Boxwood

The approximately eight-acre garden is maintained by one horticultural staff, the Biological Technician, who oversees the care and maintenance of the one hundred- and fifty-year-old to one hundred- and seventy-year-old boxwood as well as the surrounding landscape. The boxwood were located near the Carl Sandburg home as hedges and foundational plantings.

Figure 31 View of the Carl Sandburg Home from the circular pool.

The historic *B. sempervirens* were located at the top of a stone wall near the historic barn as a hedge of boxwood leading up to the historic house, as well as foundational plantings around the home. A later addition of boxwood were planted to extend the historic hedge, possibly Korean boxwood, sourced from Saunders Brothers Nursery. The majority of the boxwood are planted in full sun, with the rest in shaded areas. The boxwood are planted in well drained and do not receive supplemental water. The boxwood have been fertilized twice within twenty years with a light top dressing of manure. The boxwood are not mulched as it is not historically accurate. Historically, the boxwood were pruned and maintained often by the Smyth's; however, this formality was not maintained by the Sandburgs and the boxwood were allowed to grow naturally with an occasional pruning. This is how the boxwood have been maintained under the NPS ownership. One rejuvenation prune was performed around 2007/2008 because the boxwood had become dense, and light was unable to penetrate the interior of the plant. The boxwood have been left alone since then.

Boxwood Blight

With an incident of boxwood leaf miner in 2005 and one case of Volutella, the boxwood at the Carl Sandburg Home had minimal issues with health and performance over Van Hoff's

twenty-year career at the site. However, in March of 2021, boxwood blight was discovered. Van Hoff did not believe the sickly-looking boxwood was diseased with blight at first, searching online for photos of blight identification and later sending off samples to the extension service who confirmed that it was boxwood blight. Blight was found on the branches of two boxwood that were relatively separated from one another and was scouted as large branch infections. After removing the symptomatic branches, the boxwood continued to show signs of infection. The boxwood were then removed wearing Tyvek protective gear and the debris was double bagged and taken to the landfill. The soil was burned, and Van Hoff continued to wear Tyvek protective gear when preforming weekly assessment of the remaining boxwood. Blight continued to infect boxwood for the rest of the year, with Van Hoff removing boxwood if the plant was infected up to a 3% threshold. All of the boxwood, aside from a few healthy specimen boxwood in a secluded area, have been removed from the site and the area has not been replanted. There are around eighty to one hundred rooted propagated cuttings of the historic *B. sempervirens* in their plant nursery that could possibly serve as replacement plants. Prior to her retirement at the end of 2021, Van Hoff was in communication with the NPS regional office and other parks with known boxwood blight, also seeking advice from the NPS Division for Historic Landscapes.

While certain staff members are trained in tool sanitation, no formal education regarding boxwood blight has been implemented at the site, and they are currently taking a hands-off approach with the few remaining boxwood until the new Biological Technician arrives. McDade is not staying updated on boxwood blight news and is not in communication with other historic sites about their blight protocols.

Montpelier

Brief History and Description of Garden/Landscape Areas Containing Boxwood

Montpelier is the home of Founding Father James Madison, the Father of the Constitution and Architect of the Bill of Rights, and his wife, Dolley. In 1801, Madison inherited Montpelier, located in Orange County, Virginia, along with over one hundred enslaved persons. In addition to Montpelier's plantation operations, the property also maintained a four-acre designed garden which contained ornamental plants and flowers, as well as vegetables and fruit trees. The garden was designed by French gardener Bizet.[183] Some of Montpelier's enslaved individuals became assistant gardeners after receiving gardening instruction and when Bizet returned to France one of the trained enslaved persons took his place as Montpelier's gardener. In 1844, widowed Dolley sold Montpelier and the garden fell into a period of abandonment until the property was purchased by William duPont in 1901. William's wife Annie devoted herself to developing the existing dilapidated eighteenth-century garden into a twentieth-century formal

Figure 32 Aerial view of the terraced formal garden at Montpelier.

[183] "The Life of James Madison," James Madison's Montpelier https://www.montpelier.org/learn/the-life-of-james-madison.

garden that would later be characterized as a Colonial Revival design. Annie undertook the restoration of the historic terraces, adding new vegetation and ornamentation to the garden. William and Annie's daughter Marion duPont Scott made additions to the garden as well which were designed by Charles Gillette the celebrated landscape architect. In 1984, Montpelier was acquired by the National Trust for Historic Preservation and now operates as a private, nonprofit corporation under The Montpelier Foundation. The garden was restored to its twentieth century appearance by The Garden Club of Virginia in 1990 although the garden retained elements of the eighteenth-century Madison-era design. Montpelier receives 70,000 annual visitors and the mission of the 2,650-acre site is focused on educating the public about James Madison and his family, the constitution, and the enslaved community that lived and worked at Montpelier.[184] The garden is kept as a historic representation of portions of the Colonial era 1810-1830s garden along with the 1910/1950 Colonial Revival additions of Annie duPont, Marion Scott, and Charles Gillette.[185] According to Robert Myers, visitation has not resulted in alterations of the historical representation of the garden.

[184] "James Madison's Montpelier," Historic Sites, National Trust for Historic Preservation, 2022, (https://savingplaces.org/places/montpelier.
[185] "Montpelier - Annie duPont Formal Garden," Flickr, 2022, (https://www.flickr.com/photos/itinerant_wanderer/7188871996.

Figure 33 Site map of Montpelier.

Existing Landscape Characteristics

Although there are 13 landscape characteristics defined by the National Park Service, those discussed below are the most relevant for Montpelier's cultural landscape. The landscape characteristics not addressed were: land use, cultural traditions, constructed water features, small-scale features, and archeological sites. Please note that the landscape characteristics were assessed for the Annie DuPont Formal Garden where boxwood is located.

Figure 34 View of the garden from the bottom terraces and mountain landscape beyond.

Natural Systems and Features & Topography – Natural aspects of the site that may have influenced the development of the garden is the sites' gradual rolling hills and large open pastureland. The garden is terraced down a gradually sloping hillside. The garden terraces may have been a logical way to address the topography of the site, as well as an aesthetic opportunity to create division in the garden. Additionally, the garden may have been developed in its location in order to take advantage of the views of the mountains in the background.

Spatial Organization & Cluster Arrangement – The garden is located to the southwest of the residence but maintains no formal alignment/relationship with the residence. The rectangular garden is symmetrically organized and exhibits a formal geometric layout. The garden is divided

by a gravel walkway that runs through the middle. The garden is divided into four or five terraces which run perpendicular to the center walkway. Generally, each garden terrace is a mirror image of itself on either side of the gravel walkway.

Circulation – The garden's primary circulation is a single linear, edged gravel path that cuts the entire garden in half and leads the visitor from the top of the garden to the bottom of the garden where the path splits, creating a circular path around a pergola-like structure with flowering vines. Secondary garden circulation exhibits geometric gravel paths which reinforce formal geometric planting beds on the second terrace.

Vegetation – Existing vegetation in the garden includes flowering ornamentals, vines, boxwood specimen shrubs and hedges, and expansive turf lawns as well as deciduous and evergreen trees.

Buildings and Structures – The rectangular residence does not appear to have a direct relationship with the garden but exhibits an axial alignment with the adjacent enslaved persons quarters to the south of the house.

Views and Vistas – Being a highly geometric and symmetrical garden divided by a singular linear walkway, there are views and vistas of the entire garden from the entry of the garden at the top. Because views and vistas are multi-directional, there are also views and vistas of the entire garden from the bottom of the garden as well as views and vistas from each terrace.

From this brief overview of the history of the site and identification of existing landscape characteristics, the following summary tables compare the landscape characteristics to the National Register aspects of integrity to determine overall integrity of the cultural landscapes or gardens within which the boxwood plantings lie as a combination of Colonial and Colonial Revival era garden design. See Tables 16-17.

Table 16 The integrity of the existing landscape characteristics of the formal garden at Montpelier

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Natural Systems and Features, Spatial Organization, Cluster Arrangement, Circulation, Topography, Vegetation, Buildings and Structures, Views and Vistas	Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Did not address land use.	Did not address cultural traditions.	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Did not address constructed water features.	Did not address small-scale features.	Did not address archaeological sites.

Table 17 Assessment of the overall integrity of the boxwood and formal garden at Montpelier.

Integrity of Location	Integrity of Setting	Integrity of Design	Integrity of Materials	Integrity of Workmanship	Integrity of Feeling	Integrity of Association	Overall Integrity
The garden is in its historic location of the colonial and colonial revival periods. The boxwood are in their original colonial revival location(s).	The garden and boxwood are not surrounded by the historic colonial period setting. The garden is surrounded by its historic colonial revival period setting, generally.	The garden maintains the layout, pathways, and boxwood of its colonial revival design.	The garden is planted with original colonial and colonial revival boxwood.	The boxwood are maintained as they would have been historically.	The garden and boxwood retain integrity of feeling.	The garden and boxwood retain integrity of association.	The garden and boxwood retain overall integrity

Landscape Management

Robert Myers has been the Horticulturalist at Montpelier for three years. He is a certified horticulturalist through the Virginia Nursery and Landscape Association and has experienced with hands on learning and on-site training in horticulture and landscape management having worked in the high-end residential landscaping industry prior to working at Montpelier. With a degree in fine arts, Myers worked in the retail industry for twelve years prior to his career change. He has spent much time devoted to personal training and education on boxwood and has attended boxwood symposiums for additional learning. Myers is the only horticultural staff at Montpelier, relying on additional assistance from volunteers.

Cultivation of Boxwood

The boxwood are located around the mansion and grounds at Montpelier, including the formal 2.4 acre Annie DuPont garden which boasts a one mile boxwood allée, with the east side of the allée predating the DuPont era. Most of the boxwood are *B. sempervirens* 'Arborescens' of which the majority are one hundred and seventy plus years old. There are a few boxwood that are two hundred and seven to two hundred and twelve years old and four that are ten years old. There were a few historic *B. sempervirens* 'Suffruticosa' on the property, but most were taken out due to issues with boxwood decline. Additionally, a few dozen historic boxwood surrounding the mansion were removed during the 2005 mansion restoration. Also present on the property are *B. sempervirens* 'Rotundifolia', *B. sempervirens* 'Elegantissima', and *B. sempervirens* 'DeeRunk' boxwood as well as *Buxus sinica* 'Justin Brouwers'. The boxwood is used on site as hedges, specimen shrubs, topiary/tree form, edging, and an allée.

There have been significant issues with boxwood leafminer, boxwood decline, and winter damage at Montpelier, but overall, the boxwood are in good health. The boxwood allée is

stressed due to recent rejuvenation efforts, with one specimen boxwood in decline. A few boxwood have been infilled using propagated boxwood from the historic Montpelier 'Arborescens'. Although Myers transplants and grows some historic boxwood from natural layers and secondary growth on property, he uses an outside company to propagate their boxwood, the Living History Growers. Myers regularly monitors the boxwood for issues.

Eighty to ninety percent of the boxwood are in full sun and in well-drained soil. The soil pH has been tested in previous years. During the dry summer months, Myers uses soaker hoses to water the allée, although he has never had to water the specimen boxwood. The allée and specimen boxwood, as well as other boxwood in full sun, are thinned and shaped every other winter, alternating between the boxwood locations. The two specimen boxwood located at the ends of the boxwood hedges are shaped and thinned with orchard ladders and long-reach pruners every other winter. All other boxwood maintenance is performed using manual pruners and loppers beginning mid-December until mid-March, and twice in the summer. Boxwood is harvested during December as holiday greenery. Although winter damage is a continual issue at Montpelier, Myers does not protect the boxwood during the winter because of time and labor constraints, opting to prune out any winter damage.

The Montpelier boxwood are fertilized using a 50/50 compost mulch blend and light application of plant tone. Although the boxwood allée is mulched, the other boxwood are not because mulch would not have been historically accurate to the Madison and DuPont historical periods.

Boxwood Blight

Although Montpelier does not have and has not had boxwood blight, Myers was familiar with boxwood blight. Myers is taking preventative measures for boxwood blight having

specified that no outside boxwood is allowed to enter the property, especially holiday greenery. In addition, Myers times pruning and maintenance according with the correct time and temperature and performs weekly scouting for disease. He works in sections of the garden to further avoid the possibility of spreading disease and sanitizes his clothes, shoes, hand tools, tarps, and equipment, hauling all debris outside of the garden. Myers has a fungicide regime ready to go if blight enters the site with plans to remove and burn the infected shrub. All neighboring plants will be sprayed with fungicide and closely monitored. If it is a small area of infection and relatively isolated, Myers will perform a selective removal of the infected plant, implement a fungicide regime, and closely monitor for changes. The volunteers at Montpelier understand what boxwood blight is but are not allowed to assist with boxwood care at this time as a precaution. Myers stays updated on boxwood blight news by checking the Virginia extension service website and the Saunders Brothers boxwood guide. He is a member of the American Boxwood Society and looks to their publications for additional updates. Myers has spoken with Tudor Place in Virginia about their boxwood blight protocols.

Stratford Hall

Brief History and Description of Garden/Landscape Areas Containing Boxwood

Stratford Hall is the eighteenth-century 2,000-acre estate of the Lee family located in Westmorland County, Virginia. The Lee family boasts a few prominent figures in American history including "Light Horse Harry" Lee the Revolutionary War hero and his son, Robert E. Lee, famed Civil War General, as well as two signers of the Declaration of Independence.[186] In 1929, The Robert E. Lee Memorial Foundation (Currently the Robert E. Lee Memorial Association) was established to obtain Stratford Hall in order to restore, preserve, and maintain the estate. Based on a letter from 1790, it is currently understood that Stratford Hall boasted gardens, vineyards, orangeries, and lawn. However, when The Garden Club of Virginia was contracted to restore the gardens in 1929, evidence of the eighteenth-century garden was obsolete. In 1933, The Garden Club of Virginia installed the new terraced East Garden designed by Morley J. Williams. The new design, which contained no fruits, vegetables, or flowers, was not

Figure 35 View of the 2018 renovated East Garden upper terrace.

[186] "Welcome to Stratford Hall," Stratford Hall, https://www.stratfordhall.org/.

a depiction of an eighteenth-century garden, but a boxwood-dominated design that's planting beds and paths conflicted with prior archeological findings of the garden. William's plan is characteristic of Colonial Revival garden design. In an attempt to remediate some of the issues that resulted from the Williams plan, including boxwood cultivation issues due to being planted in full sun, Alden Hopkins re-designed the garden in the 1950's to incorporate trees, shrubs, and flowers as well as more accurate paths. Changes to the East Garden in current years have been the result of contemporary research of eighteenth-century garden design and the pursuit of creating a more historically accurate landscape. Beginning in 2018 Rieley and Associates, through intensive historical research and documentation findings, began the restoration of the first terrace. The first terrace now exhibits four eighteenth-century era appropriate planting beds with reconfigured garden paths and vegetables, flowers, and evergreen trees. The mission of Stratford Hall is "to preserve the legacy of the Lee family and its plantation community, to inspire an appreciation of America's past, and encourage commitment to the ideals of leadership, honor, and independent thought and civic responsibility." Today, the East Garden at Stratford Hall is a combination of Colonial Revival and eighteenth century-era appropriate garden designs.[187]

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[187] Will Rieley, "Stratford Hall: An Early Garden Restoration Revisited," *Magnolia: Publication of the Southern Garden History Society* XXXIII (2020), https://southerngardenhistory.org/wp-content/uploads/Magnolia-NL-Summer-20-FINAL.pdf.

Figure 36 Site map of Stratford Hall.

Existing Landscape Characteristics

Although there are 13 landscape characteristics defined by the National Park Service, those discussed below are the most relevant for Stratford Hall's cultural landscape. The landscape characteristics not addressed were: land use, cultural traditions, constructed water features, small-scale features, and archeological sites. Please note that the landscape characteristics were assessed for the East Garden where boxwood is located.

Natural Systems and Features & Topography –

The natural aspect of the site that may have influenced its development is the relatively flat topography. The East Garden exhibits this flat topography which may have influenced the development of terraces which create more impactful views, hierarchy, and diversity.

Spatial Organization, Cluster Arrangement, & Buildings and Structures–The rectangular-shaped mansion has four rectangular-shaped outbuildings that are aligned with the four corners of the mansion to the northwest, northeast, southeast and southwest directions. The north and southeast outbuildings' alignment is parallel with the north and south boundaries of the East Garden. There is a small octagonal outbuilding to the northeast of the mansion which is perpendicularly aligned with the walkway on the first terrace in the East Garden. The rectangular-shaped East Garden is organized on a perpendicular axis with the east side of the mansion. The garden is geometrically organized with various planting beds depicting formal, geometric shapes. one primary walkway dividing the garden.

Circulation – The linear garden walkways exhibit primary and secondary hierarchy. The primary gravel garden path divides the East Garden in half and connects the top terrace to the

bottom terrace. Secondary gravel walkways reinforce the various geometric formal garden beds and are both perpendicular and parallel to the primary garden path, as well as to one another.

Figure 37 View of the East Garden from the upper terrace.

Vegetation – Existing vegetation in the East Garden includes boxwood, evergreen trees, deciduous trees, flowers, vegetables, and fruit trees. There have been boxwood removal on the first terrace which have been replaced with an eighteenth-century era vegetable garden design and flower border.

Views and Vistas – There are views and vistas of the East Garden from the east side of the mansion as well as looking up the terraces in the garden towards the mansion from the end of the East Garden. There are views and vistas on each of the three garden terraces.

From this brief overview of the history of the site and identification of existing landscape characteristics, the following summary tables compare the landscape characteristics to the National Register aspects of integrity to determine overall integrity of the cultural landscapes or gardens within which the boxwood plantings lie as a combination of Colonial and Colonial Revival garden design. See Tables 18-19.

Table 18 The integrity of the existing landscape characteristics of the East Garden at Stratford Hall.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Natural Systems and Features, Spatial Organization, Cluster Arrangement, Circulation, Topography, Vegetation, Buildings and Structures, Views and Vistas	Location, Setting, Feeling, and Association (4)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address land use.	Did not address cultural traditions.	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Location, Design, Materials, Workmanship, Feeling, and Association (6)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Feeling, and Association (4)	Did not address constructed water features.	Did not address small-scale features.	Did not address archaeological sites.

Table 19 Assessment of the overall integrity of the boxwood and East Garden at Stratford Hall.

Integrity of Location	Integrity of Setting	Integrity of Design	Integrity of Materials	Integrity of Workmanship	Integrity of Feeling	Integrity of Association	Overall Integrity
The garden is in its historic location of the colonial and colonial revival periods. The boxwood are in their colonial revial period locations.	The garden and boxwood are not surrounded by the historic colonial period setting. The garden is surrounded by its historic colonial revival period setting, generally.	The garden maintains layout and pathways of its colonial and colonial revival eras of design.	The garden is planted with the historic colonial revival era boxwood and retains vegetables of the colonial era.	The boxwood are maintained as they would have been historically.	The garden and boxwood retain integrity of feeling.	The garden and boxwood retain integrity of association.	The garden and boxwood retain overall integrity

Landscape Management

Matt Peterschmidt earned his degree in horticulture with a focus on landscape design from Virginia Tech, after which he worked in the retail nursery industry. Peterschmidt went on to work at Mount Vernon for fifteen years as Head Gardener and Greenhouse Gardener until his move to Stratford Hall as the Director of Landscapes and Security, a position he has held for the past ten years. He has attended various historic garden workshops at Mount Vernon and with the Garden Club of Virginia.

With one part time Gardener and volunteers, Peterschmidt oversees the one-and-a-half-acre East Garden and surrounding Stratford Hall landscape. The Gardener maintains the larger garden while Peterschmidt is in charge of the boxwood care and maintenance.

Cultivation of Boxwood

The boxwood at Stratford Hall were planted in the 1930s and are mostly *B. sempervirens* 'Suffruticosa', with some 'Arborescens' and *B. sempervirens*. The boxwood is located in the East Garden, with a single 'Arborescens' located just outside of the walled garden, a single 'Arborescens' next to the kitchen and smokehouse, as well as a few *B. sempervirens* near the public restrooms. There is a one hundred- and twenty-foot-long hedgerow of *B. sempervirens* 'Suffruticosa' which historically were three separate plantings that have ended up growing together as a seven-foot tall and fifteen feet wide hedge. A three-foot-tall edging of boxwood in various shapes is also located on site.

There have been issues with the health and performance of the boxwood because of their advanced age including, but not limited to, boxwood decline, broken branches, and spider mites. Some of the boxwood are in decline due to cultural issues such as poor drainage, excessive soil buildup near the root collar from edging, as well as soil compaction from pedestrian traffic.

Because of the age of the boxwood and various health issues, the boxwood at Stratford Hall are in fair condition. Peterschmidt will not replace any removed boxwood for multiple reasons. Firstly, he believes that they would not be able to find the correct size of boxwood to replace an older, mature specimen. Secondly, if boxwood were found that were the correct size, the cultural constraints of installing such a boxwood would be intensive.

The boxwood are hand pruned and thinned along with dead wood removal beginning in February through March. The boxwood are allowed to grow to their natural shape. Historically the boxwood have been protected from winter damage but are not currently due to time and labor constraints. Seventy to eighty percent of the boxwood are located in filtered sunlight, with the remaining box being in full sun. Overall, the boxwood are located in well-drained soil with a pH in the high sixes although there are a few areas with underlying drainage issues. Peterschmidt supplements water during drought episodes by hand watering. The boxwood are not fertilized and, due to time and labor constraints, are not mulched. Peterschmidt does not propagate the boxwood.

Boxwood Blight

Stratford Hall has not had and does not currently have boxwood blight. The only boxwood blight preventative measures the site is taking is not allowing garden volunteers to bring their own tools. Peterschmidt will follow blight protocol if the disease is found on site and plans on removing the boxwood from site as quickly as possible. The Gardener and volunteers know what boxwood blight is but have not been formally educated. Because boxwood blight is not an issue locally, Peterschmidt is not actively staying updated on blight news but has spoken with Dean Norton at Mount Vernon regarding his blight protocols.

Swan House – The Atlanta History Center

Brief History and Description of Garden/Landscape Areas Containing Boxwood

Occupying the Buckhead area of Atlanta, Georgia, Swan House is the early twentieth century home of the Inman family, existing today as one of the most prominent historical features of the city. As the neighborhood of Buckhead increasingly became vogue in the 1920s, it attracted many leading families, including Edward Hamilton Inman and his wife Emily MacDougald Inman. The Inman's employed architectural firm Hentz, Reid, & Adler to design their Buckhead residence. Leading architect Philip Trammell Shutze, an associate with the Hentz, Reid, & Adler firm, designed the classical inspired mansion and 20-acre grounds. Shutze was inspired by classical Italian and English design which informed the layout of the landscape and gardens and architecture of the mansion.[188] Swan House boasts a "cascading fountain, terraced lawns, roses tumbling over stone walls, and clipped hedges[189]," as well as a secluded boxwood garden. The boxwood garden exhibits quadrant *parterres* arranged around a central fountain along with planting beds. The entire garden is enclosed by a stone wall

Figure 38 View of the mansion and cascading fountain from the terraced lawns.

[188] Catron and Eaddy, *Seeking Eden: A Collection of Georgia's Historic Gardens*
[189] "Swan House Gardens ", Atlanta History Center, 2022, accessed 10/27/2022, https://www.atlantahistorycenter.com/buildings-and-grounds/goizueta-gardens/swan-house-gardens/.

and lined with crape myrtles.[190] The boxwood garden was restored in the 1990s by Tunnell & Tunnell Landscape Architects. The Atlanta Historical Society acquired the property in 1966 following the death of Emily and today the Swan House operates as a house and garden museum, an event venue, and the headquarters for the society.[191]

The mission of the Swan House is to maintain the property as it would have been during the Inman family residency during the late 1920's and early 1930's. According to Tiffanny Jones, the property straddles historic preservation and visitor accommodation due to the property's nature as both a public historic house and garden and event venue operation. Because of the dualistic operations, there have been alterations implemented to accommodate visitation that are non-historic including a gravel sidewalk placed on the lawn in front of the fountain. Additionally, the lawn has been altered from its historical appearance as a weedy lawn and is

Figure 39 The Swan House Boxwood Garden, laid out in quadrant *parterres*.

[190] The Garden Conservancy, "Grant Helps Restore Historic Swan House Boxwood Garden in Atlanta," (2022). https://www.gardenconservancy.org/news/swanhouseboxwoodgarden.
[191] "Swan House," Atlanta History Center, 2022, accessed 10/27/2022, https://www.atlantahistorycenter.com/buildings-and-grounds/swan-house/.

now managed to be a pristine, over seeded lawn that is heavily manicured for visitor expectations. Swan House replants with historic plant materials when feasible but in some cases, will replant with an improved cultivar that looks similar to the historic plant or a period appropriate plant.

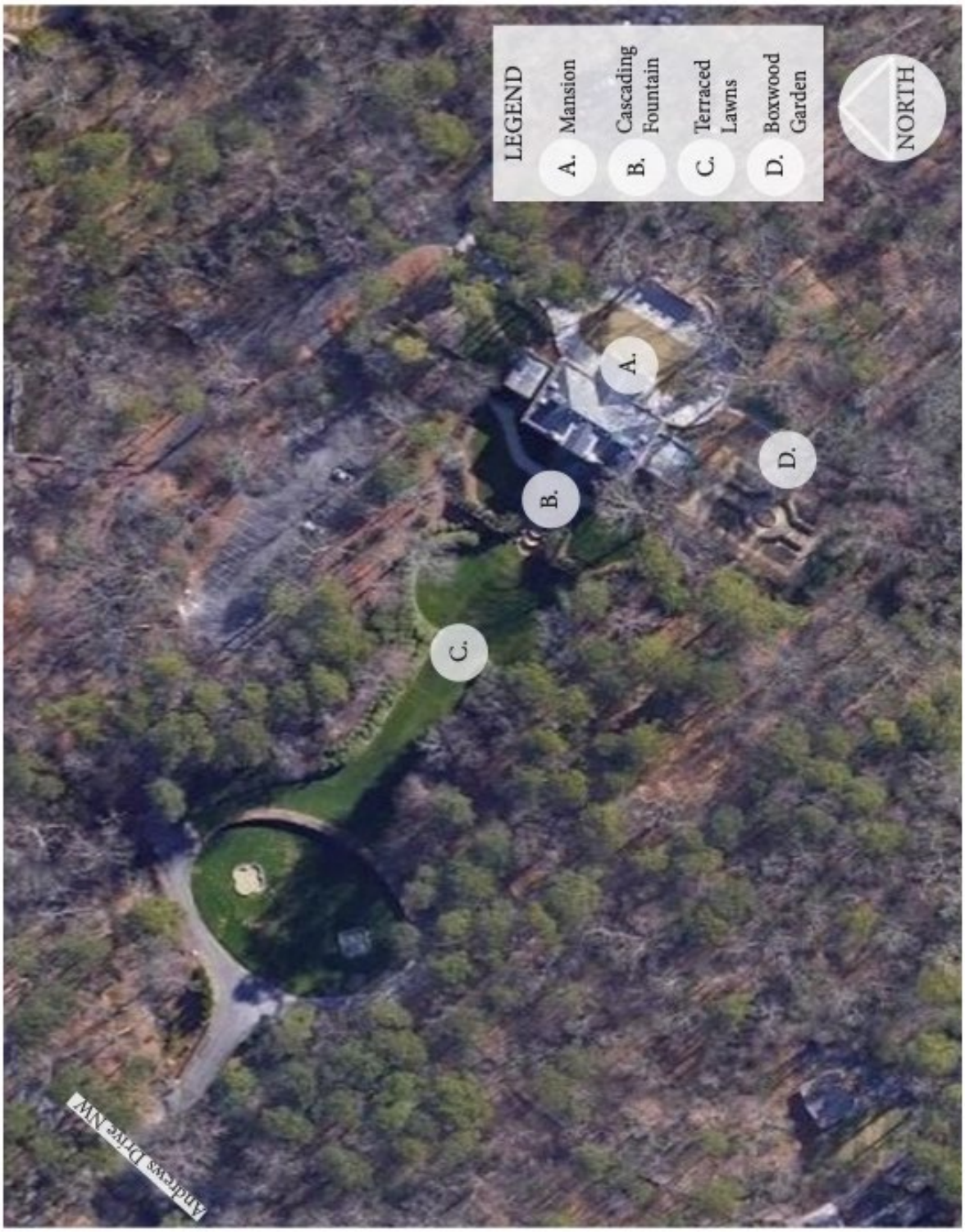

Figure 40 Site map of the Swan House.

Existing Landscape Characteristics

Although there are 13 landscape characteristics defined by the National Park Service, those discussed below are the most relevant for Swan House's cultural landscape. The landscape characteristics not addressed were: land use, cultural traditions, constructed water features, small-scale features, and archeological sites. Please note that the landscape characteristics were assessed for the Boxwood Garden and generally where boxwood is located in the northwestern landscape.

Natural Systems and Features & Topography – The natural aspects of the site that may have influenced its development is the sites' steeply sloping terrain to the west. The house is built on the highest point of the property and is facing in a northwestern direction overlooking the terrace, cascading fountain, and expansive lawn. The house's direction and relationship to the northwestern landscape features takes advantage of the downward sloping terrain. The Boxwood Garden takes advantage of flatter terrain and the natural woodlands which create seclusion.

Spatial Organization, Cluster Arrangement, & Buildings and Structures –

The square-shaped mansion is located on the high point of the property facing a northwest direction overlooking the cascading fountain, terraces, and lawn with the Boxwood Garden located at the southern end of the mansion. The northwestern landscape is arranged on a perpendicular axial alignment with the northwest (front) side of the mansion and is symmetrically arranged, exhibiting geometric formality. The formal Boxwood Garden depicts perpendicular axial alignment with the mansion's south façade, also featuring symmetry and geometry in its arrangement.

Circulation – The northwest landscape and Boxwood Garden circulation are made of gravel and are geometrically laid out. The circulation highlights the design of the northwestern landscape

and the Boxwood Garden, and particularly reinforces the quadrant *parterres* and flower bed designs.

Vegetation – Existing vegetation in the northwest landscape and Boxwood Garden includes boxwood, shrubs, mature trees, and ornamental flowers. There have been boxwood replacements in the northwest landscape with non-sympathetic boxwood species and in the Boxwood Garden with sympathetic boxwood species.

Views and Vistas – Being on perpendicular axis with the northwest façade of the mansion, there are views and vistas of the expansive northwestern landscape which features the terraces, cascading fountain, and lawn. As such, there are views and vistas from the lawn furthest from the house looking towards the northwest landscape and mansion. There are views and vistas in the Boxwood Garden of the *parterre* designs.

From this brief overview of the history of the site and identification of existing landscape characteristics, the following summary tables compare the landscape characteristics to the National Register aspects of integrity to determine overall integrity of the cultural landscapes or gardens within which the boxwood plantings lie. See Tables 20-21.

Table 20 The integrity of the existing landscape characteristics of the boxwood-containing landscape areas at Swan House.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Natural Systems and Features, Spatial Organization, Cluster Arrangement, Circulation, Topography, Vegetation, Buildings and Structures, Views and Vistas	Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Did not address land use.	Did not address cultural traditions.	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Workmanship, Feeling, and Association (6)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Did not address constructed water features.	Did not address small-scale features.	Did not address archaeological sites.

Table 21 Assessment of the overall integrity of the boxwood and boxwood-containing landscape areas at Swan House.

Integrity of Location	Integrity of Setting	Integrity of Design	Integrity of Materials	Integrity of Workmanship	Integrity of Feeling	Integrity of Association	Overall Integrity
The garden is in its historic location and the boxwood are planted in their historic location(s).	The garden and boxwood are surrounded by their historic setting, generally.	The garden maintains the layout, pathways, and boxwood of its original design.	The garden is planted with some original boxwood, but many have been replaced due to boxwood blight with sympathetic and non-sympathetic boxwood species.	The boxwood are maintained as they would have been historically.	The garden and boxwood retain integrity of feeling.	The garden and boxwood retain integrity of association.	The garden and boxwood retain overall integrity

Landscape Management

Tiffanny Jones has been with the Swan House at the Atlanta History Center for five years. Jones is the Director of Horticulture for the Swan House and two other Atlanta History Center properties, having previously held the position of Senior Horticulturalist. Jones received her bachelor's degree in horticulture from Berry College with a focus on ornamental horticulture. As Director of Horticulture, Jones oversees two full time and one part time horticultural staff at the Swan House in addition to a contractor company that oversees the lawn's turfgrass management.

Cultivation of Boxwood

The boxwood at the Swan House were installed in the 1920s and 1930s. While there are a few boxwood that are one hundred twenty to one hundred thirty years old, the most common boxwood on site are one hundred years old. Jones and one other staff member oversee boxwood care. *B. sempervirens* and *B. sinica* 'Justin Brouwers' are grown on site, with the historic boxwood being *B. sempervirens*. The boxwood are located near the cascading fountain, terraced lawns, and residence. The boxwood are planted around the home as foundational plantings and in a secluded boxwood *parterre* garden to the South of the house. Near the fountain, three of the historic boxwood have been removed due to shady and moist site conditions while twenty to thirty were removed in 2016 due to boxwood blight. These boxwood were replaced in 2016 with Ilex 'Emerald Colonnade'. Another planting of ten *B. sempervirens* located near the parking area for the mansion were removed due to blight and have been replaced with a 1920s-era appropriate camellia. Jones will not replant with boxwood again due to ongoing blight and disease issues. The boxwood *parterre* garden was restored in the early 2000s by Tunnell & Tunnell Landscape Architects and has had continued boxwood blight since 2016. Swan House has had ongoing

issues with the boxwood since 2014/2015 which includes boxwood leaf miner, Volutella, and boxwood blight. Because of the ongoing health issues, including the battle with blight for the past six years, the Swan House boxwood are in poor health.

Jones has opted for a hands-off approach with boxwood maintenance, only interacting with them to prune out blight diseased branches. The boxwood *parterre* garden receives partial sun and partial shade, with the rest of the boxwood receiving full sun. The boxwood are planted in average draining soils with a few areas with underlying drainage issues. Jones has not tested the soil pH and does not supplement water or fertilize the boxwood. The boxwood are mulched with pine nuggets to one inch. The boxwood are monitored daily by one horticultural staff. The staff, wearing gloves, will prune out any conspicuous foliage moving from the healthiest-looing box to the sickliest and bag the debris for disposal. If the diseased area is significant, they will make a point to sanitize their tools before moving onto the next plant.

Boxwood Blight

Jones is very familiar with blight, having been dealing with the disease for six years. Blight was first confirmed by a diagnostic lab in 2016 and from then on has been confirmed by the horticultural staff and the UGA extension service. Because of the disease pressure today, Jones and her team do not wait to send off samples anymore, they just prune out the diseased portion of the plant. Over fifty historic *B. sempervirens* near the fountain were removed as a result of blight in 2015/2016 and were replaced with 'Emerald Colonnade' holly. They selected this holly as a representation of what the boxwood would have looked like in form, color, texture, etc. The diseased boxwood were removed wearing Tyvek suits, the plant debris was bagging in trash bags and hauled of site, and the soil was burned after removal.

Jones is controlling the spread of boxwood blight using a fungicide regime of Daconil alternated with other fungicides that are sprayed by an outside landscape maintenance contractor every twenty-one days. The fungicides are rotated, and infected branches are removed daily, following up with sanitation as best as possible. The horticultural staff at the Swan House are trained and educated on boxwood blight. Jones was staying up to date on boxwood blight news as much as possible in 2017 when she arrived but now consults her outside landscape maintenance contractor regarding optimal BMPs. The Atlanta History Center President of Horticulture has been in contact with other historic garden managers regarding boxwood blight protocols.

Longfellow House – Washington's Headquarters National Historic Site

Brief History and Description of Garden/Landscape Areas Containing Boxwood

Longfellow House- Washington's Headquarters National Historic Site is the residence of nineteenth-century American poet Henry Wadsworth Longfellow. The Vassall-Craigie-Longfellow House was constructed in 1759 and was the core of a 100+ acre estate which was made up of agricultural land and farming operations. During the Siege of Boston from July 1775 until April 1776, General George Washington occupied the house as military headquarters due to its advantageous position in Cambridge, Massachusetts.[192] During the Colonel Vassal era of ownership from 1759-1790, and the following Andrew Craigie era of ownership from 1791-1841, the property boasted garden complexes, greenhouses, orchards, and trees. Henry and Fanny Longfellow purchased the property in 1841 and added an Italian Renaissance style garden in 1847, designed by English landscaper Richard Dolben. After her father's passing in 1882, Alice Longfellow began restoring the Longfellow House Garden with the help of Martha Brookes Hutcheson and Ellen

Figure 41 View of the formal garden at Longfellow House. Note the historic stone ground paths.

[192] "Longfellow House Washington's Headquarters ", National Park Service 2022, 2022, https://www.nps.gov/long/index.htm.

Biddle Shipman, two prominent female landscape architects of the twentieth century. In 1903, Hutcheson added arbors and gates as well as flower beds that conformed to the original Henry Longfellow beds which were designed in a Persian carpet pattern. Shipman was hired in 1924 and added "heirloom roses, evergreens, and ornamental fruit trees."[193]. Today, Longfellow House is owned and operated by the National Park Service and received 35,896 visitors in 2021. Its mission is to preserve and interpret the site which reflects "the values & ideas of its occupants". The Longfellow House Garden, roughly one hundred and fifty feet long by seventy-five feet wide, exists today as combination of the 1903-1905 restoration work of Hutcheson and the rejuvenation design of Shipman from 1923-1925, which exhibits Colonial Revival garden design, with elements of the nineteenth-century garden layout of Henry Longfellow[194].

[193] "Formal Garden," National Park Service, 2022, 2022, https://www.nps.gov/long/learn/historyculture/formal-garden.htm.

[194] National Park Service, "Formal Garden."; "Plants," National Park Service, 2022, 2022, https://www.nps.gov/long/learn/nature/plants.htm.

Figure 42 Site map of Longfellow House.

Existing Landscape Characteristics

Although there are 13 landscape characteristics defined by the National Park Service, those discussed below are the most relevant for Longfellow House's cultural landscape. The landscape characteristics not addressed were: land use, cultural traditions, constructed water features, small-scale features, and archeological sites. Please note that the landscape characteristics were assessed for the Longfellow House Garden where boxwood is located.

Natural Systems and Features & Topography – The natural aspects of the site that may have influenced its development is the proximity to the Charles River to the south as well as the sites gradually sloping topography descending to the river. The residence sits on a high point of the property with the gardens located the rear (north) of the residence on flat terrain. The gradually sloping topography and vicinity of the river make it logical to place the residence facing the river with the gardens taking advantage of the flat terrain to the rear (north) of the house.

Figure 43 Aerial view of the formal garden at Longfellow House.

Spatial Organization, Cluster Arrangement, & Buildings and Structures – The front façade of the irregular L-shaped house faces south overlooking Brattle Street, Longfellow

Park, and the Charles River. The rectangular-shaped garden is located to the rear (north) of the residence. There is a rectangular-shaped carriage house to the north of the residence and west of the garden. The formal garden exhibits highly geometric organization and is axially aligned with the residence.

Circulation – The stone ground garden paths reinforce the formal geometric garden beds and are linear and geometric.

Vegetation – Existing vegetation in the garden includes boxwood edging, deciduous and evergreen trees, roses, and ornamental flowers. There have been boxwood replacements with sympathetic boxwood species.

Views and Vistas – There are views and vistas from the front façade of the house facing south towards Charles River. There are views and vistas throughout the garden on the linear and geometric garden paths of the planting beds as well as views and vistas of the residence and carriage house.

Figure 44 Views of the linear paths within the formal garden.

From this brief overview of the history of the site and identification of existing landscape characteristics, the following summary tables compare the landscape characteristics to the National Register aspects of integrity to determine overall integrity of the cultural landscapes or gardens within which the boxwood plantings lie as a combination of nineteenth century and Colonial Revival era garden design. See Tables 22-23.

Table 22 The integrity of the existing landscape characteristics of the formal garden at Longfellow House.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Natural Systems and Features, Spatial Organization, Cluster Arrangement, Circulation, Topography, Vegetation, Buildings and Structures, Views and Vistas	Location, Setting, Feeling, and Association (4)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address land use.	Did not address cultural traditions.	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Location, Design, Materials, Workmanship, Feeling, and Association (6)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Location, Setting, Feeling, and Association (4)	Location, Settin, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address constructed water features.	Did not address small-scale features.	Did not address archaeological sites.

Table 23 Assessment of the overall integrity of the boxwood and formal garden at Longfellow House.

Integrity of Location	Integrity of Setting	Integrity of Design	Integrity of Materials	Integrity of Workmanship	Integrity of Feeling	Integrity of Association	Overall Integrity
The garden is in its historic location from the nineteenth and colonial revival periods and the boxwood are planted in their historic location(s) within the garden.	The garden and boxwood are surounded by their colonial-revival era setting, generally.	The garden maintains the layout, pathways, and boxwood of its nineteenth-century and colonial revival era designs.	The garden is planted with sympathetic boxwood species and the ornamental flowers of its colonial-revival era of design.	The boxwood are maintained as they would have been historically.	The garden and boxwood retain integrity of feeling.	The garden and boxwood retain integrity of association.	The garden and boxwood retain overall integrity

Landscape Management

Chris Norris has been the Gardener at Longfellow House since January of 2022. The previous Gardener at Longfellow house retired after twenty years, leaving the position vacant for three years until Norris' arrival. Norris, having a background in economics and two years of experience in vegetable gardening, is the only horticultural staff at Longfellow House, relying on seasonal interns and volunteers for assistance in the garden. Norris is enrolled in landscape management courses through UMass Green School and receives guidance from the previous Longfellow House Gardener.

Although adjustments to the annual planting pallet has been necessary because of issues with sourcing historic and heirloom varieties, no change has been implemented to the design of the historic Longfellow Garden. The modern plant cultivars are selected to match the size, shape, and color of the historic plant in order to represent the garden as historically accurate as possible. The garden is being represented through the lens of the 1903-1925 restoration and rejuvenation designs of Martha Hutchinson and Ellen Shipman, which follows the vision and guidance of Alice Longfellow.

Cultivation of Boxwood

The boxwood are located within the formal garden at Longfellow House and are used as edging for pathways and garden beds. The boxwood are planted in well drained, acidic soil in full sun. The boxwood are not fertilized or mulched, as mulching is not historically accurate. The boxwood are kept at ten inches tall, which is the historical edging height, and are sheared every year or every other year using manual shears in the spring. The boxwood at Longfellow House experience lots of winter dieback due to snow issues and dead branches must be cut back. In order to combat winter damage, boxwood will be protected this year with burlap. The boxwood

are hand watered a few times per week in drought conditions, with sporadic watering during non-drought conditions. In addition to seasonal shearing, the boxwood are thinned to increase air flow and light into the interior of the plant.

Longfellow House does not have historic boxwood growing on site. There are one hundred or so *B. microphylla* that are around eight years old which were planted by the previous Longfellow House Gardener. Norris sheared the eight-year-old boxwood in May, but they have not recovered. An additional two hundred *B. microphylla* 'Wintergreen' and *B.* x 'Green Mountain' were planted in June to replace existing *B. sempervirens* 'Suffruticosa'. These boxwood plantings are doing well. In the spring of 2021, replacement boxwood sourced from Saunders Brothers were planted by volunteers are currently dying. Norris believes their current condition is because of being too deeply planted. Norris has plans to replant the dying boxwood with one hundred or more *B.* x 'Green Mountain' in August.

Longfellow House has experienced staffing issues, including a three-year vacancy for the Gardener position. The staffing shortage has made it difficult to care for newly planted boxwood. Due to late season planting, being planted too deep, and lack of routine watering after planting, the boxwood have struggled to establish. As a result, the boxwood that are living are culturally stressed and weakened and are experiencing significant issues with boxwood psyllid and spider mites. Norris uses water spray as a mechanical means to remove the pests.

Boxwood Blight

Norris knows of boxwood blight but is not familiar with the disease or currently managing for it. While his understanding of boxwood blight is limited, Norris has begun to implement a few prevention practices as precaution due to a few boxwood that have begun to cause concern. Any diseased looking boxwood branches are removed, bagged, and taken off site.

This is followed by tool sanitation. After the mechanical removal of pests via water sprays, excess water is blown out of the boxwood plants to reduce moisture. Additionally, possible vectors are prohibited from the site, including *Pachysandra sp*. Norris hopes to send infected-looking plant samples to the state extension for analysis.

Norris is fully aware of the threat of boxwood blight and is currently working towards becoming more educated on the disease and creating a management plan. He is looking to the UMass extension service for BMPs and has been in touch with the Arnold Arboretum regarding their management of box blight. The Longfellow House seasonal interns and volunteers are aware of the disease but not formally educated. Additionally, Norris is working closely with the former Gardener of Longfellow House for further advice and horticultural education. Norris has plans to contact other NPS historic sites on their blight protocols and hold a boxwood blight training day with the John Quincy Adams National Site and Minutemen National Site.

Peace field - Adams National Historical Park

Brief History and Description of Garden Containing Boxwood

Peace field is the residence of four generations of the Adams family, located in the thirteen-acre Adams National Historical Park in Quincy, Massachusetts. The Adams National Historical Park is made up of the Old House at Peace field, as well as the Stone Library and Birthplaces of John Adams and John Quincy Adams. The Old House at Peace field was constructed in 1731 and purchased in 1787 by second U.S. President John Adams and First Lady Abigail. John and Abigail operated the 75-acre property as a working farm. Abigail redesigned an existing garden with rectangular boxwood-edged planting beds full of fruit trees and flowers to the west of the residence. She replanted the boxwood hedges to enlarge the space for additional fruit trees, excluding her kitchen garden planted in the northeast garden plot. In addition to planting fruit trees and vegetables, Abigail enhanced the property with various flowering bulbs and vines, including the wisteria vine growing on the west side of the Old House.[195] Over time, the property served as a country estate for the family rather than a working

Figure 45 View of the formal garden at Peace field.

[195] National Park Service, Peace field: Adams National Historical Park Cultural Landscapes Inventory (National Park Service, 2012). Pgs. 37-41

farm. Charles Francis Adams, son of sixth U.S. President John Quincy Adams, and his wife Abigail Brooks, are credited with developing the former eighteenth-century kitchen and fruit garden into a formal garden in the Colonial Revival garden design. Charles and Abigail Brooks removed the northeast vegetable garden in order to construct the Stone Library in 1870, also removing and replacing the fruit trees in the garden with flower bordered grass plots.[196]

The Adams Memorial Society gifted the property to the National Park Service in 1946 where it was developed into the Adams National Historical Park that we know today.[197] The park's purpose as described by the NPS "is to preserve and protect the grounds, homes, and personal property of four generations of the Adams family and to use these resources to interpret the history they represent and to educate and inspire current and future generations".[198] Today, the garden is a combination of Colonial and Colonial Revival garden design. The Peace field garden retains its Colonial period layout, stone-dust gravel paths, and boxwood edging while exhibiting the Colonial Revival design additions. The garden is represented to encompass the historic periods of the four generations of Adams family residency, with an emphasis on the Colonial Revival garden style which characterized the latter part of the Adam's occupation.[199]

[196] National Park Service, Short Peace field: Adams National Historical Park Cultural Landscapes Inventory 48-49
[197] "Adams National Historical Park English Language Brochure," National Park Service, U.S. Department of the Interior, 2021, 2022, https://www.nps.gov/adam/planyourvisit/english-language-brochure.htm.
[198] "Adams National Historical Park: History & Culture," National Park Service, U.S. Deparment of the Interior, updated April 30,2015, 2015, 2022, https://www.nps.gov/adam/learn/historyculture/index.htm.
[199] "Adams National Historical Park: Places ", National Park Service, U.S. Depertment of the Interior, updated September 11, 2022, 2022, 2022, https://www.nps.gov/adam/learn/historyculture/places.htm; National Park Service, Short Peace field: Adams National Historical Park Cultural Landscapes Inventory

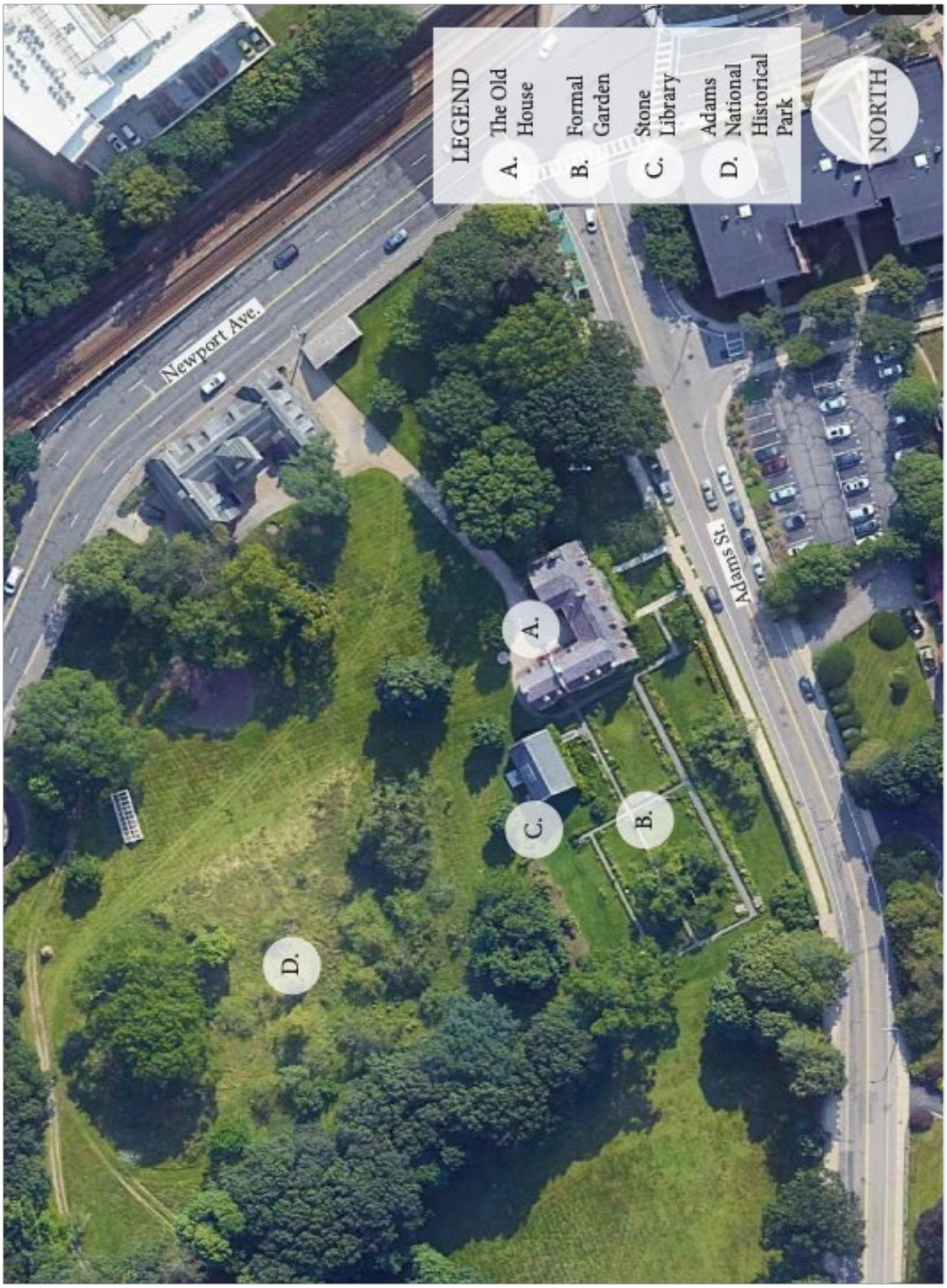

Figure 46 Site map of Peace field.

Existing Landscape Characteristics

Although there are 13 landscape characteristics defined by the National Park Service, those discussed below are the most relevant for Peace field's cultural landscape. The landscape characteristics not addressed were: land use, cultural traditions, constructed water features, small-scale features, and archeological sites. Please note that the landscape characteristics were assessed for the Garden at Peace field where boxwood is located.

Natural Systems and Features & Topography – The development of the site may have been influenced by natural aspects which include the level terrain and proximity to the Boston Harbor. The location of the residence and garden take advantage of the flat topography of the site as well as the open pastureland.

Spatial Organization, Cluster Arrangement, & Buildings and Structures – The front façade of the L-shaped residence faces south towards Adams Street. The garden is located to the west of the Old House and is geometrically arranged in rectangular beds. The garden, being on an axis with the west façade of the residence, is the same width of the west side of the Old

Figure 47 View of the Stone Library at Peace field.

House. There is a rectangular-shaped Stone Library in the northwest edge of the garden, which sits closest to the residence.

Circulation – The stone dust garden paths are linear and reinforce the geometric, rectangular garden beds. The paths are perpendicular and parallel to one another.

Vegetation – Existing vegetation in the garden includes boxwood edging, mature trees, grass plots, vines, and ornamental flowers.

Views and Vistas – There are views and vistas of the garden from the west façade of the house, as well as from the westernmost end of the garden looking towards the Old House. There are views and vistas within the garden of the flower boarders and boxwood edged grass plots.

From this brief overview of the history of the site and identification of existing landscape characteristics, the following summary tables compare the landscape characteristics to the National Register aspects of integrity to determine overall integrity of the cultural landscapes or gardens within which the boxwood plantings lie as a combination of Colonial and Colonial Revival era garden designs. See Tables 24-25.

Table 24 The integrity of the existing landscape characteristics of the formal garden at Peace field.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Natural Systems and Features, Spatial Organization, Cluster Arrangement, Circulation, Topography, Vegetation, Buildings and Structures, Views and Vistas	Location, Setting, Feeling, and Association (4)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address land use.	Did not address cultural traditions.	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Location, Setting, Design, Materials, Workmanship, Feeling, and Association (7)	Did not address constructed water features.	Did not address small-scale features.	Did not address archaeological sites.

Table 25 Assessment of the overall integrity of the boxwood and formal garden at Peace field.

Integrity of Location	Integrity of Setting	Integrity of Design	Integrity of Materials	Integrity of Workmanship	Integrity of Feeling	Integrity of Association	Overall Integrity
The garden is in its historic colonial and colonial revival location and the boxwood are planted in their historic colonial location(s) within the garden.	The garden and boxwood are surrounded by their historic colonial revival contextual setting, generally.	The garden maintains the layout, pathways, and boxwood of its colonial era design, with the turfgrass plots and flower boarder retained from the colonial revival period.	The garden is planted with the historic colonial-era boxwood but does not retain its historic vegetables or fruit trees. The garden is planted with colonial revival ornamental plants and turf.	The boxwood are maintained as they would have been historically.	The garden and boxwood retain integrity of feeling.	The garden and boxwood retain integrity of association.	The garden and boxwood retain overall integrity

Landscape Management

Jamie McGuane has been the Gardener Supervisor and Safety Coordinator at Peace field since 2017. McGuane transitioned into a career with the National Park Service over twenty years ago after working in the restaurant industry. He has been studying horticulture for the past twenty years and has held various positions in the field of cultural landscapes, including a position at the Frederick Law Olmsted National Historic Site and Longfellow House. McGuane has eight years of experience with the Olmsted Center for Landscape Preservation and is a certified arborist and pesticide applicator.

There are two horticultural staff in charge of garden management at Peace field, which includes McGuane's position as the Gardener Supervisor and a second Gardener position. Garden maintenance is determined by daily needs, focusing on different tasks each day. Boxwood care falls to the Gardener Supervisor.

Cultivation of Boxwood

The historic boxwood at Peace field are two hundred- and fifty-year old *B. sempervirens* which create 1017 linear feet of edging in the garden next to the Old House. The boxwood are planted in well-drained soil with a pH of 6.5, receive full sun, and are generally healthy, with a few spots where cultivation issues have caused the boxwood to become stressed. In certain areas, the shallow boxwood root system is growing into the historic stone-dust pathway as well as the flower bed on the adjacent side of the box. On the path side of the box, much of the soil has disappeared and been replaced with the stone dust from the pathway while the other side of the boxwood has been continually tilled and cultivated from flower bed maintenance. McGuane has forty propagated cuttings of the historic boxwood which will replace the box on site once mature and more is known about boxwood blight.

The boxwood are sheared and thinned yearly, also requiring routine monitoring, IPM, and hand watering. The boxwood are hand watered only during drought episodes. Drip irrigation is used in the flower beds and turfgrass is watered using over-sprays which consequently spray the perimeter of the boxwood. The boxwood are not fertilized but get top-dressed with compost every other year. The boxwood are not mulched as mulching is not historically accurate. The flower garden is planted July 4th, and the boxwood are sheared the week after. Prior to McGuane's employment, the boxwood were sheared using electric trimmers, however, McGuane has only used hand shears since his arrival five year ago. The boxwood must be protected from winter damage using hoops with boards on top to shield them from snow load.

Boxwood Blight

Although McGuane is familiar with boxwood blight, there have been no cases of the disease at Peace field. McGuane is implementing preventative management practices for boxwood blight which includes scouting daily, sanitizing after pruning, and prohibiting the introduction of new boxwood plants on site. If boxwood blight is confirmed on site, McGuane plans on seeking assistance from someone who is more knowledgeable about blight and looking for BMPs, possibly removing everything within ten feet of the diseased plant. The Peace field Gardener knows that blight exists but, because she is new to the field, is still learning about the disease. McGuane is staying updated and educated on boxwood blight news by looking to publications from the University of Connecticut and state extension publications. He is not in communication with other historic garden curators at this time.

Founders Memorial Garden

Brief History and Description of Garden Containing Boxwood

The Founders Memorial Garden is a two-and-a-half-acre public garden located in the heart of the University of Georgia's historic North Campus. The Founders Memorial Garden is a Colonial Revival garden designed in the 1930s by Hubert Bond Owens, founder and first Dean of the University of Georgia landscape architecture program, along with Brooks Wiggington and other faculty of the time. The garden surrounds the Lumpkin House, an antebellum-era residence. The garden was designed and constructed between 1938 and 1950 to commemorate the founders of The American garden club movement, which began in Athens, Georgia in 1891 by the Ladies' Garden Club of Athens, as well as World War II soldiers.[200] The garden is comprised of a courtyard garden surrounded by a kitchen and smokehouse, a boxwood *parterre* garden, a terrace garden, a perennial garden, and a pedestrian forecourt.[201] With roughly 5,000 annual visitors, the Founders Memorial Garden is managed by the College of Environment and Design and is a much beloved University jewel that is both a nostalgic landscape for alumni and a

Figure 48 Boxwood *parterre* garden at Founders Memorial Garden.

[200] "Founders Memorial Garden," University of Georgia, 2022, https://ced.uga.edu/about/facilities/fmg/.
[201] Catron and Eaddy, *Seeking Eden: A Collection of Georgia's Historic Gardens*

working classroom for current students. The garden receives many visitors in the fall, including alumni who travel to their alma matter for Georgia football gamedays in Athens. The garden receives significant foot traffic from alumnus on gamedays as well as daily foot traffic as students travel through the garden from class to class. Classes are often held at the Founders Memorial Garden where it acts as a living classroom. The overall mission and vision of the historic site is to commemorate the first garden club in America, and act as a learning laboratory through the maintenance and preservation of the historic garden and house.

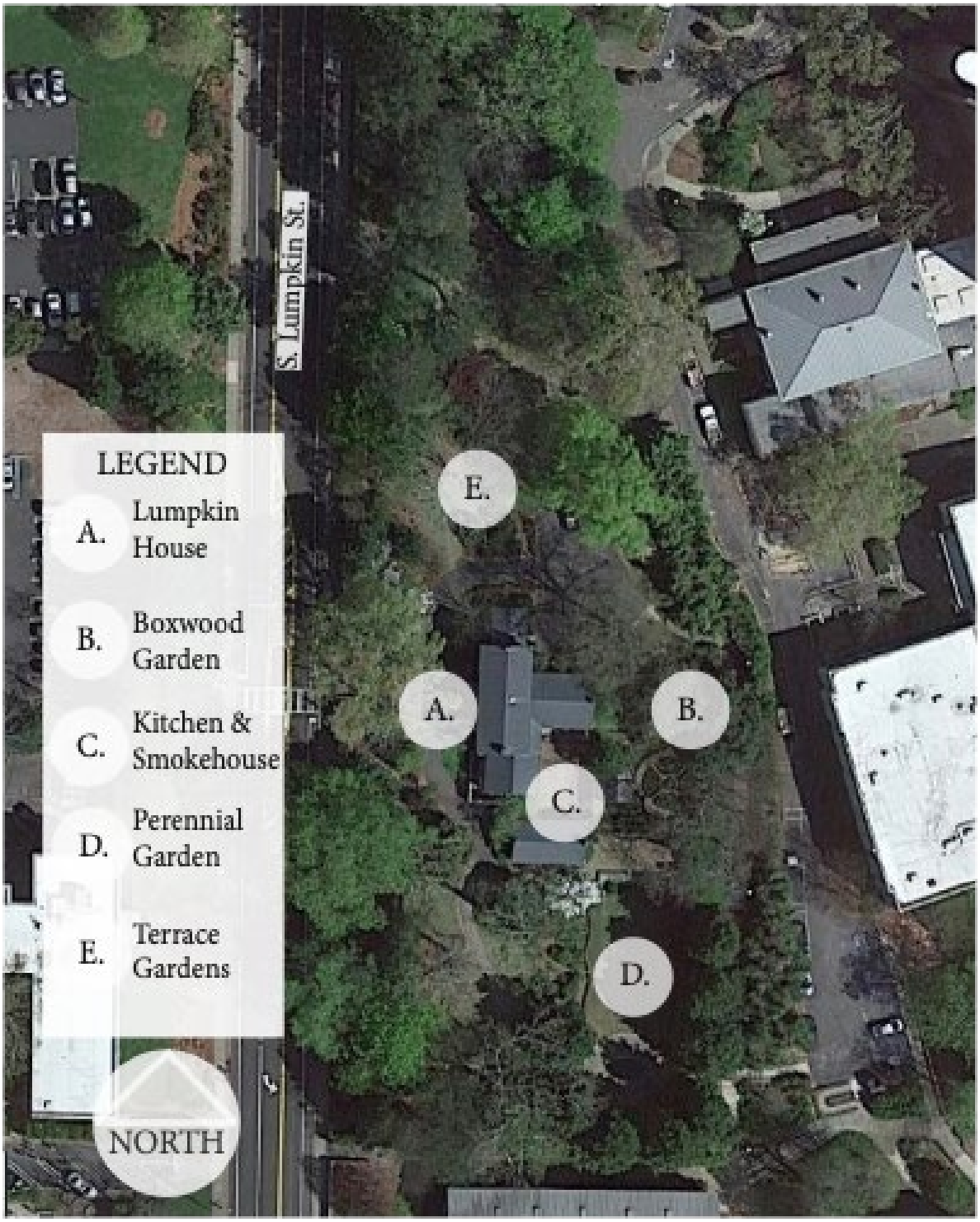

Figure 49 Site map of Founders Memorial Garden.

Existing Landscape Characteristics

Although there are 13 landscape characteristics defined by the National Park Service, those discussed below are the most relevant for Founder Memorial Garden's cultural landscape. The landscape characteristics not addressed were: land use, cultural traditions, constructed water features, small-scale features, and archeological sites. Please note that the landscape characteristics were assessed for the boxwood parterre garden and perennial garden where boxwood is located.

Natural Systems and Features & Topography – The natural aspects of the site that may have influenced its development is its steep and gradually sloping topography. The Founder's House is situated on one of the highest points of the property with the gardens surrounding it. The gardens' development around the house benefits from the gradual and steeply sloping topography of the site which creates hierarchy and diversity within the various areas of the garden. Both the boxwood *parterre* garden and perennial garden utilizes flat terrain.

Spatial Organization, Cluster Arrangement, & Buildings and Structures – The front facade of the T-shaped Founders House faces west overlooking South Lumpkin Street. There is a rectangular-shaped kitchen and square-shaped smoke house which are located to the rear (southeast) of the residence, which collectively create a courtyard between them. These outbuildings flank the west side of the boxwood *parterre* garden, which sits in the rear (east) of the Founders House. The boxwood *parterre* garden and perennial garden are axially aligned with the Founders House and outbuildings. The boxwood *parterre* garden exhibits formal geometric arrangement. The perennial garden is arranged symmetrically and geometrically.

Circulation – There are geometric brick garden paths in the boxwood *parterre* garden which reinforce the garden design. The perennial garden does not have formal designated circulation but exhibits a turf grass lawn which is used by pedestrians for circulation.

Vegetation – Existing vegetation in the gardens includes boxwood edging, hedges, and specimen plantings, as well as various shrubs, mature trees, and ornamental flowers. There have been boxwood replacements in the *parterre* with sympathetic boxwood species.

Views and Vistas – There are views and vistas of the boxwood *parterre* design within the boxwood *parterre* garden. There are views and vistas on the terrace overlooking the perennial garden as well as views and vistas from the southernmost end of the turf grass in the perennial garden looking towards the terrace and residence.

From this brief overview of the history of the site and identification of existing landscape characteristics, the following summary tables compare the landscape characteristics to the National Register aspects of integrity to determine overall integrity of the cultural landscapes or gardens within which the boxwood plantings lie as a Colonial Revival era garden. See Tables 26-27.

Table 26 The integrity of the existing landscape characteristics of the boxwood-containing gardens (boxwood *parterre* garden and perennial garden) at Founders Memorial Garden.

Existing Landscape Characteristics	Integrity of Natural Systems & Features	Integrity of Spatial Organization	Integrity of Land Use	Integrity of Cultural Traditions	Integrity of Cluster Arrangement	Integrity of Circulation
Natural Systems and Features, Spatial Organization, Cluster Arrangement, Circulation, Topography, Vegetation, Buildings and Structures, Views and Vistas	Location, Setting, Feeling, and Association (4)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address land use.	Did not address cultural traditions.	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Location, Design, Materials, Workmanship, Feeling, and Association (6)
Integrity of Topography	**Integrity of Vegetation**	**Integrity of Buildings and Structures**	**Integrity of Views and Vistas**	**Integrity of Constructed Water Features**	**Integrity of Small-Scale Features**	**Integrity of Archeological Sites**
Location, Setting, Feeling, and Association (4)	Location, Setting, Design, Materials (some boxwood replacements with sympathetic boxwood species), Workmanship, Feeling, and Association (7)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Location, Design, Materials, Workmanship, Feeling, and Association (6)	Did not address constructed water features.	Did not address small-scale features.	Did not address archaeological sites.

Table 27 Assessment of the overall integrity of the boxwood and boxwood-containing gardens (boxwood *parterre* garden and perennial garden) at the Founders Memorial Garden.

Integrity of Location	Integrity of Setting	Integrity of Design	Integrity of Materials	Integrity of Workmanship	Integrity of Feeling	Integrity of Association	Overall Integrity
The garden is in its historic location and the boxwood are planted in their historic location(s) within the garden.	The garden and boxwood are not surrounded by their historic contextual setting.	Aside from the addition of the platform surrounding the pool, the garden maintains its historic design. The boxwood are planted in their historical design(s).	The gardens are planted with the original boxwood. The boxwood parterre has a few replacement areas with a sympathetic boxwood species.	Aside from the use of modern tools and equipment, the boxwood are maintained as they would have been historically.	The garden and boxwood retain integrity of feeling.	The garden and boxwood retain integrity of association.	The garden and boxwood retain overall integrity

Landscape Management

The Founders Memorial Garden is managed by Dr. Debra Mitchell, Founders Memorial Garden Curator/Instructor. With an undergraduate degree in biology, Dr. Mitchell began her career in horticulture working with the University of Georgia horticulture crew, later pursuing a career with the State Botanical Garden of Georgia where she held numerous positions involving public education. In conjunction with her horticultural career, Dr. Mitchell received a master's in science education along with a PhD in science education, after which she began teaching the subject in Athens public schools.

Dr. Mitchell oversees the care and maintenance of the historic Founders Memorial House and Garden. She is a certified Georgia Green Industry Association Landscape Specialist. Having been with the Founders Memorial Garden since June of 2021, Dr. Mitchell has been through two growing seasons in the garden and has read extensively on the garden's past maintenance and care. She is assisted in the garden by two landscape architecture student staff. The turnaround rate for these student positions are typically driven by the University's semester calendar and range from three to fifteen months. Dr. Mitchell's staff perform garden maintenance, under her direct supervision, based on seasonality and day-to-day tasks.

Cultivation of Boxwood

The boxwood garden at the Founders Memorial Garden is roughly one eighth of an acre and Dr. Mitchell is the primary person in charge of boxwood care. The historic *B. sempervirens* 'Suffruticosa' were planted in 1939, with the possibility of a few *B. sempervirens* replacements within the last thirteen years. Boxwood at the Founders Memorial Garden are located in the boxwood garden planted as a *parterre*, edging, and specimen shrubs. Additional specimen, foundational plantings, and hedges of boxwood are located in the perennial garden and in front

of the historic house. Aside from drought issues that have occurred in previous dry, hot summers, the boxwood at the Founders Memorial Garden have not had many issues regarding health and performance. In 2021, one specimen boxwood exhibited continued branch dieback, eventually leading to death, upon which Dr. Mitchell removed the boxwood. Another boxwood planted near the location of the removed boxwood is now exhibiting oddities. Dr. Mitchell believes this could be due to soil compaction from previous construction near the boxwood. Because of continual drainage issues in the perennial garden, Dr. Mitchell is uncertain if she will replace the removed boxwood.

The edges of the boxwood *parterre* garden are defined on one side by mature crape myrtle and pecan trees while the other side is defined by a smokehouse and wooden picket fencing. The mature vegetation along the garden edges have resulted in uneven sun exposure, with one side of the boxwood garden in moderate to dense shade and the other side in full sun to partial shade. The boxwood garden has moderately drained soils with a pH of 6.9 and receives supplemental watering via overhead irrigation if the garden has not received one inch of rainfall within a week.

The Founders Memorial Garden boxwood are mulched, fertilized, pruned, and thinned, with most of the maintenance occurring in spring. The boxwood are mulched with 2 inches of pine needles and receive a granular fertilizer application of 34-0-0 in the spring, late summer, and, if needed, in the fall. Additionally, the boxwood are pruned and thinned in the spring with an electric, steel hedging saw, and lightly pruned throughout the growing season when necessary, using hedging scissors. Prior to Dr. Mitchell's care, the boxwood had not received heavy pruning in over two years, and they have responded well to the hard prune they received this spring, along with the relatively uniform rainfall events that have occurred in the Athens area this

summer. The boxwood are protected from winter damage by avoiding pruning and fertilizing near predicted cold weather events.

Boxwood Blight

Dr. Mitchell has familiarized herself with the early stages of boxwood blight, understanding what the disease may look like if scouted, but her staff are not educated on boxwood blight. The Founders Memorial Garden has not had boxwood blight and does not currently have boxwood blight. With plans to become better-educated on boxwood blight, Dr. Mitchell conveyed that her only preventative measures for the disease currently consist of keeping the boxwood healthy and scouting for oddities. Dr. Mitchell, the Director of the Founders Memorial Garden, and others involved with the garden's management have discussed the possibility of creating a maintenance plan of action for boxwood blight but have not solidified what BMPs or publications they would consult for such a plan.

4.3 Chapter Summary

This chapter presented case studies of the eleven historic sites surveyed in Chapter 3. The content of each case study included: contextual research of the site's history and description; identification and description of landscape characteristics leading to an evaluation of integrity of the gardens that contain boxwood, and the boxwood themselves; and responses to site's horticulture, landscape management, and historic preservation practices extracted from the interviews of each garden manager. A summary of the key integrity findings across all case study sites are provided in the tables below.

Table 28 Table indicating which landscape characteristics were found intact in the case study sites.

Historic Site	Natural Systems & Features	Spatial Organization	Land Use	Cultural Traditions	Cluster Arrangement	Circulation	Topography	Vegetation	Buildings & Structures	Views & Vistas	Constructed Water Features	Small-Scale Features	Archeological Sites
Mount Vernon	Yes	Yes	Yes	NA	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA	NA
Biltmore Estate	Yes	Yes	NA	NA	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA	NA
Colonial Williamsburg	NA	Yes	NA	NA	Yes	Yes	NA	Yes	Yes	NA	Yes	NA	NA
Hills and Dales Estate	Yes	Yes	NA	NA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA
Carl Sandburg Home National Historic Site	Yes	Yes	NA	NA	Yes	NA	Yes	No	Yes	Yes	Yes	NA	NA
Montpelier	Yes	Yes	NA	Na	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA	NA
Stratford Hall	Yes	Yes	NA	NA	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA	NA
Swan House	Yes	Yes	NA	NA	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA	NA
Longfellow House	Yes	Yes	NA	NA	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA	NA
Peace field	Yes	Yes	NA	NA	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA	NA
Founders Memorial Garden	Yes	Yes	NA	NA	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA	NA

Table 29 Table indicating the overall integrity of the garden and boxwood at each case study site.

Historic Site	Location	Setting	Design	Materials	Workmanship	Feeling	Association	Overall Integrity
Mount Vernon	Yes	Yes	Yes	Yes	Yes	Yes	Yes	The garden and boxwood retain overall integrity.
Biltmore Estate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	The garden and boxwood retain overall integrity.
Colonial Williamsburg	Yes	No	Yes	Yes	Yes	Yes	Yes	The gardens and boxwood retain overall integrity.
Hills and Dales Estate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	The garden and boxwood retain overall integrity.
Carl Sandburg Home National Historic Site	Yes	Yes	No	No	Yes	Yes	Yes	The garden retains overall integrity, but not integrity of boxwood.
Montpelier	Yes	Yes	Yes	Yes	Yes	Yes	Yes	The garden and boxwood retain overall integrity.
Stratford Hall	Yes	Yes	Yes	Yes	Yes	Yes	Yes	The garden and boxwood retain overall integrity.
Swan House	Yes	Yes	Yes	Yes	Yes	Yes	Yes	The garden and boxwood retain overall integrity.
Longfellow House	Yes	Yes	Yes	Yes	Yes	Yes	Yes	The garden and boxwood retain overall integrity.
Peace field	Yes	Yes	Yes	Yes	Yes	Yes	Yes	The garden and boxwood retain overall integrity.
Founders Memorial Garden	Yes	No	Yes	Yes	Yes	Yes	Yes	The garden and boxwood retain overall integrity.

It was found that, generally, all case study sites have the following landscape characteristics: natural systems and features, spatial organization, cluster arrangement, circulation, topography, vegetation, buildings and structures, and views and vistas. Only three of the case study sites have constructed water features. From the integrity evaluation, this author determined that ten of the eleven case study sites retained overall integrity of the gardens containing boxwood and of the boxwood themselves. One case study site (Carl Sandburg Home

National Historic Site) retained overall integrity of the garden, however, because the historic boxwood have been removed and have not been replaced, it does not retain overall integrity of the boxwood. The key integrity findings from this chapter, along with the information regarding the site's horticultural, landscape management, and historic preservation practices, will be utilized in Chapter 5 which will synthesize the research results from Chapters 2-4 to create a set of research findings that ultimately answer the research question.

CHAPTER 5

ANSWERING THE RESEARCH QUESTIONS

"Protecting the longevity of boxwood in historic American gardens would ensure an irreplaceable piece of our gardening history and heritage is preserved." Keeli Windham

The statement above, written in the first chapter of this thesis, has been the guiding direction throughout this research to understand the relationship between boxwood blight and historic American gardens. Although the overarching research question for this thesis was "*What are the current best management practices of boxwood blight that are being applied to historic American gardens, encompassing Colonial to Colonial Revival eras of garden design, and how does it affect the authenticity/integrity of the historic landscape?"* there were numerous sub questions that also needed to be answered.

Chapter 2 presented critical context to answer the sub questions: *How has boxwood generally been used in garden design throughout history? How has boxwood generally been used in American gardens throughout history? What are the horticultural industry standards for boxwood cultivation? What are the standards for best management practices for boxwood blight? What are current best management practices for historic preservation and cultural landscape preservation, emphasizing authenticity and integrity?* Yet, even with these answers, research gaps were recognized leading to a survey of historic site managers, horticulture industry professionals, and landscape designers and cultural landscape experts, to fill in the missing information.

Chapter 3's summary of those survey responses answered the sub questions unable to be answered by the traditional secondary research undertaken in Chapter 2. The sub questions asked, and answered, in Chapter 3 included: *What management and maintenance are boxwood receiving at historic sites? What are their cultivation conditions? Do historic sites know about boxwood blight? Are boxwood blight best management practices being applied to historic gardens? If so, what BMPs are they implementing and have they worked? What role does historic preservation play at these sites and does that affect boxwood cultivation?* Yet, because this chapter collated all the historic site managers' answers into one collective answer for all of the sub questions, it was decided that each historic site deserved individual attention, as occurred in Chapter 4.

The case studies in Chapter 4 presented detailed information regarding horticultural practices, landscape management, and historic preservation at historic gardens as well as a brief history and description of the boxwood at each site. Using this information, existing landscape characteristics were identified, and overall integrity of each case study's cultural landscape or garden was assessed which provided the answer to the outstanding question, *How are these management decisions ultimately affecting the historic landscape?*

Organized by topical areas *landscape management*, *horticulture*, and *historic preservation*, this chapter will provide a detailed synthesis of the research to answer the overarching thesis research question.

5.1 Landscape Management

> *In what ways are **current best management practices of boxwood blight** being applied to **historic American gardens, encompassing Colonial to Colonial Revival eras of garden design,** and how does it affect the authenticity/integrity of the historic landscape?*

This section will address the landscape management portions of the research question – ***current best management practices of boxwood blight*** and ***historic American gardens,***

encompassing Colonial to Colonial Revival eras of garden design, including the sub questions that were necessary to provide context for this portion of the research question.

How has boxwood generally been used in garden design throughout history? How has boxwood generally been used in American gardens throughout history?

Chapter 2 provided a brief history of the use of boxwood in ancient gardens, European gardens, and American gardens. Although European precedent influenced the use of boxwood in Colonial American gardens, boxwood use was modified by early settlers to reflect their functional and utilitarian gardens that were characteristic of the early Colonial era. In Colonial gardens of America, boxwood was planted as hedges, edging, and *parterre* gardens in various geometric and symmetrical shapes. During the nineteenth century, boxwood *parterres* were utilized in the formal and geometric gardens of the wealthy Southern elite as a physical embodiment of their perceived dominance over nature. Boxwood was also used during this time planted in hedges for utilitarian purposes. Following the Reconstruction Era, celebration of the nation's centennial birthday revitalized an interested in Colonial American culture. This resulted in the use of boxwood once again in *parterre* garden designs and as hedging and edging. However, these Colonial Revival gardens depicted high style ornamentation that are not accurate to the functional and utilitarian gardens of early American settlers. Following the Colonial Revival era, the use of boxwood has endured in contemporary garden design for its form, function, and fashion in topiary, hedging, edging, specimen plantings, and *parterre* gardens. From this brief history in Chapter 2, it was established that boxwood has been used as a functional and aesthetic plant as well as to emphasize cultural values through various garden design forms including hedges, edging, specimen plantings, topiary, and *parterres*.

What management and maintenance are boxwood receiving at historic sites?

In the historic site surveys from Chapter 3, each site manager was asked a series of questions pertaining to boxwood maintenance and boxwood best management practices. It is understood from Chapter 2 that boxwood has been used throughout history for a variety of reasons including its ability to be sheared and pruned to various heights, forms, and shapes as well as its low maintenance. Hence, questions were asked to understand current boxwood needs and requirements in terms of *level* of maintenance as well as the *kinds* of maintenance in terms of specific shearing and pruning. Survey questions included: *Are there specific staff in charge of boxwood care? What kind of maintenance do the boxwood need?* From the Chapter 3 survey results, this author determined that boxwood are still considered a low maintenance plant as there are no specific staff directly charged with boxwood care at the sites surveyed. The survey results did show that the majority of the historic site managers oversee boxwood care and maintenance broadly. The Chapter 3 survey results, as well as the case study narratives in Chapter 4, revealed that current boxwood maintenance at historic sites has remained relatively unchanged from historic maintenance. Boxwood are still pruned and sheared to specific heights, forms, and shapes although the types of tools used to perform this maintenance vary and contemporarily include electric shears, gas-powered hedge trimmers, hand pruners, and traditional shears.

From the Chapter 2 research, the best management practices to optimize boxwood health when used in tandem with proper cultivation conditions include proper pruning, shearing, thinning, fertilizing, mulching, and supplementing water during drought episodes or hot summer months. From the research, it is understood that pruning and shearing, as well as fertilizing and supplementing water, all have appropriate implementation times. Thus, the survey questions were created to reflect the best management practices and their proper implementation times.

Survey questions included: *Do you have any special care/management specific to the boxwood? How often and when is the maintenance performed? Do you fertilize the boxwood? If so, what do you fertilize with and how often? Are the boxwood mulched? If so, what mulching material is used and approximately how thick is the mulch layer? Do you ever need to supplement water?* From the survey results in Chapter 3, as well as the case studies in Chapter 4, this author discovered that the management of boxwood at historic sites is highly varied, often depending on the way in which boxwood is used at the historic site, like hedging, edging, specimen, *parterre*, etc. For the most part, boxwood management in terms of pruning and shearing is performed in early to late spring, early fall, and/or in winter when the plant is dormant. Thinning was not common, as six of the eleven historic sites implement thinning regularly as a best management practice. Five historic sites apply fertilizer to their boxwood yearly or every other year. Seven of the historic sites do not mulch due to historical inaccuracy, but the four that do mulch maintained 1-2" thick mulch layer. Eight of the eleven historic sites provide supplemental water to their boxwood.

What are the standards for best management practices for boxwood blight?

To understand the *application* of boxwood blight best management practices, it was necessary to first understand current *standards* for boxwood blight best management practices. Chapter 2 provided a brief introduction to boxwood pest and diseases, including a detailed narrative of boxwood blight and contemporary boxwood blight best management practices. There have been many guidance documents outlining standards for boxwood blight BMPs since the disease's discovery in 2011 including publications from the Connecticut Agricultural Experiment Station and the Virginia Polytech Institute and State University. The most current and comprehensive guidance for BMPs was published by the Horticultural Research Institute

(HRI) in 2020. Because the HRI's boxwood blight BMPs build upon previous BMPs published by the horticulture industry and research extension publications, they represent the standard BMPs for boxwood blight as summarized below:

1. Train personnel for disease scouting and biology, sanitation, and management.
2. Purchase plant material from reputable suppliers who adhere to a boxwood blight compliance agreement.
3. When installing new boxwood, select varieties tested and known to be more tolerant and less susceptible to boxwood blight.
4. Mulch boxwood plantings.
5. Sanitize tools, equipment, shoes, clothing between plantings. 70% alcohol and other products are recommended sanitizers.
6. Shearing boxwood is not recommended. Pruning to encourage air flow is ideal. Avoid flat surfaces. Remove lower branches that touch the ground.
7. Avoid working in boxwood plantings when foliage is wet.
8. All infected plant material should be double bagged and disposed of in an approved landfill, burned, or buried at least 10" below the soil surface.
9. Do not compost infected plant material.
10. Fungicides are preventive only and will not cure an infected plant.[202]

[202] Cubeta et al., *Best Management Practices: Boxwood Health Production and Landscape Management* pg 17

Table 30 Summary of the use of boxwood and its maintenance and management at historic sites.

Historic Site	Historic Boxwood On Site	Historic Boxwood Age	Historic Boxwood Use	Pruning, Shearing, and/or Thinning	Pruning at the appropriate time	Fertilizer	Fertilizer at the appropriate time	Mulch (type and height)	Supplemental Water
Mount Vernon	Yes	Clone of 1700s box	Specimen & parterre	Shearing & Thinning	Yes	Yes	Yes	Ground leaves and compost .24-.50'	Over-head irrigation
Biltmore Estate	Yes	100-120	Specimen	Boxwood allowed to grow naturally	NA	No	NA	Leaf mulch <1"	No
Colonial Williamsburg	Yes	90+	Parterres, edging, hedges, and topiary	Pruning, Shearing & Thinning	Yes	Yes	Yes	Not historically accurate	Drip irrigation and soaker hoses
Hills and Dales Estate	Yes	80+	Parterres, foundational, specimen, hedges, container, and espalier	Pruning, Shearing & Thinning	Yes	No	Yes	Not historically accurate	Over-head irrigation
Carl Sandburg Home National Historic Site	Yes	150+ and 200-300	Hedges & specimen	No	NA	No	NA	Not historically accurate	No
Montpelier	Yes	150-170	Hedges, specimen, topiary/tree form, edging, allee	Pruning, Shearing & Thinning	Yes	Yes	Yes	Not historically accurate	Soaker hoses
Stratford Hall	Yes	170+ and 207-212	Hedges, specimen, edging	Pruning & Thinning	Yes	No	Yes	No mulch	Hand watering
Swan House	Yes	90+	Foundational & parterre	Not currently	NA	No	NA	Pine nuggets 1"	No
Longfellow House	Yes	100 & 120-130	Edging	Shearing & Thinning	Yes	No	NA	Not historically accurate	Hand watering
Peace field	No	NA	Edging	Shearing & Thinning	Yes	No	NA	Not historically accurate	Hand watering
Founders Memorial Garden	Yes	250	Parterre, edging, specimen	Shearing & Thinning	Yes	No	NA	Pine needles 2"	Over-head irrigation

Summary Thoughts and Recommendations for Landscape Management

The Chapter 3 and 4 research revealed that boxwood are maintained in historic gardens as low-maintenance plants with pruning, shearing, and thinning depending on how the boxwood is used at the historic site. The application of fertilizer is inconsistent and thinning to improve sunlight penetration and airflow does not seem to be common. The research did show that most historic sites provide supplemental water, but not all. Utilization of mulch is scarce due to a site's desire to use historically accurate vegetation maintenance techniques. Mulching is not a historically accurate maintenance technique for Colonial and Colonial Revival eras. However, boxwood best management practices indicate that proper mulching can protect the shallow-growing boxwood roots, insulating them in the winter and conserving moisture during summer and drought. This author recommends that historic sites revisit best management practices for boxwood to identify ways in which they can improve their boxwood health, even if it means the use of historically inaccurate mulching techniques. By applying and utilizing all boxwood best management practices in tandem with optimal cultivation conditions, boxwood health can be maximized, resulting in a more resilient plant that can better defend itself from pests and diseases such as boxwood blight.

5.2 Horticulture

> ***In what ways are current best management practices of boxwood blight being applied to historic American gardens, encompassing Colonial to Colonial Revival eras of garden design****, and how does it affect the authenticity/integrity of the historic landscape?*

What are the horticultural industry standards for boxwood cultivation?

The horticulture industry standards for boxwood cultivation was discussed in Chapter 2. It was discovered that there are three critical cultivation requirements for boxwood longevity which include proper sun exposure, soil drainage, and soil pH. Utilizing boxwood best management practices can further contribute to boxwood growing success when cultivation

conditions are optimal. Boxwood best management practices encompass proper fertilizing, mulching, pruning, thinning, and/or shearing, and supplementing water during drought episodes.

Because boxwood is found growing in the wild as an understory shrub, it prefers sites with part sun and part shade exposure, with some species and cultivars tolerating more sun than shade. Generally, all boxwood will grow in shady areas, however, sites with morning sunlight and afternoon shade are optimal for boxwood. Boxwood thrive in well-drained soils with an optimal soil pH range of 6.8 to 7.5. Poorly drained soil is a common underlying culprit for many boxwood problems, as oversaturated roots can be detrimental to boxwood health. When the soil is at the optimal pH range, little fertilization is necessary because the soil nutrients are most available. However, if fertilization is needed based on soil test results, it is recommended to apply in the fall to encourage root growth which can support the new surge of foliage that will occur in spring. Fertilizer is best applied above the mulch layer at the drip line to protect the shallow growing boxwood roots from being burned by the fertilizer. Applications of fertilizer in late summer or early fall can result in a flush of delicate new foliage which can be left exposed to winter damage.

Not only can pruning and shearing boxwood achieve a specific form, height, and shape, but pruning produces new bursts of foliage. Continual pruning and shearing can result in a thick leaf layer at the topmost portion of the plant, leaving the interior of the plant densely shaded with poor airflow. Thus, it is critical to thin boxwood to promote light penetration and airflow into the interior by pruning out short branches to create pockets. Likewise, older boxwood that have become overgrown may be subject to a rejuvenation pruning to produce a healthy flush of new foliage; however, it is imperative that one third of the boxwood be left when performing this pruning technique. In any case, it is necessary to prune in advance of cold temperatures as

improper timing of pruning and shearing can result in new, tender foliage being exposed to damaging weather.

Boxwood are relatively drought tolerant after they become well-established, however, this does not make them immune to drought stress. Because boxwood leaves do not show typical wilting symptoms of drought stress, it is critical to monitor soil moisture and provide supplemental water during drought episodes or hot summer months. Established boxwood require around one inch of water every ten days beginning in early spring until late fall. Maintaining a mulch layer can help retain soil moisture and protect boxwood roots, as well as add organic matter and nutrients into the soil as the mulch decomposes. It is critical to not over mulch as this can suffocate roots so maintaining a layer of around ½ to 1 inch thick of pine needles, hardwood bark, or softwood bark is best.

Achieving the optimal cultivation conditions and applying best management practices can produce an overall healthy boxwood plant which will be less susceptible to pest and disease issues.

What are their cultivation conditions in (historic gardens)?

In the Chapter 3 surveys for historic sites, questions were asked based on the three critical cultivation requirements outlined in Chapter 2: *How much sun does the boxwood receive? Is the soil well-drained? Have you tested the soil pH?* The Chapter 3 survey results showed that nine of the eleven historic sites have boxwood planted in full sun, with the other two having the optimal partial sun and partial shade exposures. Ten of the historic sites have well-drained soil, with one having moderately draining soil. Only four sites have optimal soil pH ranges, with four below the optimal range, and three having unknown pH levels.

Do historic sites know about boxwood blight?

In the historic site surveys from Chapter 3, each interviewee was asked *Do you know about boxwood blight?* with a follow-up question of *What is your understanding of boxwood blight?* From the Chapter 3 survey results, it was determined that all eleven historic site managers know about the disease generally but their understanding of and familiarity with boxwood blight was varied. Their familiarity was categorized as being high, moderate, and low. The sites with low familiarity know what boxwood blight is in terms of it being a fungal disease, understand that it is a highly transferrable disease with limited options for remediation, and may be able to describe few symptoms. The moderate familiarity with boxwood blight characterizes historic sites that are educated on how the disease is spread as well as disease symptoms and how to identify the disease. The sites with high familiarity are knowledgeable about how the disease is spread including optimal climatic conditions for spread, how to identify the disease, what to scout for, as well as the lifecycle of the disease and phases of infection. From these two survey result questions from Chapter 3, this author determined that, of the eleven historic sites, six were highly familiar with the disease, two were moderately familiar, and three had low familiarity.

Are boxwood blight best management practices being applied to historic gardens? If so, what BMPs are they implementing and have they worked?

From the survey results from Chapter 3, this author was able to determine the application of boxwood blight BMPs in historic gardens and their success. In Chapter 3, survey questions that were asked included: *Have you had boxwood blight, and/or do you currently have boxwood blight? When did you first notice boxwood blight? How bad has it/had it intruded? What actions have been taken? How are you controlling the spread of boxwood blight in the garden? Are you managing/taking preventative measures for boxwood blight?* Ten of the eleven historic sites are implementing best management practices for boxwood blight. It is important to note that seven

of the historic sites are implementing BMPs to *prevent* boxwood blight from entering the site while three historic sites that currently have boxwood blight are implementing BMPs to *manage* boxwood blight on site.

Of the seven historic sites that are implementing BMPs to *prevent* the introduction of boxwood blight on site (Mount Vernon, Biltmore, Montpelier, Stratford Hall, Longfellow House, Peace field, & Founders Memorial Garden), five are prohibiting any introduction of outside boxwood on site, six of the sites scout daily for the disease, and three implement sanitation practices. Stratford Hall prohibits the use of outside tools on site. Most of these sites implement a combination of no outside boxwood, scouting, and/or sanitation measures as preventative BMPs for boxwood blight. As of August 2022, these seven sites are boxwood blight free.

Three of the eleven historic sites currently have boxwood blight while two of the eleven had boxwood blight but do not currently. The two sites that had boxwood blight - Mount Vernon and Carl Sandburg - performed complete removals of the infected plant from the site and as of August 2022, both sites are blight free. The three sites that currently have blight - Colonial Williamsburg, Hills and Dales, and Swan House - have been implementing fungicide regimes, daily scouting for the disease, and sanitation practices including tools and personal gear (shoes, clothes, etc.) since the discovery of blight on site. The gardens were infected at different times with Swan House being the oldest case of boxwood blight discovery in 2015/2016, Hills and Dales Estate in December 2020, and Colonial Williamsburg in 2021. Both Hills and Dales and Colonial Williamsburg have quarantined their infected gardens. Additionally, Colonial Williamsburg has applied various other BMPs, which have not proved successful, including the application of sterilant, antidesiccants, and bioremediation plants. As of August 2022, boxwood blight has continued to reinfect the gardens at all three sites.

The Chapter 3 survey results show that historic sites are applying BMPs but that the amount of BMPs being applied are varied. For the sites that have no blight and are applying BMPs preventatively, they consist of no outside boxwood, scouting, and/or sanitation measures. The sites with boxwood blight are applying similar BMPs, with the difference being the application of fungicides, generally. The research, which analyzed boxwood cultivation conditions, care, and application of boxwood blight BMPs on the East Coast, has shown that the BMPs being applied to manage boxwood blight are not effective as each of the gardens with blight have continued to experience the spread of the disease and continual reinfection. In contrast, the research has shown that the preventative application of BMPs could be effective. It must be stated that preventative BMPs *could be* effective because of the management practices themselves, or because the historic sites have been lucky that the disease has not yet been introduced on site.

Table 31 Summary of boxwood cultivation conditions and application of boxwood blight best management practices.

Historic Site	Sun Exposure	Soil Drainage	Soil pH	Boxwood Blight Trained Staff	Familiarity of Boxwood Blight	BMPs	Removal and/or Remediation	When Boxwood Blight was scouted	Boxwood Blight Status
Mount Vernon	full sun, partial sun, full shade	well-drained	6.5-6.7	Yes	High	Preventative (scouting, no outside boxwood)	Removal	April/May 2021	No Blight
Biltmore Estate	Part sun/shade	well-drained	acidic	Yes	High	Preventative (scouting, no outside boxwood)	NA	NA	No Blight
Colonial Williamsburg	full sun, partial sun, full shade	well-drained	acidic	Yes	High	Management (fungicides, sanitation, scouting, sterilant, antidesiccant, quarantine)	Removal and Remediation	Jul-21	Blight
Hills and Dales Estate	full sun, partial sun, full shade	well-drained	acidic	Yes	High	Management (fungicides, sanitation, scouting, quarantine)	Removal	Dec-20	Blight
Carl Sandburg Home National Historic Site	Full sun	well-drained	Unknown	No	Low	None	Removal	Mar-21	No Blight
Montpelier	full sun	well-drained	unknown	No	Moderate	Preventative (sanitation, scouting, no outside boxwood)	NA	NA	No Blight
Stratford Hall	Part sun/shade	well-drained	6.5+	No	Low	Preventative (no outside tools)	NA	NA	No Blight
Swan House	Full sun	well-drained	Unknown	Yes	High	Management (fungicides, sanitation, scouting)	Removal and Remediation	2015/2016	Blight
Longfellow House	Full sun	well-drained	acidic	No	Low	Preventative (sanitation, no outside boxwood)	NA	NA	No Blight
Peace field	Full sun	well	6.5	No	Low	Preventative (sanitation, scouting, no outside boxwood)	NA	NA	No Blight
Founders Memorial Garden	full sun, partial sun, full shade	moderately-drained	6.9	No	Low	Preventative (scouting)	NA	NA	No Blight

Summary Thoughts and Recommendations for Horticulture

This author recommends that historic sites revisit the three critical cultivation conditions for boxwood and address each cultivation condition at their historic site. Most of the historic sites from this research indicated that their boxwood grows in well-drained soils, with sun exposure and pH levels being highly variable. Remediating soil pH to the optimal range of 6.8-7.5 can be easily implemented and greatly improve the health of boxwood. Sun exposure is a difficult condition to remedy, especially considering the constraints of design intent, historic preservation, and garden representation. But, if the boxwood seems to be struggling in current sun exposure conditions, exposure could be improved with the addition of temporary shade structures during the most intense times of sun exposure during the summer and winter. The most optimal way to remedy sun exposure is to plant shade-giving trees. Again, this author recognizes the constraints within which historic sites operate, so making sure to address soil drainage and pH and utilizing all boxwood best management practices would be the most easily implemented to improve boxwood health and increase resiliency, if exposure cannot be remedied.

There is a strong disparity in the level of familiarity of boxwood blight at historic sites as only five of the eleven historic sites have trained and educated staff. This author recommends that historic sites with boxwood educate themselves on boxwood blight and boxwood blight BMPs by utilizing the many horticultural industry publications available to them online. Additionally, this author hopes that the research presented in this thesis will further support the knowledge gap in the education of boxwood blight at historic sites by providing a clear understanding of the disease as well as the various prevention management options available.

Historic American gardens are applying best management practices in order to prevent boxwood blight or to manage boxwood blight. The research has shown that boxwood blight BMPs that are being applied at historic sites are not effective in ***managing*** the disease. Sites that have boxwood blight are implementing BMPs to manage boxwood blight which include fungicide applications, sanitation, scouting, excluding new boxwood from the site, and quarantining gardens. Three historic gardens from this research have experienced the spread of the disease and continual reinfection in their gardens, despite applying all of the optimal boxwood blight BMPs that are recommended by the horticultural industry to manage the disease. In contrast, the research shows that the application of BMPs ***preventatively*** may be effective. Preventative boxwood blight BMPs, which are being applied to sites with no boxwood blight, include sanitation, scouting, and excluding new boxwood from the site. The application of preventative BMPs may be effective because the BMPs are successful or because the sites have been lucky that the pathogen has not yet been introduced on the site

This author recommends that historic sites need to focus on optimizing boxwood health to increase resiliency to pest and diseases by improving cultivation conditions and applying boxwood best management practices. In terms of preventative and managerial boxwood blight BMPs, this author suggests implementing a strict sanitation regime which would involve sanitizing all tools after each boxwood plant when performing maintenance, as well as footbaths to sanitize shoes and washing all other personal gear in hot water after working with boxwood. Additionally, historic sites should implement a daily disease scouting regime. Lastly, the horticultural industry standard BMPs to manage boxwood blight need to be revisited and reevaluated to reflect the research result and current climate of boxwood blight in historic sites.

5.3 Historic Preservation

In what ways are current best management practices of boxwood blight being applied to historic American gardens, encompassing Colonial to Colonial Revival eras of garden design, ***and how does it affect the authenticity/integrity of the historic landscape?*** *What are current best management practices for historic preservation and cultural landscape preservation, emphasizing authenticity and integrity?*

In Chapter 2, current best management practices for historic preservation and cultural landscape preservation were outlined. The National Register of Historic Places (NRHP), established in 1966, is a list of historically significant resources including buildings, objects, sites, and districts which are regarded as being deserving of preservation. While landscapes are not listed as a historic resource type, they can be nominated to the National Register as a site or district. To be nominated to the National Register, the historic resource must be 50 years or older, its *significance* must be justified to meet one of four criteria of evaluation, and it must exhibit its *integrity* or *authenticity*. The four National Register significance evaluation criteria of a historic resource are – *Event, Person, Design/Construction,* and *Information Potential*. The *significance* recognizes the historic resource's importance while a historic resource's *integrity* determines whether it retains authenticity. There are seven aspects of integrity as defined by the National Register – *location, setting, design, workmanship, materials, feeling,* and *association* – which help to determine if tangible historic resources retain authenticity.

Since 1966, the profession of historic preservation has grown to recognize various other types of historic resources that were previously not recognized, including cultural landscapes. Because the National Register nomination process was developed with architecture and archeology regarded as the standard types of historic resources to be nominated, evaluative systems were developed to make these new historic resource types compatible with the existing nomination process. The National Park Service Cultural Landscape Program created an evaluation system which used Landscape Characteristics to describe the characteristics of each

historic period(s) of the cultural landscape which can help reveal the cultural value of a landscape. Understanding and comparing the landscape characteristics of each historic development period to the existing landscape characteristics can help identify the integrity of the cultural landscape. The same National Register nomination process is followed for cultural landscapes with the addition of the 13 landscape characteristics – *Natural Systems and Features, Spatial Organization, Land Use, Cultural Traditions, Cluster Arrangement, Circulation, Topography, Vegetation, Buildings and Structures, Views and Vistas, Constructed Water Features, Small-Scale Features, and Archeological Sites* - to assist in evaluating the integrity. For cultural landscapes, vegetation is a considerably important landscape characteristic and is considered a material when evaluating integrity because of its dynamic quality. The presence of historic plant materials increases the integrity of a cultural landscape, but the absence of historic plant materials does not discount its integrity, if the vegetation has been replaced with the same species or sympathetic species. Suitable replacement vegetation should be guided by the historic design intent of the original designer's specifications of the physical appearance of a landscape and the role of vegetation within that landscape.

From Chapter 2, historic preservation and cultural landscape preservation best management practices, emphasizing authenticity and integrity, were discussed through the process of nominating a historic resource to the National Register. In understanding landscape characteristic in assisting the process of assessing the integrity of a cultural landscape, the importance of management of vegetation and the designed landscape, guided by the design intent, was established. This research focused on historic designed landscapes and boxwood within that landscape, emphasizing the concept of design intent.

What role does historic preservation play at these sites and does that affect boxwood cultivation?

From the survey results in Chapter 3, along with the case studies presented in Chapter 4, this author found that not all historic sites are focused on historic preservation. In Chapter 3, historic site managers were asked *What is the mission/vision of the historic site?* This question was asked to determine the role of historic preservation at the site based on its inclusion in their mission/vision of the site. Of the eleven historic sites, four have preservation in their mission/vision, four have representation, two have preservation-interpretation, and one has preservation- representation. Regardless of the mission/vision of the historic site, whether it be representation or preservation-based, the research shows that the role of preservation does not directly relate to boxwood cultivation, as it would seem that boxwood are cultivated similarly across all sites, regardless of the role of historic preservation

How are these management decisions ultimately affecting the historic landscape?

The way in which the garden is depicted guides the management decisions of the historic landscape and boxwood at each survey site. From the Chapter 3 surveys and Chapter 4 assessment of significance, it was determined that each historic site is focused on depicting the garden/cultural landscape one of two ways, generally: a combination of design periods (Hills and Dales, Montpelier, Stratford Hall, Longfellow House, Peace field, Founders Memorial Garden) or one singular design period (Mount Vernon, Biltmore Estate, Colonial Williamsburg, Carl Sandburg, Swan House). In each of these gardens, boxwood plays a role in the design and the way in which the garden is depicted, as such determines boxwood management and the historic landscape management as a whole. From the research, this author discovered that the most impactful way in which boxwood blight management decisions have affected the historic landscape is the removal and replacement of historic boxwood. At sites where boxwood removal

and replacements have occurred it was out of necessity to control disease/pest issues, including boxwood blight, as well as issues with cultivation conditions. Of the eleven historic sites, six have removed some of the historic boxwood, with two having to completely remove boxwood from the site. Of the six that have some historic boxwood removed, four have replaced the boxwood with sympathetic boxwood species and two have plans to replant with boxwood sympathetic species. The two sites with some boxwood removals are unsure if they will replant with boxwood due to boxwood blight pressures. The landscape that had complete boxwood removed because of boxwood blight, does not retain integrity of the boxwood, according to National Register standards. The research has shown that the management decisions regarding boxwood removal and replacements can directly affect the historic landscape's overall integrity, and if boxwood are not replaced, reduce the cultural landscape's overall integrity.

Table 32 Summary of the historic site depiction, change, and overall integrity.

Historic Site	Garden Design Period(s)	Garden Depiction	Site mission	Change to the cultural landscape & boxwood based on management decisions	Overall Integrity
Mount Vernon	18th century	Depicted as it would have been during George Washington's time in the 18th century	Preservation + Representation	Historic boxwood removal and replacements with sympathetic boxwood species.	The garden and boxwood retain overall integrity
Biltmore Estate	Late 19th century	Depicted as it would have been during George Vanderbilt's time in the late 19th century	Preservation	Added walkway, planting with improved cultivars of the historic variety matching design intent	The garden and boxwood retain overall integrity
Colonial Williamsburg	18th + 20th centuries	Depicted as a combination of its 18th and 20th century garden designs	Representation	Some historic boxwood removal	Ludwell Paradise does not retain boxwood integrity - all other gardens and boxwood retain overall integrity
Hills and Dales Estate	19th + early 20th centuries	Depicted as a combination of its 19th and early 20th century garden designs	Preservation	Some historic boxwood removal	The garden and boxwood retain overall integrity
Carl Sandburg Home National Historic Site	19th + 20th centuries	Depicted as it would have been during Carl Sandburg's time in the 20th century	Representation	Historic boxwood removal	The garden retains overall integrity, but does not retain integrity of boxwood.
Montpelier	19th + 20th centuries	Depicted as a combination of its 19th and 20th century garden designs	Representation	No change	The garden and boxwood retain overall integrity
Stratford Hall	18th + 20th centuries	Depicted as a combination of its 18th and 20th century garden designs	Preservation	Some historic boxwood removal	The garden and boxwood retain overall integrity
Swan House	20th century	Depicted as it would have been during the Inman families' time in the 20th century	Preservation + Interpretation	Added walkway, removal of historic boxwood and replacement with non-sympathetic boxwood species, planting with improved cultivars of the historic variety	The garden and boxwood retain overall integrity
Longfellow House	18th + 19th + 20th centuries	Depicted as a combination of its 19th + 20th century garden designs	Preservation + Interpretation	Historic boxwood removed and replaced with sympathetic boxwood species, planting with cultivars selected to match historic plant	The garden and boxwood retain overall integrity
Peace field	18th + 20th centuries	Depicted as a combination of it's 18th and 20th century garden designs	Representation	No change	The garden and boxwood retain overall integrity
Founders Memorial Garden	20th century	Depicted as a 20th century garden design	Preservation	Added walkway, some historic boxwood removed and replaced with sympathetic boxwood species	The garden and boxwood retain overall integrity

*Summary Thoughts and Recommendation*s on Historic Preservation

Some of the historic sites in this research are more focused on preserving the garden's historical appearance as a whole, rather than preserving the individual historic boxwood plant. For landscape preservation it is important to address both the individual feature (plant), and the garden as a whole (design intent). At some of these sites, the historic boxwood are managed under stressful and non-optimal cultivation conditions because of the historic design of the garden. This is evident in situations where the historical boxwood are planted in full sun and are not mulched, amongst other factors. There is a noticeable tension at the historic sites in delineating the site's primary goal as preservation-focused or horticulture-focused. In remediating this tension, historic sites should determine when preservation is the best primary goal and when horticulture should take precedence as the primary goal for the overall historic site. It would seem that at most historic sites the physical representation and depiction of the garden as a whole (preservation) takes precedent over the health of the boxwood (horticulture). Unfortunately, that approach directly affects the preservation of the historic boxwood as an important material, thus negatively impacting integrity of the individual plant. The removal and replacement of boxwood due to stressful cultural conditions can negatively impact the integrity of the boxwood and garden, yet are acceptable by preservation standards, recognizing the dynamic nature of vegetation, as long as the replacement is sympathetic to the design intent. In these instances, slowly declining boxwood health may result in a culturally stressed plant which leads to a high susceptibility to pest and diseases, like boxwood blight. The primary step in remediating this is to address boxwood cultivation conditions and applications of boxwood best management practices. The secondary step in remediating this is the propagation of historic boxwood for future replacement plants. When historic garden design as a whole takes

precedence over the individual boxwood, and replacement becomes inevitable, having a propagated cutting of the original plant material can act as insurance for the integrity of the historic landscape, and integrity of the boxwood. Many of these historic sites retain original boxwood. However, not all historic sites are propagating their historic boxwood. This author feels strongly that all historic sites with original plant material should be propagating their boxwood as a precaution to the possibility of their destruction from stressful cultural conditions and/or disease like boxwood blight as well as provide insurance for historic integrity. Propagating the historic boxwood is a way to physically preserve an irreplaceable piece of the historic site. Ultimately, the historic sites from this research were not strictly focused on historically preserving their gardens/cultural landscapes as much as they were focused on the garden's targeted depiction, which directs the management of the garden and the boxwood.

5.4 Chapter Summary

The intent of this chapter was to synthesize all the research and analysis, to ultimately prove that the overarching research question was indeed answered. Compiling the findings of Chapters 2, 3, and 4, guided by the desire to *protect the longevity of boxwood in historic American gardens*, recommendations were made within the topical areas of landscape management, horticulture, and historic preservation.

Through this process the research question has indeed been answered. Yet, while this research has shown that preventative BMPs are successfully implemented at several important historic sites, current BMPs to manage boxwood blight need to be reassessed as this research indicates that they are ineffective as several historic sites. Further, there is room for more

guidance on the decision-making process regarding the relationship between mission/vision and boxwood maintenance. As a stop gap measure, this author recommends the following:

- Historic sites should evaluate the three critical boxwood cultivation conditions, addressing those that are not optimal, when applicable.
- In tandem with proper cultivation conditions, all boxwood best management practices should be implemented at historic sites. Improving the boxwood environment and providing optimal care will improve boxwood health to create a more resilient plant as a preventative measure for boxwood blight.
- Historic sites should utilize the multitude of publications regarding boxwood blight and boxwood blight BMPs to educate themselves on this devastating disease as understanding how to properly scout, identify, and apply preventative BMPs could be a determining factor in the future of their historic boxwood.
- Historic sites should increase their sanitation and scouting regimes to stay ahead of the disease as much as possible as the research shows that preventative BMPs may be an effective way to prevent the introduction of the disease.
- Historic sites should propagate their historic boxwood as insurance for preserving the site's historic integrity in the situation that replacement is inevitable, especially considering the pressures of boxwood blight.
- Boxwood blight BMPs need to be revisited or created anew for sites that currently have boxwood blight. In writing these new BMPs, factors like varying geographic locations/climes which have proven to directly affect disease pressures need to be considered. Although the existing BMPs tend to be universal, perhaps the most optimal way to battle boxwood blight is to create regional BMPs which could address the differences in geographic locations/climes.

This guidance is proposed in the hopes that it *would ensure an irreplaceable piece of our gardening history and heritage is preserved.*

CHAPTER 6

CONCLUSION

The goal of this thesis was to provide the answer to the question:

> *In what ways are current best management practices of boxwood blight being applied to historic American gardens, encompassing Colonial to Colonial Revival eras of garden design, and how does it affect the authenticity/integrity of the historic landscape?*

Spanning the thesis collectively, this research question was answered. Chapter 2 provided contextual information that was needed to answer portions of the research question which included the history of the use of boxwood in Ancient, European, and American gardens, horticulture and boxwood blight best management practices, and historic preservation and cultural landscape preservation focusing on authenticity and integrity. In Chapter 3, gaps in the knowledge that were unable to be addressed in Chapter 2 assisted in the creation of meaningful surveys which resulted in the understanding of boxwood cultivation, application of boxwood blight best management practices, and the role of historic preservation at historic sites, amongst other topics. The case studies in Chapter 4 addressed the remaining question regarding how the management of boxwood blight affects the historic landscape and its authenticity and integrity by evaluating landscape characteristics and assessing the overall integrity of the historic sites. Chapter 5 provided a synthesis of the research results from Chapters 2 through 4 to answer the sub questions and overarching research question. Based on this synthesis of the research results, Chapter 5 provides guidance and recommendations for historic sites to help battle boxwood blight.

6.1 Reflection

As I reflect on the completed thesis research, a few factors come to mind regarding what could have been done if I had the knowledge that I do now.

First, the time allocated to conduct the entirety of the thesis research was too short, or rather my question was larger than I had originally thought. Because of this, I would have narrowed my research question down to encompass two of the three professions of which I endeavored to combine into my overarching research question. The complexity of my research question and combination of three professions reduced the amount of time I was able to spend on specific aspects of the research including researching the contextual histories of each historic site, compiling information regarding the historic site's current condition, conducting the surveys, and assessing the overall integrity of the historic sites. Looking back, it would have been beneficial to have had a less complex research question in order to maximize the time that was available to me.

Second, if I had known how much time it would take to compile the historic site manager's contact information as well as the difficulty in connecting with them regarding interviewing for the research, I would have begun to compile the contacts earlier and begun to reach out to them at least three extra weeks in advance, which would have given them one month to get in contact. This would have been done with the hopes that more historic sites and managers would be included in the research. Additionally, scheduling the survey interviews and creating meaningful questions took a bit more time than was expected. For the overall survey interview process, I would have given myself at least two extra months. Hindsight is truly 20-20 and for the surveys, there were a few important questions that were not asked due to the time spent contacting and scheduling the interviews themselves. A few of the questions that should

have been asked of the historic site managers include: *How long have you been implementing BMPs? Were you implementing BMPs prior to the discovery of boxwood blight? How did you attain information to identify and mitigate boxwood blight? Were you using generic BMP guidelines, local extension pathologists or other authorities, plant societies and/or institutional associations? What is the current condition of the garden? Is historic preservation training offered at the site?* Although the answers to these questions remain unanswered, the questions and resulting answers that I was able to compile from the eleven interviews were more than sufficient to answer my overarching research question.

Lastly, the assessment of the integrity of the historic garden/cultural landscape containing boxwood was dictated by what was available to me online and in publications regarding the history and development of the gardens. Some of the sites have publications that provide ample detail for the garden's histories while others have very minimal information available to the public. Because it was not feasible to visit each of the eleven historic sites considering time and monetary constraints, I had to rely on what I was able to find regarding current photos and descriptions to identify existing landscape characteristics at the site. If I had known of this difficulty, I would have asked for historical documents that had historic research in them as well as current photos of the garden and details of the garden so I could control the assessment of the landscape characteristics and overall integrity.

6.2 Future Research

In an endeavor to trailblaze the understanding of the application of boxwood blight best management practices in historic American gardens and their resultant effect on authenticity and integrity, this research supports three areas for possible future exploration.

First, standard boxwood blight best management practices can and should be reevaluated to reflect the research results from this thesis. The future of historic, irreplaceable boxwood in American gardens hangs in the balance until innovative BMPs have been established.

Second, research can and should be done to further understand the rich history of boxwood in historic American gardens. The research presented in this thesis only touched the surface of what is an incredibly magnificent history. Boxwood is a quintessential American garden shrub and its history and use in garden design in America should be well documented for future academic research and public education.

Third, research can and should be conducted to document all types of historic American gardens, whether they be well-known or unfamiliar. The disparity in publications detailing garden development, design, and current conditions, amongst other aspects, should be remediated in order to record and preserve invaluable American gardening history and heritage for generations to come.

6.3 Conclusion

It is only fitting to provide a few final words to conclude this thesis by ending where this research began. In the fall of 2021, intimidation, intrigue, and anticipation were words I would use to describe the emotions when thinking of the task at hand. Conducting this thesis research has been one of the most demanding, yet enriching adventures of my collegiate career. The light remained constant at the end of the tunnel every step of the way but seemed only to shine as bright as a matchstick. Now that I am at the end of the tunnel, I can say wholeheartedly that the light indeed shines bright. The past five chapters have resulted in the discovery of the application of boxwood blight best management practices in historic American gardens and how it affects

the authenticity and integrity. In celebrating what has been accomplished, one can only dream of the opportunities for further exploration on the topic of histories' beloved boxwood.

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APPENDIX A

HORTICULTURAL RESEARCH INSTITUTE

BEST MANAGEMENT PRACTICES

Horticultural
Research Institute

Endorsed by

AmericanHort NPB national plant board NATIONAL ASSOCIATION OF LANDSCAPE PROFESSIONALS

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introduction

ABOUT BMPs

The following voluntary industry recommended ***Best Management Practices for Boxwood Health*** were designed to provide guidelines to help growers and landscape managers contend with the risk of boxwood blight (caused by ***Calonectria pseudonaviculata***, previously called ***Cylindrocladium pseudonaviculatum***) introductions and respond if the disease is confirmed on the nursery or landscape grounds.

These suggestions are based largely on best management practices (BMP's) promoted by the Connecticut Agricultural Experiment Station (CAES), the Oregon Department of Agriculture, and the Virginia Polytechnic Institute and State University and have received the support of the both the production and landscape management industries, the research community, and those in the regulatory community.

HOW TO USE

Best Management Practices for Boxwood Health are presented and suggested for voluntary adoption by growers producing ***Buxus*** spp. and other boxwood blight host plants, as well as caretakers of Buxus spp. and other boxwood blight host plants in the landscape. They were developed by a working group convened by the HRI, the research affiliate of AmericanHort, with review and input from the National Plant Board (NPB). The NPB developed a model compliance agreement for growers either choosing to operate under a formal compliance agreement or required to after detection of boxwood blight at their place of production or management. Growers should be advised that if operating under a compliance agreement, key aspects of the BMP's, such as record-keeping, may become legally binding and subject to oversight by state plant regulatory personnel.

DEVELOPMENT & ENDORSEMENTS

The ***Best Management Practices for Boxwood Health*** were developed by the Horticultural Research Institute. They have been endorsed by AmericanHort, the National Plant Board, and the National Association of Landscape Professionals (NALP). These recommendations are strictly voluntary and are intended to provide guidance that is practical in terms of cost and benefit, relevant to multiple types of production and management, and takes into consideration the diversity of nursery and landscape sizes, their regional climatic conditions, and their production and management systems. All statements regarding plant material pertain only to ***Buxus***, ***Pachysandra***, and ***Sarcococca*** species and are not to be interpreted more broadly. Please be advised that holiday boxwood greenery and germplasm are also known as potential boxwood blight carriers.

REVIEW TEAM

Marc Cubeta, North Carolina State University
Margery Daughtrey, Cornell University
Bruce Hellerick, BrightView Landscape Services
Chuan Hong, Virginia Polytechnic Institute and State University
Tom Hughes, Hughes Nursery and Landscaping
Dan Kenney, Ohio Department of Agriculture
Bob Mann, National Association of Landscape Professionals
Scott McAdam, McAdam Landscaping
Dana Rhodes, Pennsylvania Department of Agriculture
Scott Schirmer, Illinois Department of Agriculture
Anni Self, Tennessee Department of Agriculture
Nina Shishkoff, United States Department of Agriculture – Agricultural Research Service

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boxwood blight symptoms

Only leaves and stems are affected in field conditions. If in doubt, please contact a local plant diagnostic lab for help. Boxwood blight can be confused with Volutella infections and even some insect pest infestations.

FIRST SIGNS

First symptoms = light to dark brown, circular leaf spots with dark borders

FALLING FAST

Rapid defoliation, especially in the lower canopy

INFECTED STEMS

Infected stems have dark brown to black, elongated cankers.

Individual landscape management companies are encouraged to review the recommended practices and apply some or all of them, depending on their specific circumstances.

SECTION A: Boxwood Blight Training

a. Early detection is critical; educate personnel to recognize the disease symptoms and know what to do if symptoms are observed.
b. Train personnel in BMP's, including the biology and survival of the pathogen, sanitation strategies, and management options.
c. Be aware that symptoms may be discreet and difficult to detect on some cultivars.
d. Be aware that boxwood blight spores are sticky and can be transmitted from one property to another via contaminated spray hoses, clothing, shoes, tarps, vehicles, pruning tools, animals, etc.
e. If a diseased plant is suspected, contact your state agricultural department or your local/regional National Plant Diagnostic Network[1] laboratory to submit a sample for confirmation while restricting access to suspected blighted plants. When submitting a sample, collect plant material, about 8-10" in length, with both healthy and symptomatic material (such as leaf spots,

stems with black streaks, defoliated stems). Place all plant material in a 1 gallon Ziploc bag. Samples can be cut in half to fit in a bag if needed. Keep varieties and/or blocks in separate bags. Do not add moisture to the bag. Samples can be mailed but should be sent early in the week or via overnight delivery to avoid sitting over the weekend. Hand deliver to the lab, if possible.

f. Resources to aid in training and identification can be found at:
Virginia Cooperative Extension Boxwood Blight Task Force [2]
Connecticut Agricultural Experiment Station Boxwood Blight Plant Disease Information Office[3]

SECTION B: Share BMPs adopted by landscape management company with parties and customers being serviced.

Landscape managers should be proactive and share the best management practices they adopt with their customers.

SECTION C: Mitigate introduction to a landscape. It is much easier to prevent boxwood blight introduction than control it or remediate.

a. Well established boxwood gardens and plantings
   i. Avoid bringing any host plant material to the property
   ii. Use nonhost groundcovers and companion plants
   iii. Purchase plant material only from reputable suppliers, ideally nurseries that are licensed and/or certified according to applicable phytosanitary law and applications.
   iv. Maintenance should be done by designated staff with site-specific set of tools
   v. Boxwood management is ideally done independently of other tasks. Schedule boxwood maintenance as either the first or last task of the job and/or as the first or last stop of the day and practice strict sanitation protocols.
   vi. Practice sanitation measures and advocate these to others working on the same property
   vii. Scout regularly
b. New boxwood gardens and plantings
   i. Purchase only from reputable suppliers, ideally nurseries that are licensed and/or certified according to applicable phytosanitary laws and regulations.
   ii. Install boxwood species and cultivars which are less susceptible than ***Buxus sempervirens*** 'Suffruticosa' and ***Buxus sempervirens***. HRI's Boxwood Initiative currently supports validation of a standardized testing procedure to evaluate cultivar susceptibility and tolerance. Studies are in progress, and results will be released when available. Until then, please consult the Tennessee State Extension guide[4].
   iii. Request history of fungicide applications from the producer/nursery, including fungicide name(s,) application rate(s,) and date(s) applied.
   iv. Plants should be inspected for symptoms of boxwood blight at the time of purchase.
   v. Hold plants for at least four weeks before planting to ensure that they are disease free prior to planting, especially if there are already established boxwoods on the property.
      1. Avoid co-mingling of plant material if obtained from different vendors/ nurseries.
      2. Choose a holding area with a surface that can be easily cleaned of plant debris.
      3. Remove all plant debris on a regular basis by vacuuming, sweeping, or raking and properly dispose of it. Do not compost.

UPDATES & DISCLAIMER

Updates to the recommendations are made on an ongoing basis and as new information regarding boxwood blight and its management comes to light.

Reference within this document to any specific commercial or noncommercial products by trade name or active ingredient does not constitute or imply an endorsement or recommendation by AmericanHort and HRI. Please consult product labels for the most current use rates and guidelines.

4. Do not use fungicides on new plants during the holding period.

vi. Do not use or dispose of boxwood greenery near boxwoods in the landscape.
   1. When disposing holiday greenery, double bag it in sealed plastic bags and dispose of it in the landfill or bury it so that the top of the debris is at least ten inches below the soil surface.
   2. Do not compost.

vii. Minimize exposure of 'temporary/seasonal' boxwoods (e.g. in planters, pots, etc.) to, and contact with, infected areas/plants within the landscape. If relocation or disposal is required, handle these plants as if they are infected.

viii. Be aware that boxwood blight spores are sticky and can be transmitted from one property to another via contaminated spray hoses, clothing, shoes, tarps, vehicles, pruning tools, animals, etc.

ix. Advocate sanitation and hygiene practices to the property and business owners.

x. If a diseased plant is suspected, contact your state agricultural department or your local/regional National Plant Diagnostic Network[1] laboratory while restricting access to suspected blighted plants. When submitting a sample, collect plant material, about 8-10" in length, with both healthy and symptomatic material (such as leaf spots, stems with black streaks, defoliated stems). Place all plant material in a 1 gallon Ziploc bag. Samples can be cut in half to fit in a bag if needed. Keep varieties and/or blocks in separate bags. Do not add moisture to the bag. Samples can be mailed but should be sent early in the week or via overnight delivery to avoid sitting over the weekend. Hand deliver to the lab, if possible.

SECTION D: Mitigate spread in the event of a confirmed infection.

a. Contain the disease and protect remaining healthy-looking boxwood on the property
   i. All infected plants and plant debris should be double bagged in sealed plastic bags and disposed of in an approved landfill (per applicable laws) or incinerator, promptly burned, or buried a minimum of ten inches below the surface. Do not compost.
   ii. Remove all adjacent, non-symptomatic boxwood, Pachysandra, and Sarcococca plants within ten feet of symptomatic plants.
   iii. Cover or bag diseased plants before transport.
   iv. Do not move during rain events.
   v. If plants are too big to bag, then burn or bury them on-site or transport in a covered trailer for disposal. Carefully remove leaves and clean the trailer with a disinfectant, such as a quaternary ammonia-based product (Green Shield® or Physan 20®) or ethanol, after use.
   vi. Remove all fallen leaf and plant debris from areas where pathogen is detected.
   vii. Do not compost infected plant material.
   viii. If the diseased plant is in a container, the container must be treated. Disinfest (sanitize) or bury pots and containers quickly and effectively disinfest tools and contaminated impervious surfaces. Conidia, a type of spore, are killed within seconds, and microsclerotia, a long-lived type of spore capable of persisting in soil from 5-6 years, are killed within four minutes. Other products, including concentrated Lysol, 10% bleach solution, hydrogen dioxide (Zero Tol®), hydrogen peroxide (OxiDate®), peroxyacetic acid (peracetic acid), and octanoic acid (caprylic acid) only kill conidia.

RESOURCES & LINKS

[1]National Plant Diagnostic Network: https://www.npdn.org/home

[2]Virginia Cooperative Extension Boxwood Blight Task Force: https://ext.vt.edu/agriculture/commercial-horticulture/boxwood-blight.html

[3]Connecticut Agricultural Experiment Station Boxwood Blight Plant Disease Information Office: https://portal.ct.gov/CAES/PDIO/Boxwood-Blight/Boxwood-Blight

[4]Tennessee State Extension resource on boxwood blight for guidance as to cultivar resistance/susceptibility: http://www.tnstate.edu/extension/documents/Boxwood%20Blight%20Factsheet.pdf

ix. Clothing, equipment, and vehicles used during the disposal of diseased plants should be sanitized before entering other properties; outer clothing of workers who conduct disposal should either be disposable or laundered before entering another property. The use of disposable booties, coveralls, etc. are recommended.
x. If other boxwood remains on the property, initiate a preventive fungicide spray program and do not use overhead irrigation. See Section E, Fungicides below for a list of fungicides.
xi. Monitor for disease development on a regular basis, once a week for several months after removal.
xii. Continue preventive fungicide spray program

b. Replanting
   i. Removal of diseased boxwood and all associated leaf debris will not eradicate boxwood blight from the location. The pathogen produces long-lived survival structures, microsclerotia, that can persist in the soil for 5-6 years.
   ii. Tolerant boxwood cultivars may be planted in a site where disease was detected on other boxwood earlier, but may require repeated fungicide applications in subsequent years, depending on the level of resistance and weather conditions.
   iii. Mulch a new boxwood planting immediately following replanting to prevent pathogen reinfection.
   iv. Sanitize tools, equipment, shoes, gloves, and clothing between plantings. The use of disposable booties, coveralls, etc. are recommended. 70 % alcohol, either isopropyl or ethanol, is an inexpensive product to quickly and effectively disinfest tools and contaminated impervious surfaces. Conidia, a type of spore, are killed within seconds, and microsclerotia, a long-lived type of spore capable of persisting in soil from 5-6 years, are killed within four minutes. Other products, including concentrated Lysol, 10% bleach solution, hydrogen dioxide (Zero Tol®), hydrogen peroxide (OxiDate®), peroxyacetic acid (peracetic acid), and octanoic acid (caprylic acid) only kill conidia.

SECTION E: Management practices in the landscape

a. Cultural practices
   i. Choose cultivars with a more open-growth habit, as opposed to those with a dense canopy, to increase airflow and minimize leaf wetness. HRI's Boxwood Initiative currently supports validation of a standardized testing procedure to evaluate cultivar susceptibility and tolerance. Studies are in progress, and results will be released. Until then, please consult the Tennessee State Extension guide[4] cited below.
   ii. Shearing boxwoods is not recommended. Pruning strategies that promote airflow and quick drying (e.g. thinning the canopy, separating, etc.) are ideal. If shearing is occurring, increase scouting practices and consider employing a preventive fungicide program. See Section E, Fungicides below for a list of fungicides.
   iii. Shaping boxwood with a peaked form is recommended to improve air flow rather than flat surfaces.
   iv. Avoid overhead irrigation.
   v. Provide adequate spacing between plants and avoid close spacing such as that associated with most hedges.
   vi. Remove lower branches and leaves by pruning.
   vii. Mulch boxwood plantings.
   viii. Avoid working in boxwood plantings when foliage is wet to reduce potential spread of spores.
   ix. Plant boxwood in open air area, if possible.
   x. Elevate surrounding tree branches to improve air movement.

b. Sanitation
   i. Sanitize tools, equipment, shoes, gloves, and clothing between plantings. 70 % alcohol, either isopropyl or ethanol, is an inexpensive product to quickly and effectively disinfest tools and contaminated impervious surfaces. Conidia, a type of spore, are killed within seconds, and microsclerotia, a long-lived type of spore capable of persisting in soil from 5-6 years, are killed within four minutes. Other products, including concentrated Lysol, 10%

bleach solution, hydrogen dioxide (Zero Tol®), hydrogen peroxide (OxiDate®), peroxyacetic acid (peracetic acid), and octanoic acid (caprylic acid) only kill conidia.

ii. All infected plants and plant debris should be double bagged in sealed plastic bags and disposed of in an approved landfill (per applicable laws) or incinerator, promptly burned, or buried a minimum of ten inches below the surface.

iii. Work in plantings with suspected infection last, after completing work in known healthy plantings.

c. Fungicides

i. Fungicides are only preventive for boxwood blight management.

ii. Fungicide applications can suppress symptom development and prevent further spread but do not cure the plant from infection.

iii. Repeated applications will be necessary, the number depending on the tolerance of cultivars present and weather conditions from year to year.

iv. Thorough coverage is difficult given the compact growing habit of boxwood. Spray to run-off. Spray fungicides on both front and back of leaves and stems.

v. Fungicides that have federally labeled for boxwood blight management include, but are not limited to:

1. Chlorothalonil (Daconil®, others)
2. Chlorothalonil + thiophanate methyl, (Spectro®, others)
3. Cyprodinil + fludioxonil (Palladium®)
4. Fludioxonil, (Spirato®)
5. Fluxapyroxad + pyraclostrobin (Orkestra®)
6. Propiconazole (Banner Maxx®, others)
7. Tebuconazole (Torque®, others)

vi. Always consult product labels for most up to date rates, spray intervals, and site recommendations, as well as local restrictions.

SECTION F: Record Keeping. Accurate and detailed records for the following activities should be maintained a minimum of 12 months for traceability, if possible.

a. Cultivar names and locations by property.
b. Where and when plants were purchased.
c. Location of any diseased boxwood, even if removed.
d. Fungicide treatments
   i. Product name
   ii. Rate used
   iii. Date of application
      1. Location of any and all burial pits. Burial of infected debris does not kill the pathogen quickly but immobilizes it while it dies slowly. Therefore, it is important to avoid replanting Buxus in these areas.

Horticultural Research Institute

Boxwood Blight BMPs *for landscape*

CAUSAL AGENT

Calonectria pseudonaviculata

HOST PLANTS

Buxus species, Pachysandra, Sarcococca. 100% resistance has not been documented in any variety.

HOW DISEASE SPREADS

- Infected plant material and plant debris
- Contaminated tools, clothing, tires, hoses
- Rain splash and wind-driven rain
- Contaminated animals, including dogs, deer, squirrels, others

For a complete list of recommended best management practices for managing boxwood blight in the landscape, consult HRI's Best Management Practices for Boxwood Health at **www.HRIresearch.org.**

SPOT THE SYMPTOMS

Only leaves and stems are affected in field conditions. If in doubt, please contact a local plant diagnostic lab for help. Boxwood blight can be confused with Volutella infections and even some insect pest infestations.

First symptoms = light to dark brown, circular leaf spots with dark borders

Rapid defoliation, especially in the lower canopy

Infected stems have dark brown to black, elongated cankers.

TOP 10 BEST MANAGEMENT PRACTICES FOR BOXWOOD HEALTH IN THE LANDSCAPE

Train personnel for disease scouting and biology, sanitation, and management	Purchase plant material from reputable suppliers who adhere to a boxwood blight compliance agreement.	When installing new boxwood, select varieties tested and known to be more tolerant and less susceptible of boxwood blight.	Mulch boxwood plantings.	Sanitize tools, equipment, shoes, clothing between plantings. 70% alcohol and other products are recommended sanitizers.
Shearing boxwoods is not recommended. Pruning to encourage air flow is ideal. Avoid flat surfaces. Remove lower branches that touch the ground.	Avoid working in boxwood plantings when foliage is wet.	All infected plant material should be double bagged and disposed of in an approved landfill, burned, or buried at least 10" below the soil surface.	Do not compost infected plant material.	Fungicides are preventive only and will not cure an infected plant.