DOCUMENTING LIVING COLLECTIONS:
A STUDY OF CURATORIAL PRACTICES, CHALLENGES, AND SOLUTIONS FOR HISTORIC BOTANIC GARDENS

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ABSTRACT

Botanic gardens are living museums, offering opportunities for conservation and research as well as education, experience, and enjoyment through their plant collections. A garden's plant records system is as vital as the plants themselves, and serves as a framework for the preservation of information, the care of the collections, and access and use of information about the collections. While standards for best practices exist, curatorial approaches to the establishment and maintenance of plant records vary among institutions. There is an expressed need in the field for more resources on the documentation of living collections, especially for smaller and emerging gardens. This exploratory study investigated and described current plant records practices, challenges, and solutions at a unique subset of gardens in the United States. Preservation gardens—historic landscapes that have transitioned from private to public gardens—often include rare plants, heritage cultivars, and unique germplasm that may not be represented elsewhere in cultivation or the wild, offering untapped potential for research and conservation. Interviews with 10 professionals in the field informed the development of a nationwide survey of preservation gardens focused on documentation practices, challenges, and solutions, as well as on the transition period from private estate to public garden. Grounded Theory Methodology guided the data collection, analysis, and development of key recommendations founded on empirical evidence. This resource is intended to help preservation gardens, and other gardens navigating the plant records process, to develop an approach to documenting their living collections. A well-documented collection both improves internal efficiency and increases an institution's capacity to contribute to larger-scale efforts by sharing information with researchers, other institutions, and the public.

BIOGRAPHICAL SKETCH

Emily Detrick holds a BFA from Murray State University (2007). After working for several years as a studio artist, educator, and administrator for a public art program, she apprenticed at Skarsgard Farms, a Community Supported Agriculture (CSA) farm in Albuquerque, New Mexico. She became the Propagation Manager, initiated an education program for the farm, then co-founded and managed a satellite farm and membership base in Las Cruces, NM. Farming while informally studying the biodiversity of the Chihuahuan desert led her to botanic gardens: the perfect synthesis of art, education, sustenance, and science. She left New Mexico to attend the Stonecrop Gardens School of Practical Horticulture in Cold Spring, NY, where she went on to become the Alpine Horticulturist for two years before beginning her MPS at Cornell University. Emily is currently a Horticulturist for Cornell Plantations, where she cares for the Pounder Vegetable Garden and Groundcover Collections.

This work is dedicated to my grandmother, Dorothy Mae Detrick, whose sunny Kentucky garden shaped my earliest memories.

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LIST OF ABBREVIATIONS

AABGA: American Association of Botanical Gardens and Arboretums (now APGA)

AAM: American Alliance of Museums (formerly American Association of Museums)

APGA: American Public Gardens Association

BGCI: Botanic Gardens Conservation International

GSPC: Global Strategy for Plant Conservation

IMLS: Institute of Museum and Library Studies

PCN: Plant Collections Network

KEY TERMS

Botanic Garden: an institution holding documented collections of living plants for the purposes of scientific research, conservation, display and education (BGCI, 2012).

Collections Policy: A written, accessible document outlining the purpose and scope of the plant collection along with specific guidelines for the botanic garden aiding acquisition, management and de-accessioning of the plant material (Hohn, 2008).

Curation: the process of managing the Living Collections to guarantee its conservation, guide its development, ensure its documentation, and facilitate its enhancement in a professional and ethical manner (Dosmann, 2008b; Michener, 2011).

Curator: the steward of the living collection, responsible for the development and care of collections through time. Tasks include: development of policies, acquisition of plants for collections, arrangement of appropriate record keeping and labeling, management of horticultural care, evaluation of plant performance, and arrangement of access to the collections for study or use by others (Donnelly & Peske, 2011).

Database: the information in digital tables that are an institution's records; distinct from the software programs that interact with the data (Michener, 2011).

Deaccessioning: the process of removing a living specimen from the collection, but does not include the removal of any records related to that accession (Dosmann, 2008b).

Documentation: the suite of policies, databases, maps, and related files that document the institution's living collections; often referred to as plant records. (Michener, 2011).

***Ex situ* conservation:** conservation of an organism outside its native habitat (Reichard, 2011). Compare to ***in situ* conservation**, which occurs in the organism's native habitat.

Historic Designed Landscape: 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 architecture. Aesthetic values play a significant role in designed landscapes. Examples include parks, campuses, and estates (Birnbaum, 1994). *Not all historic landscapes are "preservation gardens." This term refers specifically to gardens that were established as private estates before becoming public gardens. However, all preservation gardens are historic designed landscapes.*

Inventory: a physical or digital list of plants and/or accessions present in an area on a date; also, the action of making such lists. Additional information about specific accessions such as condition and size is often recorded at this time (Michener, 2011).

Label: a tag, sign, or other marker that identifies a plant for the public. Additional information may be present, but without a plant name it is an interpretive sign. Small tags with inventory

numbers and related information are specialized labels (Michener, 2011). Labeling provides the link between the living material and the electronic plant record (BGCI, n.d.)

Living Collections: all plants formally accessioned, and in a broad sense also contain un-accessioned plants in natural areas, spontaneous flora, and research material (Dosmann, 2008).

Map: a plan showing selected characteristics, such as accessions for an inventory or site features for field confirmation; can be created by various methods, from hand drawn to output from geospatial databases (Michener, 2011).

Mission statement: succinct statement that defines the primary purpose of an organization and acts as a guide for decision making (Matheson, 2011).

Plant records: suite of policies, databases, maps, and related files that document an institution's living collections (Michener, 2011).

Preservation Garden: a landscape including historic plant specimens that was established as a private property, and has been preserved as a publicly accessible entity, usually as a nonprofit, and sometimes under the guidance or partnership with a preservation organization (such as The Garden Conservancy, The Trustees of Reservations, or The National Trust for Historic Preservation). *Not all historic landscapes are "preservation gardens," but all preservation gardens are historic designed landscapes.*

Provenance: the original source; used both as a specific location (wild populations vs. nursery grown) and a concept (as wild-collected vs. cultivated stock).

Public Garden: an institution that maintains collections of plants for the purposes of public education and enjoyment, in addition to research, conservation, and higher learning. It must be open to the public and the garden's resources and accommodations must be made to all visitors. Public gardens are staffed by professionals trained in their given areas of expertise and maintain active plant records systems (APGA, n.d.-a).

Purposive Sample: A non-probablity sample method that is used when studying a target group. Compared to a cross-section or a conventional probability-based sample, this technique allows concentration on specific but diverse instances that will best illustrate the research objectives (Denscombe, 2010).

Strategic Planning: an organization's process for defining its strategy or direction and making decisions about allocating its resources to pursue that strategy (Matheson, 2011).

Taxon (pl., taxa): is a unit of any rank within the taxonomic hierarchy (e.g., family, genus, species, variety, cultivar) (Dosmann, 2008b).

CHAPTER ONE: INTRODUCTION

Introduction

Overview

> "Botanic gardens are institutions holding documented collections of living plants for the purposes of scientific research, conservation, display and education."
>
> --BGCI, *International Agenda for Botanic Gardens in Conservation*, 2012

Living plant collections are the physical manifestations of botanic gardens' missions. They comprise the critical material that instills these institutions with scientific, educational, and cultural relevance. Significance lies not only in the plants themselves, but also in the information that accompanies them (Guthe, 1970). Botanic gardens, as living museums, are not only ethically and legally obligated to maintain basic information about their collections according to accepted professional standards, but without proper documentation, these institutions have a limited story to tell and little reference value (American Association of Museums (AAM), 1984, referenced by Hohn, 2008). In the botanic garden context, documentation, often referred to as plant records, is composed of a suite of policies, databases, maps, and related files that document the institution's living collections (Michener, 2011). The benefits of well-documented collections are many; most notably, accessible and coherent internal organization and greater potential to contribute to larger-scale efforts by sharing information with researchers, other institutions, and the public (Highland, 2014).

Some botanic gardens employ well-developed practices, use sophisticated software, and follow internal standards that guide their record-keeping and enable the material to be easily utilized. These collections play a crucial role in scientific research and conservation efforts (Sharrock &

Hird, 2014) and are widely accessible through collaborative internet databases, such as Botanic Gardens Conservation International's PlantSearch or BG-BASE's Multisite search page hosted by the Royal Botanic Garden Edinburgh. However, the curation of living plant collections as a discipline is still maturing (Dosmann, 2008a). Collections from smaller, historically private gardens that transition into public botanic gardens rarely play such a substantial role, though their unique and storied holdings exhibit an enormous wealth of untapped potential for conservation and research. Gardens and arboretums that have transitioned from private estates to public gardens (termed *preservation gardens* by the Garden Conservancy) often include rare plants, heritage cultivars, and unusual taxa that may not be represented elsewhere in cultivation or in the wild (Eirhart, 2014). Not all historic designed landscapes are "preservation gardens." This term refers specifically to gardens that were established as private estates before becoming public gardens. However, all preservation gardens are historic designed landscapes.

Preservation gardens face a unique set of challenges, including the management of historic plant holdings while building new collections. The plant records that accompany these collections through their transition exist in varying states of accuracy, detail, and formats, and the task of translating them into accessible documents can be daunting. The key to maximizing their value lies within the preservation and maintenance of this very documentation. There is not only limited information available about current plant records practices at preservation gardens, but also limited resources on the documentation processes that are appropriate for them.

Expressed Need

For the botanic garden profession to grow in strength and excellence it must undertake research in botanic garden practice, which is a branch of museology (Hohn, 2008). Within the field, there needs to be examination of procedures and practices, and the questioning of why things are done in a particular way in all aspects of operations: administration, collections management, public programming, and exhibition (Hohn, 2008, p.150). There has been an ongoing need expressed by the industry for curatorial resources; several recent descriptions are described below.

During the 2014 American Public Gardens Association (APGA) annual conference in Denver, Colorado, members of the Plant Collections Professional Section requested resources addressing "basic aspects of effective living collections curation" (Stormes et al., 2016). Later that same year, a follow-up survey to the APGA Plant Collections Symposium (APGA, 2014b) asked participants *What topics would you like to see addressed through future professional development opportunities?* A third of respondents requested "small garden collection needs, nuts and bolts of collection management, database options for gardens (which one and why), and collection building on a small budget in small/new gardens."

Moreover, through personal correspondence prior to the outset of this study, both the Plant Collections Network (PCN) Manager and the Vice-President of Preservation at The Garden Conservancy recognized the importance of and expressed support for the creation of a study compiling resources and practices for transitioning gardens; they have also confirmed that present resources do not specifically meet this need. Additionally, recent posts have been made on botanic garden professional web forums (LinkedIn & APGA Professional Sections) seeking insight and examples for auditing and documenting collections at historically private gardens transitioning to public gardens.

Inspiration for this study was also generated from firsthand experience. The author previously worked as a horticulturist in a garden with unique holdings of taxa that had been collected, cultivated and developed by a plantsman on his private estate for over half a century. In the 1980s, the estate was transitioned into a public garden. Gradually adjusting to this new identity, the garden has continuously grappled with the challenge of recording, maintaining, and accessing the information accompanying the collections. The author witnessed first hand the search for, and factors obstructing, the development of a cohesive, efficient, and maintainable collection documentation system. Through interactions with other practitioners and reviewing relevant literature, it was learned that this challenge is not unique to this garden. Motivation for this study was thus driven by two goals: a need to bridge an informational gap between researchers and practitioners that would enable preservation collections to be more readily accessible, and the author's desire to become well versed in the art and practice of collections documentation in order to be an effective facilitator of plant research and conservation in the public garden field.

A review of literature revealed that, historically, there have been few studies on and resources for the practice of documenting living collections. The existing literature typically address the *why* of documenting living collections; the *how* is described in general terms and is left largely up to individual institutions to determine. This is likely out of awareness that public gardens vary in mission, resources, staffing structure, and other variables, making the idea of standardized plant record keeping in botanic garden community a challenge. However, this lack of resources may also be because there is not documented, accessible information about current practices being implemented in the field.

Objectives

The purpose of this exploratory study was to investigate the plant records practices in preservation gardens: historic landscapes of the United States that have transitioned from private estates to public gardens or arboretums. Some botanic gardens with designated curatorial staff and robust technology and techniques, such as the Arnold Arboretum or Chicago Botanic Garden, share their documentation methods with the larger public garden community via their websites, presentations at professional symposia, or publications. Yet the practices of the majority of gardens in the United States are largely understudied and inaccessible except by direct inquiry. This exploratory study will lend insight into the current plant records practices at a particular subset of gardens, so that knowledge of practice may be shared, and recommendations and resources may be developed to more specifically address industry needs.

1. Primary objective: to investigate and describe current plant records practices, challenges, and solutions at preservation gardens.

2. Secondary objective: based on findings, to develop recommendations for plant records practices, with the intention to both improve internal organization and increase potential for preservation gardens to contribute to larger-scale efforts by sharing data with researchers, other institutions, and the public.

A mixed-methods study design, rooted in Grounded Theory Methodology, guided the collection and analysis of data. Interviews with staff at 10 selected preservation gardens informed the design of a national, web-based survey of a purposive sample of preservation gardens. The qualitative and quantitative results of both the interviews and survey were selectively coded and cross analyzed to reveal trends. Specific points of study were general background information (size, age, location, collections), the transition period (history and evolution of plant records, including historic methods, personnel responsible for them, and transition to current methods),

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and current practices (written policies and protocols, accessioning and tracking, staff structure, staff and board attitude toward priority of plant records, database and mapping systems, data users, and data sharing). While the intended audience is gardens that have recently or will soon transition from public to private, it is the author's hope that any garden navigating the plant records process will find this study useful.

Delimitations

This study focused on a particular subset of gardens of the United States that fit the both BGCI definition "botanic gardens" and the APGA definition of "public gardens" (see Key Terms). Gardens were only included in the study if they are currently open to the public, maintain a website with contact information and at least some information about plants in their collections, and have membership or associations with one or more of the professional organizations described in the criteria section of the Methods chapter. The author assumes that organizations with these characteristics are actively involved in living collections management and are the best equipped to contribute to, and benefit from, this study.

The intent was to describe and recommend documentation practices that apply broadly to preservation gardens, but not to recommend specific protocols, such as software selection or priority of collections foci, which will vary according to each individual garden's mission, budget, and other factors; nor was it to offer product comparison or evaluation. Within BGCI's definition of a botanic garden, there exists a great diversity of institutions ranging from large gardens with several hundred staff and a wide range of activities, to small institutions with limited resources and activities (P. Wyse Jackson, 2013). Because of these differences, "the idea of a standard plant record keeping database programme will never be an option available to the

botanic garden community" (D. Wyse Jackson, 2003). The analysis is focused on clear trends and consistent themes, and communicated from the perspective of a practitioner, to a practitioner audience.

Organization of Paper

The following section outlines the background information necessary to understand the relevance of this study and the intended audience. The next section describes the methodology by which data was collected and analyzed; this is followed by the results of the study, then a discussion of findings. The last section contains the grounded theories that were developed about plant records at preservation gardens in the form of recommendations for best practices. The recommendations are based on new awareness of current practices and challenges from the study, recommendations collected directly from staff at preservation gardens, additional interviews with professionals in the field, and relevant literature.

Background & Significance

The Value of Living Collections

> "The life of collections and their inestimable and highly defensible values lie in what we do with them, what new knowledge can be extracted from them, and what of past knowledge is documented as groundwork for improved insight and new interpretation."
>
> -- Alden Miller, *The Curator as a Research Worker,* 1963

The multitude of uses for living collections are as diverse as the plants that compose them: from the intangible and difficult to measure benefits of beauty, serenity, and healing, to scientific studies of plant systematics and taxonomy, and a wide breadth of learning opportunities in between. Gardens mirror the values of surrounding society (Flanagan, 2011). Historically, gardens have been developed for medicinal purposes, religious teaching, taxonomic study, and mathematical design, among other pursuits. Today, one of the greatest influences guiding the missions of gardens is plant conservation. According to Missouri Botanical Garden President Dr. Peter Wyse Jackson, there has been a "renaissance" worldwide in botanic gardens in the last 20 to 30 years (2013). Wyse Jackson attributes this to a rising concern for the loss of biodiversity and the need for more institutions to be involved in preservation and conservation of plant resources.

Living plant collections offer a broad range of research opportunities that are applied (such as plant evaluation and informal experiments), basic (such as taxonomic studies), or that summarize recorded plant data, usually in the form of interpretation (Dosmann, 2006). Valuable contributions to the field include germplasm research on heritage cultivars and crop relatives, plant breeding, phenology and climate change, evaluation for introduction, invasive species

control, and conservation (Dosmann, 2006; Heywood, 2011; Eirhart, 2014). Basic research opportunities, especially if observations over a long period of time are required, include studies on morphology, anatomy, cytology, physiology, biochemistry, autecology, reproductive biology, and pathology (Raven, 1981; Crane et al. 2009).

Speaking more broadly on the value of biological collections, Suarez and Tsutsui (2004) include contributions to science and society as divergent as: homeland security, public health and safety, monitoring of environmental change, and traditional taxonomy and systematics. Moreover, Suarez posits that these collections save governments and taxpayers many millions of dollars each year by effectively guiding government spending, preventing catastrophic events in public health and safety, eliminating redundancy, and securing natural and agricultural resources (Suarez & Tsutsui, 2004). In the face of global changes and a demand for novel germplasm adapted to meet new conditions, botanic gardens will be increasingly called upon for plant introductions (Heywood, 2011). To meet today's needs, Heywood outlines a plan for an improved plant introduction process that includes more effective maintenance and dissemination of information (plant records) on the accessions of introduced plants and their fate.

Additionally, living collections offer tools for teaching about the structure, function, evolution, and classification of plants, as well as to build an appreciation for the need to preserve the great biodiversity of plants worldwide. As museums, public gardens are among the social agencies concerned with the life-long process of learning. The public exhibition of their collections allow visitors to experience direct, personal relationships with the specimens, and acts of publishing, outreach, school programs, and so forth enrich that relationship (Canada, 1988).

The need for living collections as resources is greater than ever. Target 8 of the Global Strategy for Plant Conservation is to secure "at least 75% of all threatened plant species in *ex situ* collections, preferably in the country of origin, and at least 20% available for recovery and restoration programs" by 2020 (Convention on Biological Diversity, 2010). The recognition of the new and important role of *ex situ* conservation is rooted in the fact that "ecosystems are already rapidly and demonstrably shifting as individual species react differently to climate change." In 2013, 220 institutions with living plant collections worldwide contributed information about their collections, up 41% from the number that contributed in 2010. With over 800 botanic gardens in the United States, there is substantial potential for shared collections information and strategies based on that data (BGCI, 2016a). Yet as David Aplin reiterates in his 2014 report on a global survey of living collections, "the use of *ex situ* plant material for conservation (and research) relies on two fundamental principles: the names on the labels being correct (verified) and the accession having sufficient associated data to be useful."

The 2016-2020 North American Botanic Garden Strategy for Plant Conservation encourages all botanic gardens to update their missions and strategic plans to include a "declaration of their institutional commitment to plant and habitat conservation" (Objective F, Subtarget 2) (BGCI (Comp.), 2016b). *Ex situ* conservation occurs broadly in botanic gardens with practices including "the cultivation of threatened examples of native flora, management of genetic collections of endangered species, support for in situ conservation, environmental education with a plant conservation focus, and management of wild plant populations, recovery, and restoration work" (Galbraith & Jackson, 2004).

Conservation, whether explicit or implied, is a driving force in the mission of many gardens across divisions of size, history, and operating budgets. In the context of public gardens, specifically preservation gardens, conservation can also mean the preservation of cultivated varieties, and even of specific specimens. If gardens with historic collections transitioning from private to public have access to resources for best practices to document and share their collection information, they will be empowered to contribute to efforts beyond their individual scope. Demonstrating these contributions can be helpful in securing funding. Even without formal research programs, smaller gardens and arboreta and preservation gardens can contribute to specific targets of the North American Botanic Garden Strategy for Plant Conservation 2016-2020, most readily:

Objective B2, Subtarget 4: All botanic gardens that maintain plant records will share their plant collections data with the community through tools such as BGCI's PlantSearch database.

Objective B4, Subtarget 2: Conservation programs for ornamental plant varieties will be developed, especially heirloom plants of historical or cultural importance including those derived from non-native species.

Objective B6, Subtarget 3: The number of gardens participating in formal research collaborations with other gardens, universities, government agencies, and non-governmental organizations will increase.

Objective F, Subtarget 2: All gardens will update their missions and strategic plans to include a declaration of their institutional commitment to plant and habitat conservation.

(BGCI (Comp.), 2016b).

An acknowledgement, or perhaps a word of caution, should be made on the utility of living collections for conservation and research. Plants in ex situ collections exist in cultivated environments with many differing environmental factors from their native habitat. Questions of population dynamics, as well as genetic representation of wild populations are factors limiting

the potential usefulness of these collections for some means (Namoff et al. 2010; Hurka et al. 2004). Additionally, as Aplin points out based on his 2014 global survey on living collections results, if "an average of only 14% of accessions in collections are from known wild origin and only 32% of accessions are verified, many plants in collections may not be of great conservation value. Because of this the true plight of some taxa may be unwittingly masked." The BGCI Plant Search Database suggests an "over-estimate of the number of threatened taxa in collections that are legitimately fit-for-purpose with respect to conservation" (Aplin, 2014). These limitations are acknowledged by gardens engaging in conservation initiatives, and it is an area of active research for improvement, as indicated by the North American Botanic Garden Strategy for Plant Conservation Objective B6 (BGCI (Comp.), 2016b). Additionally, recent work has been published to address this need, such as *Strengthening the scientific contribution of botanic gardens to the second phase of the Global Strategy for Plant Conservation* (Blackmore et al., 2011) and *What is the Conservation Value of a Plant in a Botanic Garden? Using Indicators to Improve Management of Ex Situ Collections* (Cibrian-Jaramillo et al., 2013)

Preservation Gardens: What They Are and Why They Matter

> "Our histories tell the two-hundred-year-old story of horticulture in North
> America—the story of plant exploration, discovery, and dissemination. We tell
> the story of human culture and our fascinations with changing styles of plants,
> garden design, and environmentalism. Our gardens hold the stories of the people
> who created them, shaped them, visited them, and loved them."
>
> -- Linda Eirhart, *Plant Collections in Historic Gardens*, 2014

In addition to their cultural significance, long-lived historic plants in botanic collections are valuable because they have been exposed to and survived a variety of environmental conditions over the years, such as drought, pests, and pathogens. Historic gardens are living laboratories

from which to test the effects of changing conditions, thus these plants hold potential as valuable genetic resources for cold and heat hardiness and for resistance to drought, disease, and insects (Eirhart, 2014). Preservation gardens care for and cultivate plants that often have been in individuals' ownership for decades before opening their doors to the public. They may include rare and endangered plants from wild collection, heritage cultivars from historic nurseries or bred on site, and unusual taxa that may not be represented at any other garden, available in the industry, or found in the wild. Examples of these "rich repositories" can be found in the succulents at Lotusland; peonies at the Matthaei Botanical Garden and Nichols Arboretum; heirloom bulbs, vegetables, and fruit trees at Monticello; and woody plants at Mount Auburn Cemetery (Eirhart, 2014). In 2010, the Aichi Target 13 of the Strategic Plan for Biodiversity 2011- 2020 recognized the global conservation importance of cultivated plants: safeguarding genetic diversity "including other socio-economically as well as culturally valuable species" (Morris et al, 2014).

According to the Preservation Assistance Division of the National Park Service, historic landscapes are one of the four classifications of a cultural landscape, which is defined as a geographic area including "both cultural and natural resource and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values" (Birnbaum, 1994). The Garden Conservancy, whose explicit mission is to preserve gardens for the education and inspiration of the public, works within the broader realm of historic preservation and environmental conservation. Private gardens that are preserved and made public "manifest the artistic spirits of their creators and showcase the broad diversity of climate, soil condition, and garden styles found on this continent" (The Garden Conservancy website, 2016). These gardens are an essential part of our cultural and environmental heritage.

"Within cultural landscapes, plants may have historical or botanical significance...If such plants are lost, there would be a loss of historic integrity and biological diversity of the cultural landscape" (Birnbaum, 1994).

When the founders of private collections pass on, the collections are often unmaintained, divided, or lost, but some endure through a transition to a publicly accessible garden with a mission to share and preserve their horticultural heritage. Organizations across the world work to facilitate the preservation of these collections in various ways (Eirhart, 2014). Plant Heritage in the United Kingdom, the Garden Plant Conservation Association of Australia, the Plant Collections Network of North America, and regional groups like The Trustees of Reservations in Massachusetts are just a few of the organizations recognizing the vital role these collections play in horticultural, social, environmental, and scientific endeavors. The "renaissance" in botanic gardens described by Dr. Wyse Jackson is evidenced in part by increased efforts to preserve private landscapes as public gardens. Since its founding in 1989, The Garden Conservancy alone has worked to ensure the survival of over 80 gardens in the United States, many of which have become public gardens (The Garden Conservancy website, 2016).

Preservation gardens are often well equipped to care for plants that have very specific climate or site requirements in a landscape, and therefore could be valuable in participating in exchange and partnership with larger gardens, or as partners in research studies. As is pointed out in the Global Strategy for Plant Conservation Target 16, "for smaller organizations, participating in networks provides a means to contribute to larger projects, benefit from mutual exercises in capacity building and learn from other partners. For larger organizations, networks provide efficient means to coordinate projects across large distances and aggregate observations and results"

(Convention on Biological Diversity, 2010). A lack of proper plant records is often a stumbling block in this relationship, and is possibly a cause for gardens not taking advantage of potential partnerships.

Preservation gardens are geographically distributed throughout the United States, and often in locations that are "off the beaten path" as a result of their origins as private estates. Larger institutions with formal research and conservation programs are typically established in urban centers, such as New York, Chicago, St. Louis, Miami, or Philadelphia. A broad distribution not only makes historically private gardens more accessible to regional students and researchers, conservation organizations serving local habitats, and the general public, but also puts them in a valuable position as potential partners and stewards of collections to ensure their survival in the face of disaster, climate change, and less dramatic drivers of loss. The Mendocino Coast Botanical Gardens is an illustration of the importance of geography to a garden's value in plant conservation and preservation. Rhododendrons grow naturally along the north coast of California, and taxa from around the world thrive in this environment, offering a rare opportunity to showcase a wide variety of species, naturally occurring and cultivated hybrids, and cultivars that are difficult to grow in other locations.

Additionally, many horticultural studies require multiple sites. For example, beginning in 1986, a long-term study at the Laboratory of Dendrology of the Central Siberian Botanical Garden of the Siberian Branch of the Russian Academy of Sciences (CSBG SB RAS) in Novosibirsk examined the cold hardiness of over 100 cultivars of Lilac (*Syringa* spp.). Groups of saplings were planted in test plots around the world -- including gardens in Finland, China, and France -- to study their stability, disease resistance, hardiness, and tolerance of city environments in various climates.

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Based on results, cultivars could be selected, introduced, and recommended for particular regions (Lyakh, 2014).

To reiterate, not all historic landscapes are preservation gardens. Finding preservation gardens is not a straightforward process. While the term "preservation garden," used by the Garden Conservancy is a precise description for this unique subset of gardens, it is not a term used to filter directory listings of gardens in BGCI's or APGA's databases. According to APGA's 2015 benchmarking survey, out of 154 gardens, 35 identified as "historic landscapes" (Anonymous, 2015). BGCI Garden Search for historic gardens in the United States yields 49 results. However, some gardens that transitioned from private to public might identify primarily as another category, such as "Display Garden" or "College or University Garden." On the other hand, some gardens that are historic may not have originated as private estates. Based on the selection process and subsequent elimination of gardens not meeting the specific criteria outlined in the Methods chapter, a list was developed of 108 true preservation gardens in the United States.

Transition from Private to Public

The process that constitutes a "transition" from private to public varies between organizations and depends on many factors, such as founders' vision, funding, revenue, governance, holdings, programming, and infrastructure (The Garden Conservancy website, 2016). It can vary widely in the length of time that the transition takes to complete, and is often a gradual process. "Public" may mean operating as its own entity, often nonprofit, or under the oversight of a partner organization such as the Garden Conservancy, National Trust, Trustees of Reservations, National Parks, or a university, city, or other governing body.

The steps to transition from private to public might parallel the steps to creating a public garden as outlined by The Darwin Technical Manual or Public Garden Management, but differ in several ways. There may be a substantial collection of plants already extant, an established landscape design, or buildings in place that may require significant funding to maintain/preserve. In some cases, there exist other priorities over plant collections, such as collections of other objects, a mission that is rooted in the intention of a founding family (who may be providing an endowment), and existing staff that are either leaving or transitioning as well, to name a few. Change of ownership almost always involves change of use as well as different priorities and levels of funding (Sales, 2009). Even "comparatively enlightened new ownership can lead to a gradual erosion of character and loss of significant values due to unsympathetic commercial activities, unrestricted access, unsuitable events, unrestrained car parking, increased noise, inappropriate smells, overcrowding, too many signs, creeping corporate identity, health and safety issues, etc" (Sales, 2009, p 224).

Part of the transition process is the translation and digitization of the records that accompany these collections into manageable documents. When private estates transition to public gardens, there is not only increased physical access to the grounds, but also informational access to the plants, both as individual specimens and as representatives of their taxonomic group. One of the criteria that makes a botanical garden, according to BGCI (2012), is "communication of information to other gardens, institutions and the public." It is a role and responsibility of institutions that maintain collections to make their plants and information about them available, whether for simple observation, intensive study, or formal research. Gardens that do not have research programs can make valuable contribution to plant science simply by making their plants and the information that accompanies them accessible to researchers. The mission for outreach

that is inherent to public gardens can be met by this collaboration with scholars. Demonstrating the research value of collections underlines their importance, potentially validating funding and resources for their maintenance (Dosmann, 2012).

The Importance of Plant Records

> "The collections [documentation] is not really the glamour part, it's the behind the scenes, it's the mortar that holds the bricks together that makes the plants meaningful well after the plants are dead and after they're gone."
>
> -- Boyce Tankersley, Director of Living Plant Documentation at the Chicago Botanic Garden; personal interview, June 2015

Together, a preserved organism and its label are a scientific specimen that has great intrinsic value (Lane, 1996). It is the combination of plants and the relevant information about these plants that differentiates the botanic garden from a public park, or a nursery's demonstration garden. Record keeping therefore is one of the key activities that constitute the essence of a botanic garden (BGCI, n.d.).

Like artifacts in a museum, plants hold meaning and potential value for research. Yet there is an obvious difference between nonliving objects and living organisms: most obviously, living organisms move, change, reproduce, and die. Plants (and plant communities), as contrived ecosystems, demand a different approach and measures than a building or objects (Sales, 2009). A system of record keeping maintaining data such as their location, condition, lineage, special characteristics, and so forth is therefore a unique challenge in the context of museum-like preservation.

According to Diane Wyse Jackson (2003), "the objectives of plant record keeping will never change." She states that living collections must be correctly identified and documented for:

- Reference (e.g. plant identification, providing plant material from their collections for pharmaceutical screening, education);
- Research (e.g. taxonomy, ethnobotany, horticulture and conservation biology);
- Breeding programs used to stock plants maintained in botanic gardens;
- Conservation collections (long-term backup collections of wild plants in cultivation);
- Population reinforcement and reintroduction in species recovery programs.

Additionally, plant records can be used to reference relevant national and international guidelines, policies, and legislation; to track plants suspected of weediness; to observe those species that are threatened and endangered; and to monitor patented plants or those impacted by a memorandum of understanding (Gates, 2006).
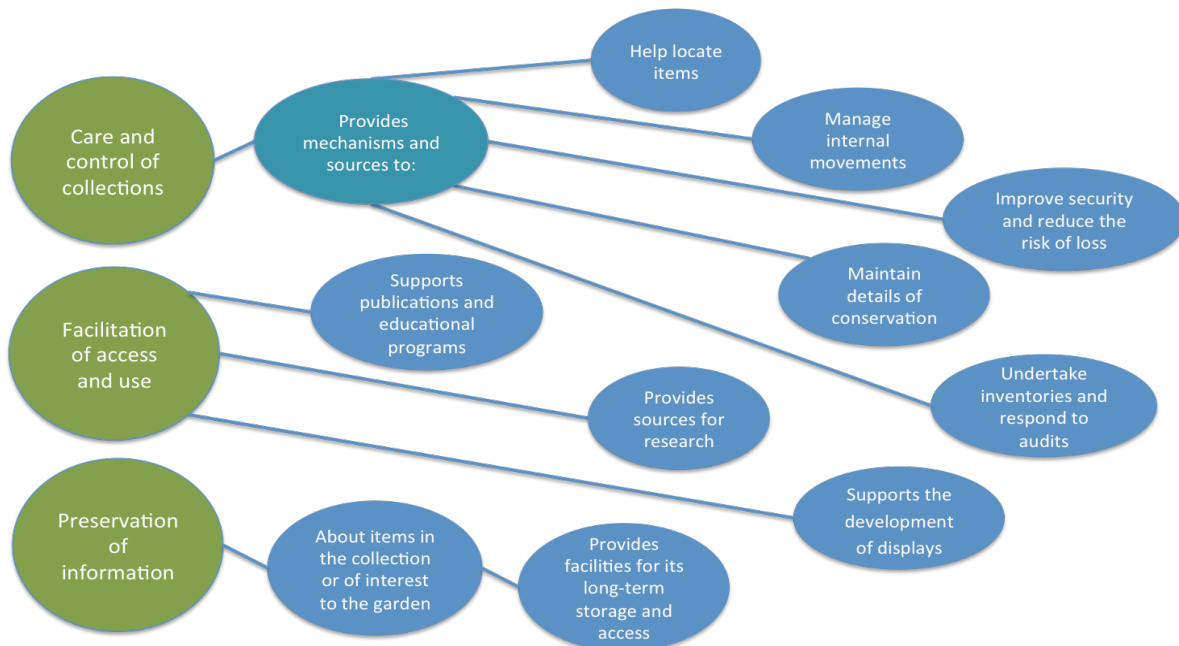
Figure 1. Key uses of a documentation system. Adapted from Roberts (1985), cited by Hohn (2008).

Accurate records also contribute to the conservation of resources in the curation and planning of living collections. In 1976, John Cullen criticized contemporary "ad hoc, unscientific methods of acquisition and selection management" as no longer tolerable, and emphasized the high cost of the scarce and diminishing resources of expertise and energy in such "random methodology." He called for the coordination of collections planning both within and between gardens, which "depends entirely on the existence of adequate and accurate records" (Cullen, 1976). This has been partially addressed with programs such as the Plant Heritage National Plant Collection scheme in the United Kingdom, in which individuals or organizations develop, document, and preserve a comprehensive collection of one group of plants in trust for the future (National Council for the Conservation of Plants and Gardens, n.d.). In North America, the Plant Collections Network coordinates a continent-wide approach to plant germplasm preservation, and promotes excellence in plant collections management. Nationally Accredited Plant Collections may serve as references for plant identification and cultivar registration, as well as germplasm repositories available for taxonomic studies, evaluation, breeding, and other research. Participating institutions compare holdings with others to identify duplications and gaps, which strengthens collections through combined collaborative activities (APGA, n.d.-b).

In Galen Gates's *Characteristics of an Exemplary Living Plant Collection* (2006), he describes 12 characteristics, two of which relate to the documentation of the collections (in bold).

    I.   **Institutional Collections Policy and Development Plans**
   II. High diversity (breadth in taxa and germplasm)
  III. Depth or areas of specialization (plant-related areas)
  IV. Thorough record-keeping
   V. Care—maintenance practices
  VI. An active Verification Program
 VII. Plants of wild origin with cultivated plants from their introducer
VIII. Taxa of conservation concern

IX. Staff expertise (knowledge acquired from the building and study of the Collection)
X. Public access (to view and study plants and benefit from associated programming)
XI. Plant Exploration Programs
XII. Relevance to science and society for multiple generations

"Representatives of an outstanding collection who provide accurate and unbiased information promote the trust and commitment of the public and the profession" (Gates, 2006).

While the fundamental reasons for keeping records on plants in a living collection might not have varied greatly across time and geography, the methods for keeping that data has changed with technology. When computers entered the botanical garden scene in the 1960s, it was suddenly more feasible to compile comprehensive catalogues of much of this information, and to make it more widely available. There was concern expressed by botanic garden professionals early on in the digitization era, however, that "by independent action, institutions may adopt incompatible systems which can result in the stored information becoming unavailable" (Brenan et al., 1975). In 1989, Brian Abell-Seddon proposed a conceptual framework for the museum field that he called a 'reference framework for organizing records in museums' (REFORM) that would standardize the fields of data translated from historic, unformatted museum records. This concept was the basis for the development of Revelation, an early collections management software platform on which BG-BASE was built. "It was conceived with the intention of meeting the demands made on record systems by their conversion to computer-based procedures for data input and retrieval. The objectives of such conversion plans should be thoroughly examined before any attempt is made to introduce a software package to perform (some of) the functions previously served by manual systems. Manual systems based on the principles of REFORM can readily adapt to implementation on a variety of computer software or, even better, record systems can be designed on these principles for implementation on a specially chosen

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software 'vehicle'" ((Abell-Seddon, 1989). There are a few current proprietary software programs that have done just that (e.g. BG-BASE, IrisBG, BRAHMS). Additionaly, BGCI proposed the International Tranfser Format in 1987 to facilitate the exchange of data on botanic garden plant collections in electronic form (BGCI, n.d.)

In Conclusion

Literature published in journals such as *Biodiversity and Conservation, Biological Conservation, BioScience, Frontiers in Plant Science,* and *Trends in Plant Science* supports and discuss the contribution of living collections to research in climate change, food security, plant systematics that will help track biodiversity loss, and the like. Proper documentation is critical in order for botanic gardens to contribute to research, databases, and public education. In an article published in *Biodiversity and Conservation,* David Rae of the Royal Botanic Garden, Edinburgh argues that it is essential that botanic gardens contribute to the science and practice of plant conservation because they have the staff skills and resources required to make a significant contribution. However, for the living plant collections to play their necessary role, "they must be guided by a Collections Policy and achieve the highest standards of sampling, record keeping and cultivation to make sure that the plants in question are fit for purpose" (Rae, 2011).

Living collections, particularly those held by preservation gardens, offer unique opportunities to contribute to research, conservation, and education. These gardens are underutilized, understudied, and are lacking informational resources for navigating the documentation of their collections. This study seeks to address this issue by gathering information about current practices, challenges, and solutions for plant records at preservation gardens. With

comprehensive and accessible documentation systems, these botanical reserves can more

significantly contribute to current research and education in the field of plant science.

<p style="text-align: center;">**CHAPTER TWO: LITERATURE REVIEW**</p>

Literature was reviewed for this project from two contextual areas:

1. Previous studies on living collections documentation practices

2. Resources from the public garden field: manuals and guides, articles about the concept of
   documentation, professional development, and examples from individual institutions

This is a summary review of the most relevant, contemporary literature, and is not intended to

include all literature published on the documentation of living collections. There are many

resources in the fields of museum and library curation that may be adapted and applied to living

collections management. These were not included in the literature review, but some are

referenced in the Recommendations chapter. The author recommends reviewing the bibliography

of Timothy Hohn's *Curatorial Practices for Botanical Gardens* (2008) for a thorough

compilation of relevant resources from the museum field.

Previous Studies on Plant Records Practices

In March of 1993, Botanic Gardens Conservation International (BGCI) conducted a worldwide

survey of their member gardens to investigate the current status of institutional plant records and

computer systems. Results of the study, entitled *Botanic Garden Plant

Records/Database/Computer System Questionnaire*, were intended to be used to plan and

provide better support for botanic garden record systems (BGCI, 1993). The survey focused on the computerization of plant records, database software programs, storage capacity, and use of the International Transfer Format (ITF) for botanic gardens. BGCI developed and first published the ITF in 1987 to facilitate the exchange of data on botanic garden plant collections in electronic form (BGCI, n.d.). It is important to note that the gardens surveyed represent a wide range of sizes, backgrounds, missions, and geographic locations across six continents; their one common denominator is their membership in BGCI. Of the 117 respondents, 77% had computer facilities at that time, and 65% kept computer records of their holdings. An ITF compatible system was reported to be in use by 28% of the institutions. The most commonly used custom software package at that time was BG-BASE, and the most popular commercial software adapted to botanic garden use was Dbase. The majority of software programs reported to be in use at that time are no longer supported, were not widely adopted, or have been superseded by new software, foreshadowing data migration challenges in years to come.

In 1999, while a trainee at the Royal Horticulture Society, London, U.K., Rhoda Maurer conducted a survey of 120 gardens in 18 countries (77.5% response) on plant labeling techniques used by gardens and arboreta (Maurer, 1999). She gathered data on the information most frequently included in labels, materials used for both accession and display labels, and the process of generating labels. At the time, labels were produced on site at a majority of participating gardens (68.2%) and collection records were managed on computer databases (68.7%). At 69% of the gardens surveyed, plant label maintenance was performed on a part-time basis or by volunteers or students, with the remaining 31% reporting 40 or more hours per week allocated to label maintenance (Maurer, 1999). Her report also includes feedback from participants about challenges with labeling, the majority of which were corroborated in this study

when reporting on curatorial challenges. Maurer's may be the only study of this scale performed on labeling techniques in gardens and arboreta, and a replication her questionnaire would be interesting now, 17 years later.

More recently, botanic and public garden management services consultant Dr. Dave Aplin of Botanical Values conducted a global survey of living collections intended to contribute to the updated Darwin Technical Manual (Aplin, 2014). The survey, promoted by BGCI, the Mexican Association of Botanic Gardens, the American Public Gardens Association and PlantNetwork in the UK, received 176 responses from 44 countries. Key findings included the most important roles of institutions (reportedly education, followed by conservation, then research); the number of accessions held (total of 1,786,917 accessions were recorded in cultivation from 135 (74%) of respondents); level of verification (average of 32% of collections are verified); existence of collections policy (39% have one); and evaluation of collections (20% demonstrated a systematic approach). Interestingly, "41 institutions were unable to provide a figure for the total number of accessions grown: the main reason given was problems with consulting the plant records database for this information" (Aplin, 2014). While Aplin's study offers some baseline data about the documentation practices at botanic gardens globally, the broad nature of the population does not accurately reflect the profile of preservation gardens in the United States, and does not delve into the practices behind the maintenance of the reported data.

Several notable graduate student theses on the preservation of historic gardens and/or collections management have included descriptions of plant records practices as well as recommendations. Longwood Graduate Fellow Jane Pepper's 1978 thesis, *Planning the Development of Living Plant Collections in Botanic Gardens and Arboretums* presents not only convincing rationale in

favor of the careful planning of living collections, but also includes guidance for avoiding poor documentation and for developing a collections policy. Pepper's inclusion of then-current collections policies at both botanic gardens and museums is a useful reference point, though many of those policies are now outdated. Pepper also cited a survey conducted in 1976 by Gary Koller and Richard Brown for the Collections Committee of the American Association of Botanical Gardens and Arboretums (now the American Public Gardens Association). Their survey, responded to by 118 of the 237 mailed, revealed 24% of participating gardens had written collections policies at the time. While Pepper's findings and suggestions are still relevant today, the focus of her paper is more upon the development of policy than plant records, and does not examine specific, contemporary records practices.

In 1990, Longwood Graduate Program student Susan Maney O'Leary's thesis *Preserving Design Intent in the Historic Landscape* developed a model for writing preservation policy that includes record keeping and documentation. This model was applied to Naumkeag as a case study. Her four guiding questions to instigate an approach to plant records offer a brief introduction to the topic of records. However, while the model acknowledges some of the widely known challenges of maintaining plant records, it was not her objective to study current practices nor to focus on this one area of preservation. Her guidelines remain relevant, and will be referenced in the Recommendations chapter, but this study delves deeper into the process of plant records specifically by describing current trends and reporting recommendations directly from practitioners.

In 2005, Longwood Graduate Program student Shelley Dawson completed a thesis on database and mapping software system combinations in use at botanical institutions. This study was

written for institutions that already had a computerized database in place and that were seeking

information on choosing a computerized mapping system. Dawson performed a survey of the

software systems currently available for mapping a living plant collection, compared the three

most commonly used software system options based on their features, and selected the most

flexible software option available for mapping living plant collections. Her survey, mailed to 459

members of the American Association of Botanical Gardens and Arboretums (AABGA) and

answered by 177 revealed that at the time, the four most commonly utilized computerized

database systems for managing plant records data were BG-BASE, Microsoft Access, FileMaker

Pro, and Microsoft Excel. The mapping systems used by surveyed botanic gardens fell within

five main groups: no computerized mapping system (either a paper system or currently no

mapping at all); users of AutoCAD products; users of BG-Map and its associated products; users

of ESRI products; and users of a variety of other computerized mapping systems or a

combination. Her evaluation and comparison of products based on user needs concluded that

ESRI products are the most accommodating, followed by Autodesk products. BG-Map was

found to be the least accommodating for survey respondents' stated desires. Dawson's

benchmark study offers a firm foundation on the history and description of mapping software

appropriate for public gardens, recommended background literature for gardens navigating the

selection of a system, and user feedback on the features of their systems. However, given the

rapid progress of technology, the results are now dated, and the curatorial practices described are

specific to mapping.

Most recently, MLA student Paul Cady completed his thesis *Managing Organizational Memory*

in Public Gardens at the University of Georgia. This study focuses on the capture of knowledge

and data held by horticultural staff at botanic gardens, and the shift in organizational culture that

is necessary to preserve valuable information. His is an interesting approach to the documentation of living collections, as it acknowledges and addresses that much of what is known about living collections does not exist in accessible, recorded formats, but rather in the memory banks of individuals. This is particularly true for preservation gardens, thus Cady's study is of unique interest. While his survey did gather data on specific practices, such as databases in use, the survey population was not limited to preservation gardens, and his work is focused on overall organizational approaches to capturing memory. Chapter 5 of Cady's thesis reports on documentation practices: 90% of participants recording some form of data on plants in their collections; databases used most commonly are BG-BASE, followed by Microsoft Excel; and 84% of gardens map their collections, mostly by hand.

Resources in the Public Garden Field

Instructional Guides

In 1998, BGCI published *The Darwin Technical Manual for Botanic Gardens* (Leadlay and Greene, 1998). The intent of this broad-scope handbook was to communicate the current knowledge on the theory and practice of managing botanic gardens in order to "raise the scientific, conservation, and educational value of the living plant collections in botanic gardens worldwide (p. 3)." It was meant to be used as in-service training for staff in a wide range of botanic gardens. The manual includes chapters on Collections Policies and Plant Records for Living Collections. Because of the broad and global audience, the focus is on principles and concepts rather than process, and the standard of practice is based on large institutions with conservation and research priorities. This resource is now out of print.

BGCI is currently in the process of updating this manual with *From Idea to Realisation—BGCI's Manual on Planning, Developing and Managing Botanic Gardens*, which will be available for free in on their website in chapter by chapter installments starting in March 2016 (Gratzfeld, 2016). Part C: The Plant Collection—Linchpin of the Botanic Garden (available in July, 2016), will include chapters on collections policy and strategy, as well as collection records management systems. This will become the most current reference for gardens navigating this process. Still, as this document is composed by and for a global audience, there may be limited relevancy of this resource to the specific interests of preservation gardens in the United States, and it may not include data on current practices.

Timothy Hohn's *Curatorial Practices for Botanical Gardens* (2008) was the first academic text dedicated specifically to curation of living collections. Hohn innovatively and skillfully draws from the museum field, applying theory on practices to living collections, and covers collection governing, building, documenting, preserving, researching, and programming. In Chapter 4: Documenting Collections, Hohn suggests standards for plant records practices and systems that are rooted in a theoretical curatorial perspective. Hohn's research is based on scholarly texts, and offers little in the way of case studies to ground the theory, nor does it examine what current practices actually are. While egalitarian in tone and comprehensive in its introduction to theoretical ideas of curation, this book offers little to the emerging garden in way of practical steps to tackle common, realistic challenges. In a personal interview with Hohn conducted for this project, he references the exclusion of preservation gardens by the breadth of his text, saying that he "always felt a little bit sensitive to the fact that [the book] didn't have more information on historic collections" (personal interview, 2016), and expressed the need for a project specific to preservation gardens.

In 2011, Don Rakow and Sharon Lee compiled *Public Garden Management: A Complete Guide to the Planning and Administration of Botanical Gardens and Arboreta*, which contains a chapter by David Michener on Collections Management (p. 253 - 271). This chapter serves as a clear, broad introduction to documentation concepts that are relevant to gardens across mission, budget, and history. It focuses on the what and why of types of collections, the foundation of collections, policies, plant records, mapping, inventories, verification, and access to data. There is a short section on managing heritage collections that emphasizes that "historical integrity requires quality documentation, not just retention of old accessions (p. 265)." Michener also recognizes the situation of gardens for which the collections goals are driven by aesthetics, but offers little guidance beyond stating that like any other collections, the plants do need records.

Several preservation organizations have developed manuals that include details on documenting living plant collections. Most directly related to this study, The Garden Conservancy's seminal *Preservation Handbook* (2006, 2nd Ed.) is a comprehensive guide to transitioning a garden from private to public. It includes an introduction to the topic of preservation, sample documents produced by grassroots garden preservation groups, case studies, and resources such as references, websites, and lists of relevant organizations. Chapter 7: Developing an Organizational and Garden Plan includes one brief but informative page on documenting the garden. The focus is to guide the capture of extant material at the time of transition, rather than the establishment of a record keeping system. However, there are details elsewhere in the handbook on strategic planning that would address the development of a strategy for documentation, if not specific practices. The authors refer to the National Park Service's

Cultural Landscape Inventory and Cultural Landscape Report as guidance for documenting historic landscapes.

The National Parks Service's Cultural Landscape Program published a second edition of their *Cultural Landscape Inventory Professional Procedures Guide* in 2009. The program, dedicated to a mission of the "preservation and protection of the cultural landscapes in the parks of the National Park System," describes cultural landscapes as ranging "from formal gardens to cattle ranches, from cemeteries and pilgrimage routes to village squares." This procedures guide acknowledges that the recognition of cultural landscapes has expanded nationally and internationally, necessitating landscape inventories that document the significant qualities and attributes of a cultural landscape that make it worth preserving (National Park Service, 2009). Cultural landscape inventories (CLI) are designed to facilitate the collection of basic information on cultural landscapes in the park system, along with other services. The CLI *Professional Procedures Guide* established a compendious protocol that includes, in Section 7, the documentation of landscape features including extant vegetation both indigenous and introduced. Key details to record include type, age, condition, use, and location of vegetation; changes that have occurred since the period of significance, function relative to land use, cultural traditions, and rotation of crops if applicable. Contextually broad but procedurally detailed, the manual is a helpful tool for situating the documentation of a culturally significant property in a larger preservation context.

Charles Birnbaum's 1994 report, *Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes* sets forth a more conceptual framework for the National Park Service preservation programming. Birnbaum calls for careful planning in order to prevent

irrevocable damage to a cultural landscape, which generally involves the following steps: "historical research; inventory and documentation of existing conditions; site analysis and evaluation of integrity and significance; development of a cultural landscape preservation approach and treatment plan; development of a cultural landscape management plan and management philosophy; the development of a strategy for ongoing maintenance; and preparation of a record of treatment and future research recommendations" (Birnbaum, 1994, p. 3). To document existing conditions, Birnbaum says, intensive field investigation should be conducted at the same time that documentary research is being gathered. He emphasizes that information should be exchanged among preservation professionals, historians, technicians, local residents, managers and visitors. He also outlines an inventory process, which is a useful reference for gardens at the time of transition from private to public.

Articles

A handful of articles have been published in professional journals such as *Public Garden*, *BGjournal,* and *Arnoldia* on curatorial topics that include plant records practices. David Michener wrote about curatorial practices in his 1989 case study of the process of verifying collections, published in *Arnoldia* (Michener, 1989). His emphasis was on the verification of existing records, rather than the keeping of records in general. Yet he elegantly sums up the value of well-documented collections: "Simply put, it is a well-curated reference collection in which one has confidence that the material is accurately identified and as fully documented as possible—a collection most capable of supporting the widest range of scientific, horticultural, educational, and aesthetic pursuits at all levels of intellectual rigor."

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Gerard Donnelly and William Feldman, members of the AABGA Plant Collections Committee, wrote an article for *Public Garden* in 1990 titled *How to Write a Collections Policy*. The purpose of this particular guide is to help institutions construct a policy by asking a series of questions. It leaves the final tailoring of the document, based on mission and collections, up to the reader. The authors clearly state their intent is not to develop procedures necessary to implement the policy (which is meant to be included in a separate procedural document), but they do mention several key points concerning documentation, such as declaration of commitment to a plant records system, inventories, and identifying parties responsible for implementation of both (Donnelly & Feldman, 1990). The authors cite several other previously published resources for writing a collections policy in their article.

In 2003, a decade after BGCI's questionnaire on Plant Records/Database/Computer Systems, *BGCNews* published Diane Wyse Jackson's *Plant Record Keeping in 2003*. In this overview of current demands and uses for plant records, Wyse Jackson asserts that while the objectives of plant records will never change—to correctly document and identify collections in order to serve user needs for reference, research, breeding, conservation, and species recovery—the method of keeping them and how they can be used has changed with the advent of new technology. As of 2003, she states that the uses of electronic plant records have expanded to include: production of labels for identification and interpretation, attachment of images for more accurate inventories, maintenance scheduling, plant mapping, production of reports, and contribution to larger datasets for analysis. She acknowledges that a standard system will never be available to the botanic garden community because of the widely varying needs and purposes of gardens, but describes some of the current offerings of relational database software programs: BG-BASE; BG-Recorder, based on Microsoft Access which needs to be adapted by each institution; and custom

programs that can be developed by "wealthier" institutions. Wyse Jackson emphasizes that "any

computer programme will only be a success if it meets the requirements of the user." She also

cites examples of communities of botanic gardens that have agreed on collective requirements

for information systems (Columbian and Dutch botanic garden networks). Her emphasis is on the

future of data sharing based on technological possibilities, and the need for systems and users to

stay up to date and aware of the budget allocations necessary to do so.

BGjournal's 2014 Vol. 11 (2), titled *Botanic gardens: using databases to support plant

conservation* compiles writing relaying to the use of databases to support the wide spectrum of

plant conservation efforts in which botanic gardens are involved. The volume underlines the fact

that the defining feature of a botanic garden is the maintenance of documented collections, and

that such documentation is capable of supporting initiatives beyond internal collections

management. Articles include a description of the role of BGCI's databases, how living

collections management has evolved to support conservation, use of technology such as GIS and

concepts in data curation, and Aplin's global survey of living collections. Like the issue of

Public Garden described below, the volume offers background on, and justification for, the use

of databases to support valuable botanical research and initiatives, and offers case studies;

however, the global audience is broad, and leaves little that is applicable to the specific subset of

preservation gardens on which this study is focused.

Also in 2014, APGA published a volume of *Public Garden* titled Plant Collections in Historic

Landscapes (APGA, 2014a). Articles included case studies on collections and landscape

management from staff at the University of Michigan's Nichols Arboretum, Lotusland,

Monticello, and Mount Auburn Cemetery, as well as more general writing on conserving

historic, cultivated plants in the UK, managing heritage trees, DNA fingerprinting of lilacs across institutions, and heirloom rose breeding. Winterthur Director of Horticulture Linda Eirhart's introduction to the issue lays a strong foundation for the importance of historic plant collections. As a whole, the issue offers rich support for preservation, but does not delve into the realm of documentation practices.

In his article *The Conservation and Management of Historic Flower Gardens of the 20th Century* in the journal *Garden History* (2009), John Sales states, "as far as is practicable a garden's inherited stock of plants should be conserved, catalogued and researched as to their origins and special characteristics" (p.222). His paper discusses the principles, strategies, and practices involved in the management of historic flower gardens of England, and proposes guidelines for their long-term conservation. Sales addresses some of the challenges present in a change of ownership of a garden, and outlines considerations for prioritizing collections for conservation. These guidelines while thorough, are broad in scope and only touch on the importance, rather than the procedures, of documentation as part of the larger framework for garden preservation.

Professional Development

Professional development opportunities are a frequent platform for sharing best practices in the public garden field. At the Historic Landscape Professional Section symposium in 2014, Mt. Cuba Center Curator Amy Highland delivered a presentation titled *Plant Records for Historic Gardens and Landscapes.* Highland emphasized the vital nature of plant records and their contribution to the mission and programming of any garden. Her roadmap for success outlines invaluable recommendations that were echoed by participants in this study, and will be returned to in the Recommendations chapter. They include the centralization of knowledge, a high level

of participation, consideration of end goals of the data, minimum information to document, dedicated staff time, organizational documents, software, and creating a culture of plant records.

To address the need expressed by members of the APGA Plant Collections Professional Section at the 2014 annual APGA conference, the author, along with three other graduate students in the Plant Collections Professional Section, designed and executed a series of three webinars titled "Collections Clarity" in early 2015. The webinars, which featured American and Canadian presenters with a variety of experiences in the public garden field, addressed topics such as what constitutes a collection, why documentation matters, the tools and personnel involved in records curation, and the key policies providing the foundation for best practices (Stormes, Detrick, Helm Wallace & Veil, 2016).

Other presentations sharing practices on plant records, collections policies, and other curatorial topics are most readily found through the American Public Gardens Association.

Institutional Examples

The following are two notable examples of institutions sharing their curatorial practices, policies, and procedures while also offering a broader framework for their process. While concepts and standards may be broadly applied, the texts are ultimately specific to one particular garden.

In 2011, the Royal Botanic Garden Edinburgh published *The Living Collection*, by Director of Horticulture David Rae. This volume offers a comprehensive account of the history of RBG Edinburgh's collections, as well as their contemporary methods for accessioning, recording, and maintaining collections documentation.

Michael Dosmann, Curator of Living Collections at the Arnold Arboretum of Harvard University, emphasizes the importance of developing guiding documents for the effective curation of living collections. Dosmann's account of the history and process of updating the Arnold Arboretum's collections policy, as well as the inclusion of the final document, offers a thorough case study, but does not include details on the procedural practices for plant record keeping (Dosmann, 2008b).

In Conclusion

The literature review brought to light existing resources in the public garden field for living collections curation and documentation. The majority of these resources are in the form of grey literature: sometimes difficult to access, often focused on institutional examples rather than industry research, and published by organizations, practitioners, or students in the field. Most literature focuses on collections policies and management, and there are few resources specifically for plant records. Knowledge is especially lacking on current documentation practices and challenges, particularly for preservation gardens. There is a need for not only baseline data on plant records practices, but also for details specific to public gardens with unique origins as private estates. This study addresses that issue and establishes a framework for other exploratory studies in the future on practices in the botanic garden field.

CHAPTER THREE: METHODS

Mixed Methods Design and Grounded Theory

This is an exploratory study seeking to develop a holistic understanding of the current plant records practices and challenges at preservation gardens in order to set forth recommendations for future practices and resources. To achieve this, a sequential, mixed methods design was selected that incorporated both qualitative and quantitative data gathering and analysis first through interview techniques, followed by a survey instrument. The interviews were performed at public gardens with professionals involved in the plant records practices of their institutions. The interview findings informed the development of a survey that was distributed via email to preservation gardens across the United States in order to generalize the practices and challenges of documenting collections in preservation gardens. The tenets of Grounded Theory Methodology guided the collection, analysis, and interpretation of data in order to answer the primary research questions.

Since there has been little previous research done on plant records practices and challenges in preservation gardens, primary research questions were rooted in the *how and why*. In fields where information system technologies and standards are ever changing, researchers must first descriptively study how organizations are *currently* managing in order to develop prescriptive management guidelines (Benbasat, Goldstein, & Mead, 1987). Qualitative research such as case studies and interviews, according to Benbasat et al., allow researchers to study systems "in a natural setting, learn about the state of the art, and generate theories from practice."

Grounded Theory Methodology (GTM) is a primarily inductive, discovery-based methodology

that sets forth data collection and analysis procedures to identify patterns in data, which can then

be derived into a theory that is empirically valid (Martin and Turner, 1986; Glaser and Strauss,

1967). Developed in the 1960s by Glaser and Strauss and originally called "the constant

comparative method," Grounded Theory has since developed into divergent paths of approach,

referred to as "Glaserian" and "Straussian." The GTM model selected for this study more closely

followed the Glaserian method, in which the emphasis is on conceptualizations (vs. full

descriptions as per the Straussian method) that are more concerned with the substantive area of

inquiry than with people and time (Fernandez, 2005). As such, it has been described as better

suited to the study of industry and organizations rather than individuals, and offers a better

probability of contributing to expertise in the field. The Glaserian method is also less

prescriptive, offering flexibility in the data coding process that is more appropriate for

exploratory inquiry (Fernandez, 2005).

The two cornerstones of the Grounded Theory Method (identified by Urquhart (2001), based on

the tenets set forth by Creswell (1998)) are:

(a) **The researcher sets aside theoretical ideas**. Preconceptions, such as a theory to prove or

disprove, are set aside, and the focus is on drawing conclusions based on evidence from collected

data, comparing it to more data, and then falsifying, confirming, or extending "the applicability

of the theory to the substantive area under study (Fernandez, 2005)."

(b) **The concepts are developed through constant comparison.** This facilitates the generation

of "theories of process, sequence, and change pertaining to organisations" that correspond

closely to the data collected (Glaser and Strauss (1967, pp.113 - 14). Constant comparison

between incidents, and the seeking of uniformities and differences, yields a diverse perspective

on the phenomenon of interest (Fig. 2).
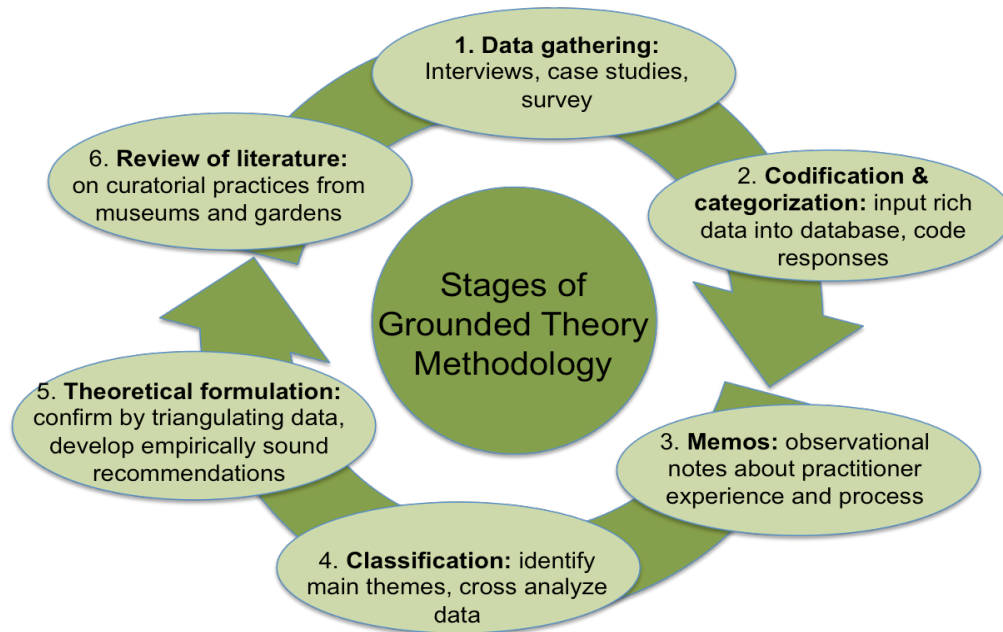
Figure 2. Stages of Grounded Theory Methodology. Model based on design by Marey-Perez (2014).

The Role of the Researcher & Ethical Considerations

"Action research is...a form of self-reflective enquiry undertaken by participants in social

situations in order to improve the rationality and justice of their own practices, and their

understanding of these practices, and the situations in which the practices are carried out" (Carr

& Kemmis (1985) as cited by Jarvis, 1999)

The concept of "practitioner-research," as set forth by Peter Jarvis (1999), describes research

being undertaken by professionals while working in that field; i.e., workers in service industries

who are conducting their own research to solve problems and to inform their practice. While this

particular study was not action nor practitioner-research in the strictest sense, as the researcher

was not actively engaged in the practice of plant records while researching it (Denscombe, 2010), it is in a broad sense: the researcher comes from, and is returning to, a practitioner role in the field being studied. Additionally, both the participants in the study and the intended audience are composed of practitioners in the public garden field. Therefore, it is important to view this particular study with the awareness of the practitioner relationship between researcher and field of study, and also of the concept of research informed by practice.

One of the benefits of practitioner research is the depth of background knowledge on a particular field that informs the gathering and interpretation of data (Jarvis, 1999). Additionally, technical jargon and field-specific references made during interview and survey responses are within the repertoire of the researcher. On the other hand, the practitioner-researcher may bring preconceived ideas about practice and the field of study into their research. In order to avoid bias in this study, the researcher sought the input of four non-practitioners and four practitioners from four different institutions on the design of interview and survey questions.

There is also a concern that the researcher as a practitioner may have an influence on the responses offered by participants. The simple fact that participants are speaking with a person in their field who is interested in performing research on plant records might influence their portrayal of practices at their institutions. All measures were taken to be neutral, consistent, and clear about the goals of the research, and to reduce the risk of the individuals involved. All interview participants received a document clearly stating the purpose of the study and how the results would be used, and signed a form consenting to participate (Appendix A). It was made clear to participants that they were being asked to represent their organizations rather than their opinions as individuals. Additionally, the interview responses were anonymized and reported

quantitatively, or with representation of the institution rather than the individual. Survey responses were recorded anonymously. This study was not considered human-participant research by the Cornell University Institutional Review Board because the information collected was not about individuals, but rather institutional methods, policies, and procedures (Cornell IRB, 2015) (http://www.irb.cornell.edu/) (http://www.irb.cornell.edu/documents/IRB%20Decision%20Tree.pdf).

Data Collection: Interviews

Interview Participants

Ten preservation gardens were interviewed in order to gain rich insight into the documentation practice, and to inform the subsequent design of a nationwide survey of preservation gardens. Gardens were selected based on specific criteria (below) to ensure their fit within the scope of the study and to represent a range of characteristics of preservation gardens, such as size and location. They were chosen from the membership base of the American Public Gardens Association (the largest national, professional organization for public gardens, established in 1940) and through affiliation with The Garden Conservancy (a national organization that has worked to preserve and restore gardens since 1989). In order to preserve the privacy of the individuals and institutions, results of the interviews were reported anonymously.

Criteria for selecting gardens to be interviewed:
All must:

- Have origins as private estates that have transitioned, or are currently transitioning, to public gardens

- Maintain websites expressing their mission and allowing public access to information about their garden and collections

As a group, they must represent:

- Diverse geo-political regions across the United States (defined as locations in a variety of states, near a range of population densities (urban to rural), ecosystem types, and climate zones)
- A range of annual operating budgets, landscape sizes, and years open to the public
- Diverse collection foci, such as wild areas, rare plants of a specific area, regional natives, etc.

Of the 10 selected gardens, nine are APGA members, three have been preserved with the assistance of the Garden Conservancy, and one is a historic site of the National Trust for Historic Preservation. They are located across five states: California (2), Delaware (2), Kentucky (1), Pennsylvania (2), and Washington (3). Based on the American Public Gardens Association size classifications according to annual operating budget, four of the gardens are classified as large gardens, three as medium, and three as small. Their cultivated landscapes range from 3.5 to 170 acres, and they've been open to the public from between 3 and 83 years. The foci of their collections vary widely, encompassing native plants, genetically diverse collections of known wild provenance, heritage cultivars, first generation introductions to the nursery industry, preserved natural areas, and plants of specific ecotype. Additionally, all interviewed gardens cultivate a wide diversity of plants for horticultural display and education purposes.

The staff members interviewed at each garden were the individuals most involved in the institution's plant records. The titles of people in this role varied across institutions, and included

executive directors, directors of horticulture, garden managers, lead horticulturists, curators/directors of collections, and plant recorders/plant information coordinators.

Interview Materials and Methods

Interviews were performed on-site over the summer and fall of 2015, funded by a fellowship from the Garden Club of America and The Landscape Architecture Foundation. A semi-structured interview format was carefully developed to elicit stories and accounts from respondents. The interviewer began with a clear list of questions divided by topic, but was prepared to be flexible on the order in which they are considered, as well as open to the development of wider concepts than initially raised (Denscombe, 2010). Some questions were open ended, while others were straight-forward, closed response (see Appendix B for list of questions). In this type of baseline qualitative protocol, the respondents carefully recorded answers become data elements (Johnson et al, 2010). The questions were submitted for review and edits by three curatorial professionals in the public garden fields, as well as by the researcher's committee members. Interviews lasted between one and two hours, and the on-site visits included documented observations of the gardens.

Interview Analysis

The interviews were analyzed for convergence (recurring regularities in the data) and divergence ("fleshing out" patterns as well as identifying deviant cases) (Patton, 2002). The transcriptions were input into MaxQDA, a qualitative data analysis software program that facilitated the organization and coding of the data by themes. Following Grounded Theory Methodology, the data was open coded by thematic occurrence, compared, then selectively coded until consistent dominant and sub-themes emerged. These themes, and the language used by practitioners to

describe them, informed the development of subsequent survey questions for a larger population. Cross-analyzed with the survey results, these themes formed the foundation for the development of grounded theories in the form of recommendations for the field.

Data Collection: Survey

Survey Participants

Based on results of the interviews, a survey instrument was designed to gather information on practices at preservation gardens nationally: their background, current methods, challenges, transition period from private to public, and recommendations. Because the target population of preservation gardens in the United States is relatively small, the technique of purposive sampling was selected in order to hone in on subjects that will be the most critical for the research. Compared to a cross-section or a conventional probability-based sample, this technique allows concentration on specific but diverse instances that will best illustrate the research objectives (Denscombe, 2010). In this case, in which the emphasis is on exploratory, heavily qualitative research, it is the relevancy of the sample group, rather than the size, that is the critical factor for data gathering.

The sampling frame was drawn from BGCI's Garden Search database under the query "historic gardens" (49); the American Public Gardens Association's Historic Landscape Professional Section (112); gardens preserved by The Garden Conservancy (25), The Trustees of Reservations (11), and The National Trust for Historic Preservation (9). Some gardens are affiliated with more than one organization. The list was then analyzed to eliminate duplicates as well as organizations that do not fall into the scope of the study, such as landscape architecture firms, horticultural service providers, or gardens that otherwise did not fit into the specific

criteria (below). In so doing, it was assured that the sampling frame was relevant, complete, precise, and up to date, thus avoiding the common error with sampling frames that they are incomplete or outdated (Denscombe, 2010), and reducing the possibility of non-response error. This brought the sample size to 100 gardens in 33 states.

Criteria for selecting gardens to be surveyed:

- Must have origins as private estates that have transitioned, or are currently transitioning, to public gardens
- Must maintain websites expressing their mission and allowing public access to information about their garden and collections
- Must have affiliations with one or more of the following organizations: the American Public Gardens Association, Botanic Gardens Conservation International, The Garden Conservancy, The Trustees of Reservations, or The National Trust for Historic Preservation.

As mentioned in the Limitations, this frame excludes gardens that may have otherwise fit this study's criteria but that are not institutional members of APGA or BGCI, or were not preserved by one of the aforementioned agencies. The author assumes that gardens which were not represented in the survey have common ground with those included and that they will benefit from, and have access to, the recommendations set forth based on the collected data.

Once each garden was confirmed to fit the criteria, an email address for the most appropriate contact person within the organization was identified through the garden's website. The "appropriate person" was defined based on the job titles of the interviewees most involved with

plant records at their organizations. The most specific job title was searched for first: curator, director of collections, plant recorder, or plant information coordinator. If one of those positions was not present then the more broad titles of lead horticulturist, garden manager, or director of horticulture were sought; finally, if staff were not listed in those positions, executive directors were selected as the most appropriate contact person. If no staff were listed, the garden's general contact email was used.

Survey Materials and Methods

The survey platform selected was Qualtrics, a powerful web-based survey service. The questions were designed to answer the primary research questions, and were submitted for review and edits by three curatorial professionals in the public garden field, as well as by the researcher's committee members (Appendix C). Additionally, reviews and suggestions were sought from staff of Cornell University's Statistical Consulting Unit and Survey Research Institute in order to reduce ambiguity of question intent, reduce bias or leading of the questions, and to assure the best response format options for subsequent efficiency of analysis. In order to reduce non-response, care was taken to produce a participant-friendly questionnaire, personalized correspondence, multiple contacts, and an award incentive (Dillman, 2000).

The 100 selected participants were emailed two days in advance of the survey distribution to inform them that they had been selected for a study, the significance and objectives of study, and the format in which they would soon receive a survey. Nine emails bounced back, and subsequent emails were sent to alternative email addresses within the organizations to seek an appropriate contact for the survey, resulting in 7 successful corrections. The link to the online survey was emailed to the final 98 participants on December 9, 2015. A reminder email was sent

on January 2, 2016, and a final reminder and thank you was sent on January 13th. The survey closed on January 15th, allowing participants just over 5 weeks to complete the survey. The survey response rate was 62%.

Survey Analysis

Like the interview data, the survey data was analyzed for convergence (recurring regularities in the data) and divergence ("fleshing out" patterns as well as identifying deviant cases) (Patton, 2002). The quantitative data was interpreted using percentages of the population and cross tabulation of quantitative and qualitative responses to reveal themes and substantive significance. The following concerns were considered when determining substantive significance of themes (Patton, 2002, p 467):

- Coherency and consistency
- The extent to which the findings increase and deepen understanding of the plant records practices
- The consistency of findings to other, existing knowledge (either confirmatory or innovation significance)
- The usefulness for contributing to overall understanding of current practices, development of theory, recommendations for the field, and usefulness for future research.

The themes were then compared to the themes that emerged in the interviews. Again following the Grounded Theory Methodology, the open-ended responses were open coded by thematic occurrence, compared to interview responses, then selectively coded until consistent dominant and sub-themes emerged and were quantified. These themes, and the language used by practitioners to describe them, further informed the development grounded theories in the form of recommendations for the field.

CHAPTER FOUR: RESULTS

Overview of Preservation Gardens

Location

The 108 preservation gardens identified by the criteria set forth for interviews (10) and surveys (98) are located in 34 states. Longitudinally, the majority (75) are concentrated in the eastern half of the country, with 18 dispersed across the Midwest and another 15 occurring on the west coast (Fig. 3). While this loosely echoes the larger public garden community (Fig. 4), there is a distinctive absence of preservation gardens across the plains and western states.
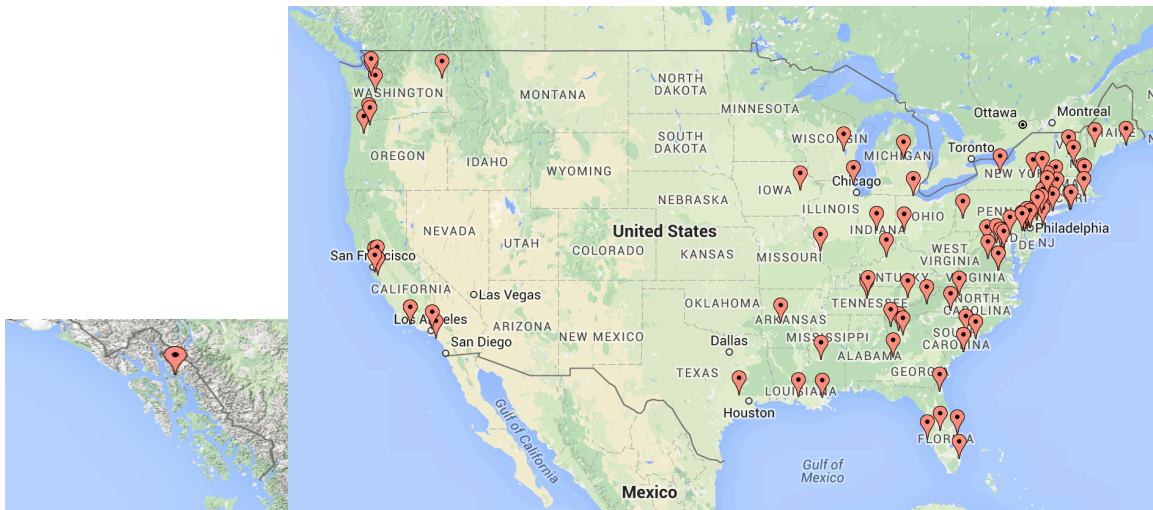
Figure 3. Locations of sample group members for interviews and survey: 34 states, including Alaska (left).
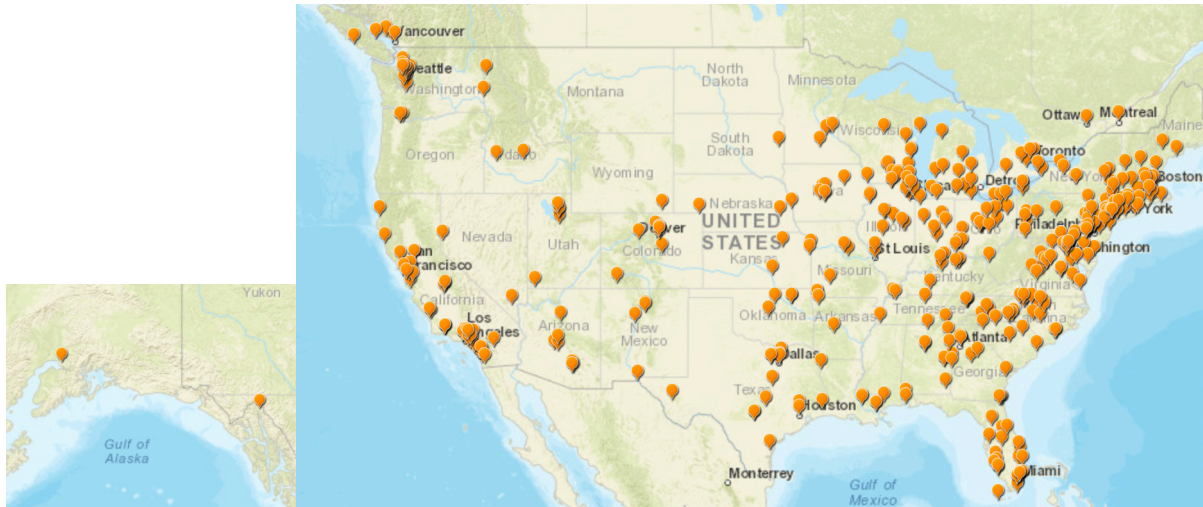
Figure 4. Locations of APGA member gardens: 582 institutions in 48 states, including Alaska (left).

Budget

Gardens were selected for interviews with the intention of representing a range of gardens sizes, backgrounds, and budgets. Their budgets ranged from under $1 million to over $5 million; 3 have budgets under $1 million, 3 between $1-2 million, and 4 over $2 million. These categories are based on the American Public Gardens Association's parameters for describing small, medium, and large gardens.

Survey participants were subsequently asked to select a category of annual operating budget so they could be grouped for analysis as small, medium, and large preservation gardens. The majority of the gardens surveyed (74%) operate on less than $1 million annually. This echoes the larger public garden population: 75% of the institutional members of the American Public Gardens Association are from gardens with annual budgets of less than $1 million (Anonymous, 2015). Of the remaining surveyed gardens, 9% have a budget of $1-2 million, and 18% operate on over $2 million a year (Fig. 5).
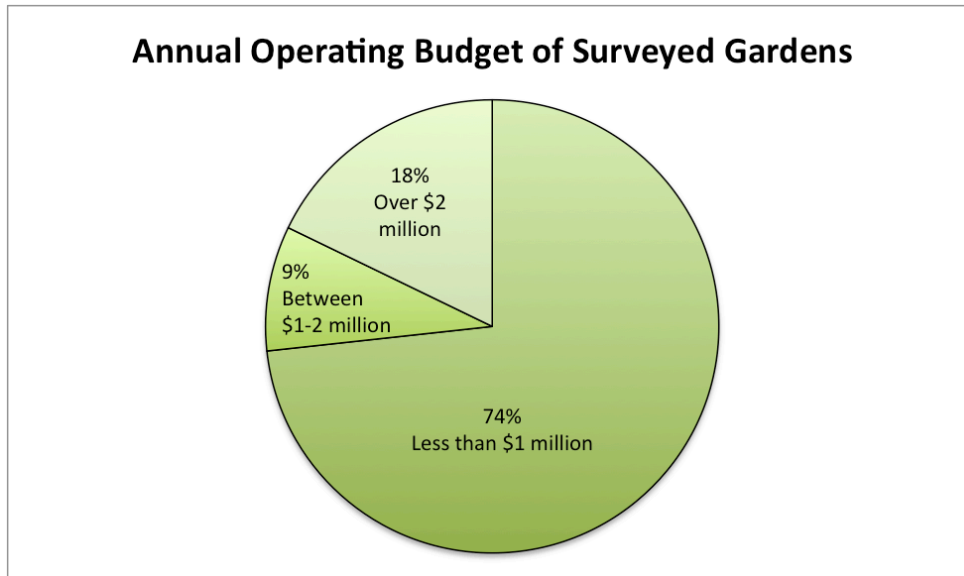
Figure 5. Annual operating budgets of surveyed gardens. Percent of survey population representing each budget category: small, medium, and large.

Acreage

The interviewed gardens, which were purposefully selected to represent a range of sizes, cultivate from 3.5 to 170 acres of land. Despite this wide range, half of the 10 gardens interviewed cultivate 25 acres or less. These results were echoed in the survey: participants reported cultivating from 1 acre to more than 200 acres, however the average is 30 acres and the median is just 6 acres (Table 1). This is substantially smaller than the typical display area of the greater public garden community, according to the 2015 APGA Benchmarking study. The 154 gardens sharing their data reported display areas ranging from 1 to 160 acres, with a median of 20 acres (Anonymous, 2015).

Years open to the public

Gardens interviewed for this study have been open from between 3 and 83 years, with a median of 17 years. Survey gardens indicate a trend of slightly older gardens, with a range from 2 to over

150 years as a public garden and a median of 40 years (Table 1). This closely echoes to the

results of the 2015 APGA Benchmarking study, in which gardens reported a range of less than 5

to approximately 150 years as well, with a median of 35 years open to the public (Anonymous,

2015).

Table 1. Overview of Surveyed Gardens: Budget, Acreage, Years Open to the Public (n=58)

	Largest	**Smallest**	**Mean**	**Median**
Budget	Over $2 million (18%)	Less than $1 million (74%)	Less than $1 million	Less than $1 million
Acreage of cultivated gardens	200+ acres	1 acre	30 acres	6 acres
Years Open	150+ years	2 years	40 years	40 years

Collections Content

Nine of the 10 gardens interviewed said they have plants in their collections that could

potentially be useful for research and conservation objectives. While a third of them reported

some use by researchers or industry professionals on their collections, all nine said they are not

being accessed to their potential. The types of preservation values described during the

interviews include:

1. Original specimens of wild collected germplasm from which introductions to nursery trade were made or breeding lines established
2. Regionally native and rare plants of wild provenance
3. Heirloom cultivars
4. Natural areas with wild plant communities
5. Examples of significant, historic landscape design projects
6. Plants that tell story of place (e.g. gifted specimens from historic figures, plants remaining from original land use)

Based on interview results, surveyed gardens were asked to identify the conservation or

preservation value, if any, of plants in their collections. Of the 58 respondents, 39% reported

holdings that are classified by state, regional, or national standards as rare, endangered, or

threatened. Not surprisingly, 90% of participants reported plants in their collections that their

garden considers to be of unique historic significance. For example, one garden's holdings

include the oldest pecan tree in Washington D.C. Other types of preservation value were

described by 29% of respondents, and include:

1. Plant Collections Network (PCN) collections
2. Parent specimens of important cv. breeding lines or propagated from 1st generation introductions to nursery industry
3. Collection depth (e.g. extensive collection of *Syringa* hardy to zone 4)
4. Natural areas
5. Intact examples of period landscape design
6. Plants original to historic site/planted by historic figures

Nearly half of respondents indicated their gardens collections contain plants with more than one

type of preservation value (Fig. 6). For example, 17% of respondents have plants in their

collection that are classified as all three: rare, endangered, or threatened; of unique historic

significance; and of another type of conservation value.
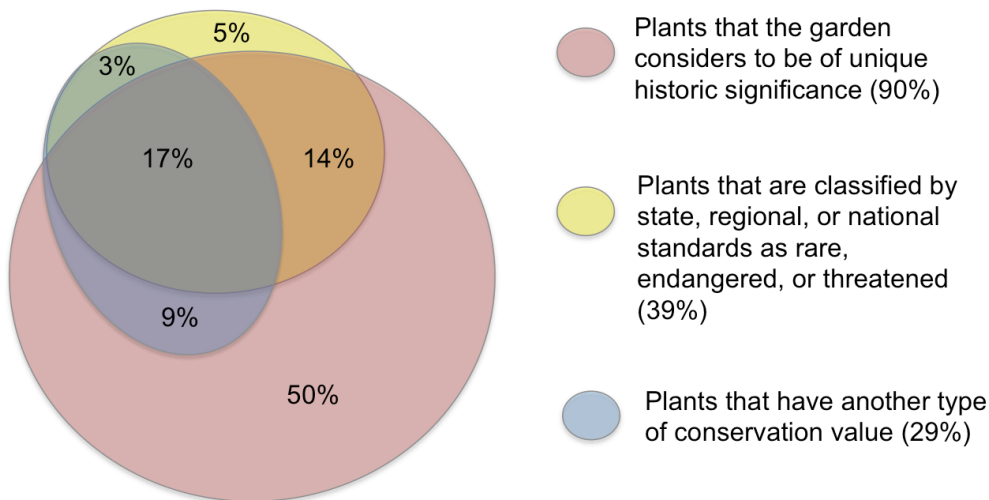
Figure 6. Holdings of preservation gardens with conservation and preservation value.

Order of Operational Priorities

Horticulture and landscape maintenance were reported to be the top priorities for preservation gardens (Table 2). This is followed by visitor-centered priorities (programming & events, interpretation & education, and expanding audience). Consistently ranked last on the list of priorities for preservation gardens are conservation and research. While average rank varied slightly, the order of rank was consistent across budget categories.

Table 2. Mean rank of operational priorities at preservation gardens.

Mean Rank	Operational Priorities (1 is highest priority, 8 is least)
1.9	Horticulture & Landscape Maintenance
3.0	Programming & Events
3.8	Expanding our audience
3.8	Interpretation & Education
4.8	Plant records
4.9	Conservation
6.2	Research
7.8	Other: fine arts curation (1), getting guests to remote location (1)

Transition Period: Successes & Challenges

In the interviews, gardens were asked to describe the history and evolution of their plant records, including historic methods, personnel responsible for them, and the transition to current methods. Based on their feedback, it was evident that the practices and challenges during their transition period were unique to that moment in time, and in many cases different than the current documentation practices and challenges they face. The interview responses guided the development of eight survey questions to find common themes in participating gardens' plant

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records methods, formats, challenges and successes specific to their transition period from private to public. The most telling responses were to the open-ended questions "In regards to plant records, what worked particularly well for your garden during the transition from private to public?" (Q28) and "What didn't work well during the transition, or what do you wish your garden had done differently in regards to plant records?" (Q29).

Responses to both interview and survey questions were coded and cross analyzed, and four common themes emerged. Depending on their presence or absence, these factors were identified as either obstacles or contributors to the success of plant records during the transition period, and are expanded upon below:

1. Historic records and capture of institutional knowledge
2. The development of practices (policies, methods, and selection of database)
3. Perception of priorities
4. Inventories

Historic Records & Capture of Institutional Knowledge

Eight of the 10 gardens interviewed described challenges arising from the absence of historic plant records. In some cases, since the gardens were operated as private estates, physical records were simply never kept, and existed only in the memories of individuals. Often, records were documented prior to the transition, but include problematic gaps due to data loss or corruption, or changes in practices or personnel over time. In other cases, what serves as records are not systematic ledgers, but instead nursery invoices, scribbled memos, notes in margins of books, and barely legible plant labels disintegrated by decades of sun and rain. There was a substantial overlap between the founders and the horticultural managers-to-be in the two gardens that did not describe the absence of historic records as a challenge. In these cases, both written and oral records were reported to be transmitted successfully.

Of the 33 responses to "What didn't work well during the transition, or what do you wish your garden had done differently in regards to plant records?" (Q29), lack of historic records was the most commonly cited challenge (36%), echoing the sentiments expressed in the interviews (Table 3). Of these gardens, 45% expressed regret that their institution did not salvage anecdotal knowledge or plant records from previous owners or property managers. In the interviews, 5 of the 10 gardens did not have the opportunity to consult with previous owners and land managers for a variety of reasons, and all expressed regret that this was the case.

Conversely, to the question (Q28) "In regards to plant records, what worked particularly well for your garden during the transition for private to public?" the majority (57%) of the 30 survey respondents reported that preserving historic records was essential to their success (Table 4). Positive accounts ranged from successful digitization of previously existing and well-detailed documents, to founders who are still involved and accessible for questions. Gardens cited the existence of photos, plant lists, historic inventories, oral histories, correspondences, and forward thinking, well-trained horticultural staff (and founders) as key elements in the preservation of historic records. However, interviews revealed that this capture is not a cut-and-dry process: at one garden, extensive oral histories were recorded along with cataloged images, but the process of organizing that information into a database format has never been completed. At another, the founder and lead gardener are still present as staff, and there is an urgent awareness that the timely capture of these individuals' knowledge is critical, but has yet to be fully undertaken. Based on the interview accounts, a survey question (Q23) was designed to specifically inquire about consultation regarding historic plant records. Of the 52 respondents, the majority (36%) did not consult with anyone; however, 32% reported consulting with landscape architects or designers with previous experiences on the site, 26% with former property owners with

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experience on the site, and 19% with former property managers or volunteers with experience on the site (Fig. 7). A small percent (6%) of respondents reported that there were no records about which to consult. Other parties that were consulted by respondents included external experts such as landscape architecture firms or curators (8%) and archives and/or family members of former owners (8%). Of those that reached out to people with previous experience on the site, almost a quarter (23%) of gardens reported consulting with a combination of two or more sources (former owners, designers, staff or volunteers).
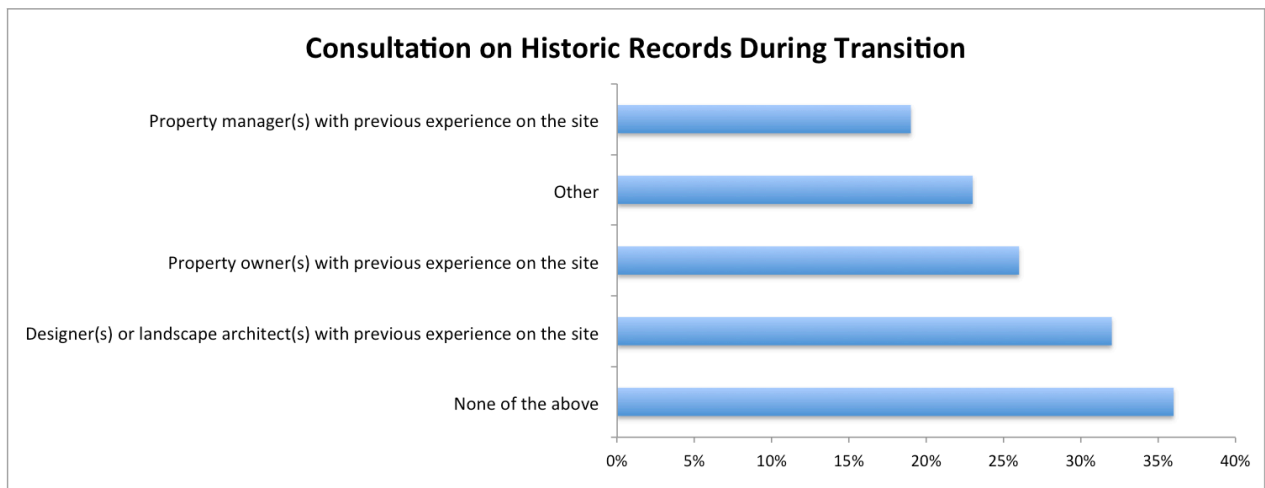
Figure 7. Parties with whom surveyed organizations consulted about historic records during the transition period. "Other" was described as external landscape architecture firms or curators (8%), archives and/or family members of former owners (8%), and simply no records (6%).

Development of Practices: Policies, Methods, & Selection of Database

Insufficient development of protocols and methods was the second most commonly cited difficulty of the transition period, which results in inconsistencies in practice over time and amongst personnel, and ultimately in lost data. On the other hand, early establishment of good practices and protocols demonstrated a lasting effect on plant records practices. Interviewed gardens communicated a range of factors that influenced the establishment of plant records protocols. Survey responses corroborated these results.

Of the surveyed gardens that responded to the open ended question regarding what didn't work well during the transition (Q29), 27% reported complications resulting from poorly or partially developed accessioning, inventorying, updating, and mapping protocols (Table 3). Also related, and equally identified as a frustration by survey participants, was inappropriate selection of database software for digitizing records. Two common trends emerged: either the software selected was powerful but ultimately too cumbersome to be effective and accessible for the staff, or the software was the most affordable and accessible option but not robust enough for data management needs. Additionally, data loss and corruption reported during data digitization and/or migration underline the importance of backing up records. Related, but identified independently by 12% of survey and interview participants, was a challenge specific to the de-accessioning documentation of dead or removed plants (Table 3).

Conversely, the second most frequently cited cause for success in the transition period, referenced by 37% of survey of respondents to Q28, was the establishment by skilled and knowledgeable parties of good plant records practices (Table 4). This includes founders, original directors of horticulture, staff, or in some cases volunteers that possessed the training and foresight—and often, hindsight—to both develop comprehensive systems for documenting the collections and to pass on their knowledge to the institution. Additionally, 17% of respondents reported that the development of guiding documents contributed to plant records success in their garden's transition. Documents included Design Management Guides, Historic Landscape Reports, and in one case, a Map of Garden Maintenance Zones that was developed by a graduate student for a thesis project.

Priority of Plant Records

Five of the 10 interviewed gardens mentioned the impact of prioritization (or lack thereof) on plant records during the time of transition. The 37% of survey respondents who reported that their plant records practices were developed by skilled and knowledgeable personnel also indicated that those individuals highly prioritized plant records (Table 4). Several factors were identified that contributed to whether or not early documentation efforts were made a priority:

1. Founders either *did or did not* keep records when it was a private residence (3 gardens)
2. Documentation either *was or was not* made a regular part of a staff member's responsibility (2)
3. Plant records either *were or were not* preserved when gardeners transitioned (2)
4. Board either *was or was not* educated about documentation policies and practices early in formation (1)

These points were supported by evidence from survey responses. In the survey, 14% of respondents indicated that an institutional attitude of low priority for plant records was one of their garden's primary records challenges during transition (Table 3). Some formerly private estates in the survey described going through a middle stage when they transitioned to public gardens, affecting a period in which the plant collections were not of greatest concern (*documentation not made a regular part of a staff member's responsibility*). For example, one participant described their garden as first being in the hands of a nature preserve, and not under the management of a horticulturist, before becoming a public garden. Another property reported that the initial preservation emphasis was on buildings and object collections, and only later was the garden considered part of the organization's holdings to be archived. Other gardens were first maintained by a volunteer group before developing a professional staff (*plant records not preserved when gardeners transitioned*). In other cases, it was simply the urgency of the governing body to open doors to the public that caused the records, and capturing of institutional

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knowledge, to drop in priority (*board was not educated about documentation practices early in formation*). These types of transitions resulted in the plant records, as both a concept and practice, being perceived as low priority.

Inventories

In the interviews, 4 of 10 gardens described the performance of an inventory at the time of transition as challenging and rarely complete, but extremely beneficial for laying the groundwork. Inventories were performed either by new staff, external professionals, or by the founder just before transition. While varying levels of financial and personnel resources resulted in varying degrees of comprehensiveness, these gardens described performing inventories that were appropriate for and accessible to them. Mass inventories are no silver bullet, however: one garden described a situation in which a well-meaning but unprepared volunteer group, in an attempt to update an earlier inventory, "did far more damage to the dataset than just leaving it alone." In the interviews, a common theme in the success of an inventory was described as having the right person that is knowledgeable in both plants and in databases.

A question was therefore posed in the survey asking whether an inventory was taken of the living plant collection at the time of transition (Q22). Of the 55 gardens that responded, 40% reported that no inventory was performed. Another 27% reported that a partial inventory was done, and 33% reported definitively that an inventory was conducted. In the open-ended question regarding what didn't work well during the transition, 15% of respondents answered the absence of a reliable inventory at that time. Explanations for the lack of inventory ranged from unawareness of the value of the collections or of the data attached to them, to mistakes in an attempted inventory (Table 3).

In contrast, 10% of respondents to the open ended question on success of the transition cited that

conducting an inventory of the plant collections—albeit to varying levels of completeness—was

critical to the success of their transition period. In some cases there were staff and volunteers in-

house that had the skill set to perform inventories; in other cases external professionals were

consulted (Table 4).

Table 3. Transition period: plant records challenges. Challenges during transition from private to public identified by survey participants (n=33), and descriptive examples.

Challenge	Description
1. Lack of historic records 36%	• Total absence of any plant records or landscape plan • Geographically spotty (records for only certain areas) • Chronologically spotty (gaps that reflect either fortunes of institutions or changes in personnel) • Data (records and/or labels) corrupted or lost by human, mechanical, or technological error at some point in time • Original landscape design extant, but not the final plans that were implemented • Opportunity lost to capture anecdotal data on existing plants from previous owners/property managers
2. Insufficient development of protocols and methods 27%	• Lack of regimen for accessioning: designated person, timeline, information to be gathered, etc. • Multiple or poorly designed formats for accession numbering • Lacking or partially developed systems for tasks such as tracking plant health, images, and measurements • Records prepared by staff or volunteers with insufficient knowledge about plant records systems and goals • "Records" are simply a byproduct of plant or label purchases • System of location plants on property poorly conceived and implemented • No map or database system ever developed
3. Inappropriate selection of database software 27%	• A packaged system was selected that proved to be too cumbersome for staff to navigate • A packaged system was selected that isn't sophisticated enough to record desired data in desired format • Original custom database crashed and was not backed up, had to be rebuilt from hard copy • Migration done poorly, data corrupted by human or technological error • Waited too long to select, time and information lost • Horticultural staff not included in conversation
4. Plant records	• Plant collections was not understood to be as important as building

designated low priority 14%	and object collection when property was preserved • After transition, garden was initially managed by non-horticultural staff (naturalists, volunteers, hobbyists) with insufficient knowledge about plant records systems and goals • Access denied to horticultural staff
5. No reliable inventory taken of extant plants at time of transition 15%	• Other objects inventoried, but plant collections not initially seen as part of museum • Not known that it would be useful to capture first-documentation date for existing taxa • Rush to open doors to public • Database started well after transition occurred • Inventory done by volunteers, data inconsistent
6. De-accessioned plants removed from database or not recorded 12%	• Dead plants were deleted from accession records; subsequently reconstructing records in order to restore living specimens to collection, or having to re-accession then officially de-accession to show evidence of prior existence • In rush to open doors to public, historic plants removed without ever being recorded • Selected software doesn't easily track de-accessions • Dead or removed plants were never marked as such, still populate accession database

Table 4. Transition period: plant records success**.** Causes for plant records successes during transition from private to public identified by survey participants (n=33), and examples.

Success	Description
1. Preservation of historic records 57%	• Paper documents scanned and data manually input into database; original paper documents saved and archived • Presence of historic photos • Original directors of horticulture established methodical records practices and passed on knowledge of early record attempts in the garden • Grant obtained to support digitization of handwritten records and oral histories • Founders involved in development of database • Founders were detail oriented: kept lists and records well organized, preserved, and passed on with estate • Relatives, friends, and staff of former owners available to answer questions • Historical societies curate archives of family correspondences and history and makes available as needed • Ownership of/access to records was transferred during transition
2. Establishment of appropriate records systems and practices (methods, protocols, database)	• Developed by skilled and knowledgeable personnel: original directors of horticulture, landscape designers, and/or founders trained in curatorial practices, established

	methods
37%	• Curator and founder developed database jointly • Adoption of selected packaged database software well-received by staff, usable • Skilled staff developed system to verify plant ID when no labels present, map, and assess • Staff or volunteers exercised innovation, adaptability, time, and patience • Successful transition from older, simpler database to newer, more sophisticated package; migration supported by software company
3. Planning documents developed 17%	• Design Management Guide described plantings in terms of character and community • Map of Garden Maintenance Zones developed by graduate student created the structure for digitally recording inventories • Historic Landscape Report undertaken • Coincided new record keeping system with a garden redesign • New plantings strictly adhere to original planting plans
4. Inventories taken at time of transition 10%	• Staff performed cursory tree ID, assessment, and mapping • Professional contracted to perform inventory • No plants labeled; staff or volunteers developed system to identify many cultivated varieties of historic perennials

Format, transition, and accuracy of historic records

Not surprisingly, given historic availability of technologies, all 8 of the interviewed gardens with

extant records and 53% of survey respondents reported that historic plant records (data and/or

maps) existed in paper format at the time of transition (Q24). Paper was defined in the survey as

"handwritten or drawn, invoices, or printed from a no longer extant database." A much smaller

number (7%) reported that already digitized records existed, in the form of spreadsheets,

databases, or another type of software program. Others indicated records existed in the format of

labeled photos (2%) or as both paper and database (2%). For over a third of survey respondents,

formal plant records did not exist at the time of transition (36%) (Fig. 8).

Format of Extant Plant Records at Time of Transition
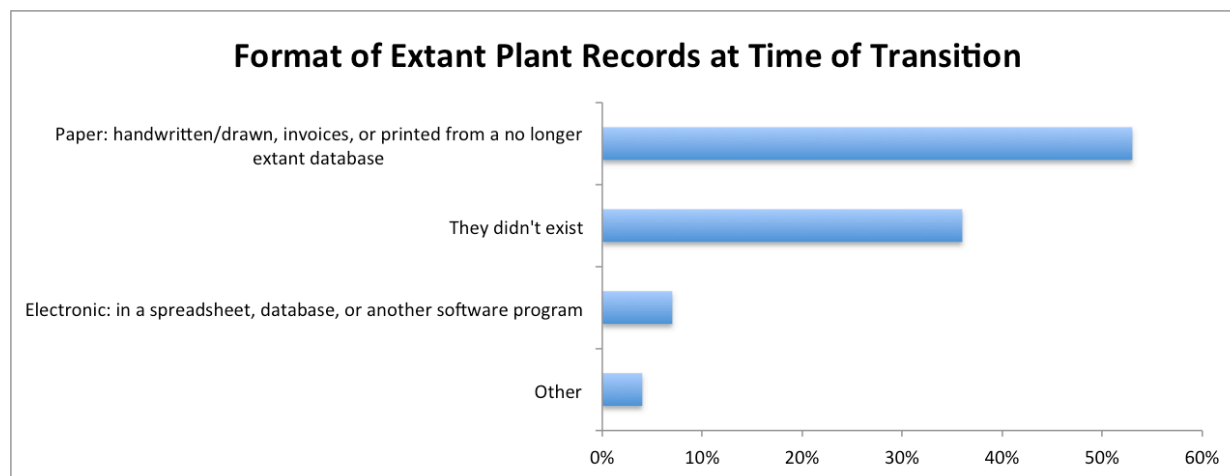
Figure 8. Format of plant records at the time of transition for surveyed gardens. "Other" was described as historic photo collections and a combination of paper and electronic database.

The eight interviewed gardens with extant plant records transitioned them to their current state mostly through manual input from written to digital format. This process was described by several as a "massive undertaking." Gardens proceeded down one of the following paths:

1. Paper to electronic flat database (e.g, Microsoft Excel) (1 garden)
2. Paper to relational database (e.g. Microsoft Access, FilemakerPro, BG-BASE) (3)
3. Paper, to electronic flat database, to relational database (3)
4. Photos and recorded oral histories to relational database (2)

Six of the interviewed gardens began assigning accession numbers to new plants in the collection beginning at the time of transition to a public garden, and are performing retroactive accessioning of historic plants, which was described as an ongoing and very slow process. Two gardens expressed difficulty with migration between systems and loss of data. One garden expressed regret at not entering more than the basic historic data at the time of transition, as retroactive additions are difficult and time consuming.

For surveyed gardens that had access to historic plant records, 63% reported that those records were transitioned to the current state by manually inputting from paper to digital format (n=49).

Two of those 31 gardens reported currently being in the process of that manual input, and both described it as a slow and careful process. Surprisingly, 27% of respondents are still using the same format in which the historic records existed. The remaining 10% reported that the data transition occurred through the development of a historic landscape plan and inventory, or stated that only a few original plantings even exist, implying transition of records on them is relatively moot.

In the interviews, 50% of gardens communicated that there were inaccuracies in their historic plant records, expressed as gaps, incorrect labels, or conflicting accession numbers from different eras that caused problems moving forward. This raised the point that while lack of records altogether is certainly a challenge, existing but inaccurate historic records might also create a challenge. However, when this question was posed in survey format, responses indicated that there was not a trend of satisfaction nor dissatisfaction; in fact, slightly more gardens expressed satisfaction with the accuracy of their historic records. Of the 57 respondents, 35% reported being satisfied or very satisfied, and 27% were dissatisfied or very dissatisfied. The majority of gardens expressed neutrality on the accuracy of their historic records (39%). Therefore, accuracy of historic records was determined not to be a common challenge.

Current Plant Records Practices & Challenges

In the interviews, gardens were asked a set of questions regarding current practices and challenges in documenting their collections. Specific points of interest were written policies and protocols, accessioning, data tracking, staff structure, staff and board attitude toward plant records, data management and mapping systems, data users, and data sharing. Based on these

topics and the themes that emerged during the interviews, survey questions were designed to inquire about current plant records practices and challenges in the broader preservation garden population.

Written policies

During interviews, it became clear that collections policies do not follow consistent formats across institutions. The comprehensiveness, relevance, frequency of reference by staff, length, models on which it was based, motivation for development, etc. varied across institutions. Six of the 10 interviewed gardens currently have a collections policy. One institution is currently in the process of developing a policy, motivated by the receipt of an IMLS grant and progress toward the development of a Plant Collections Network collection, both of which require this document. Two of the interviewed gardens have developed additional written protocols specifically guiding the maintenance of plant records, independent of their collections policy. These gardens have several other characteristics in common: staff positions dedicated to curatorial tasks, powerful software programs for maintaining their database, and a clear set of priorities outlined for regular inventories; they are, however, in different budget categories (medium and large).

The majority of respondents (64%) do not currently have a written plant collections policy, but nearly half of those that do not are currently in the process of developing one. Just over a third (36%) of survey participants have a written collections policy (describing the substance and scope of the collections), and 31% have written guidelines for maintaining plant records (describing the process by which collections are documented). Similarly, 68% of participants do not have written guidelines for maintaining plant records, but half of those are in progress. When

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cross tabulated, it is not surprising to see that there is a close relationship between the presence

of these two institutional documents among respondents (Fig. 9).
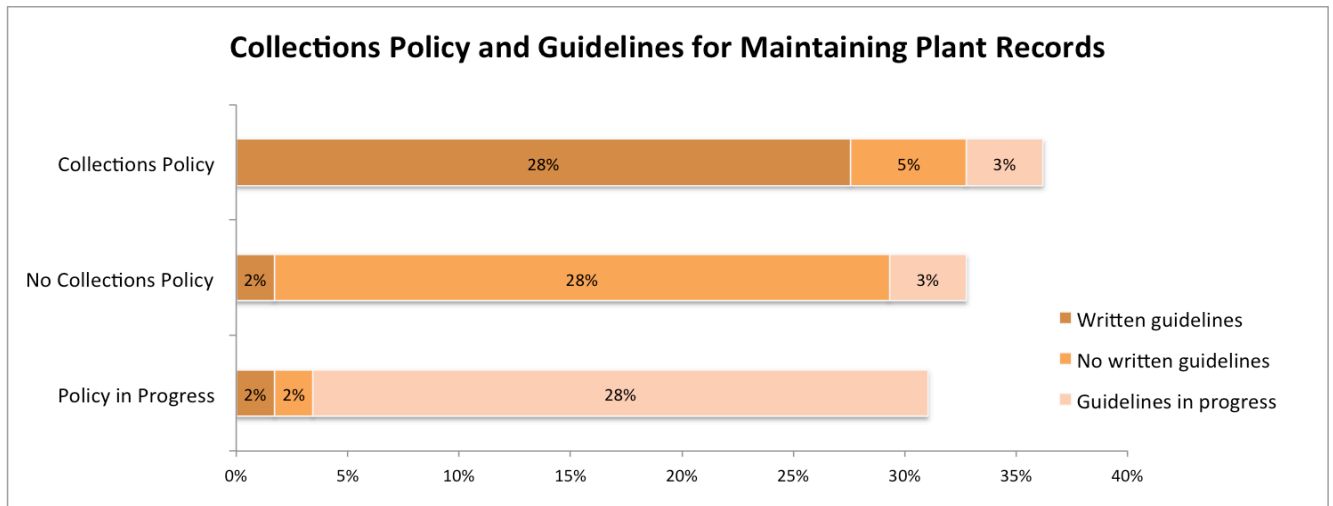
Figure 9. Existence of collections policies and written guidelines at surveyed gardens.

Accessioning and tracking

The interviews revealed a variety of approaches to the accessioning of plants to a garden's

collections, and subsequent tracking of information (location, condition, etc.) on those plants. At

some institutions, all plants are accessioned; at others, none are accessioned; in yet others, some -

based on established criteria - are accessioned. The same was found to be true for the tracking of

information (such as location in the garden and condition): information on all plants is tracked,

no information is tracked, or information on some plants - based on established criteria - is

tracked.

Responding to questions on accessioning and tracking in the survey, the majority (52%) of

participants reported that their garden creates accession records for some plants. A third of

survey respondents (29%) accession all plants in their collections, and 19% do not accession any

plants in their collections. Similarly, 60% of respondents report tracking information for some

plants in their collections, 29% track information for all plants, and 10% do not for any plants.

Like the relationship between collections policies and written guidelines, there is an association

between the practices of accessioning and tracking plants with an institution (Fig. 10). The

majority (88%) of gardens that accession all plants also track information for all plants, and 83%

that accession only some plants also track information for only some of the plants in their

collections. Surprisingly, 73% of the 11 gardens that do not create accession records for any

plants in their gardens do track information for some plants, suggesting that they have developed

a non-traditional system for documenting their collections.
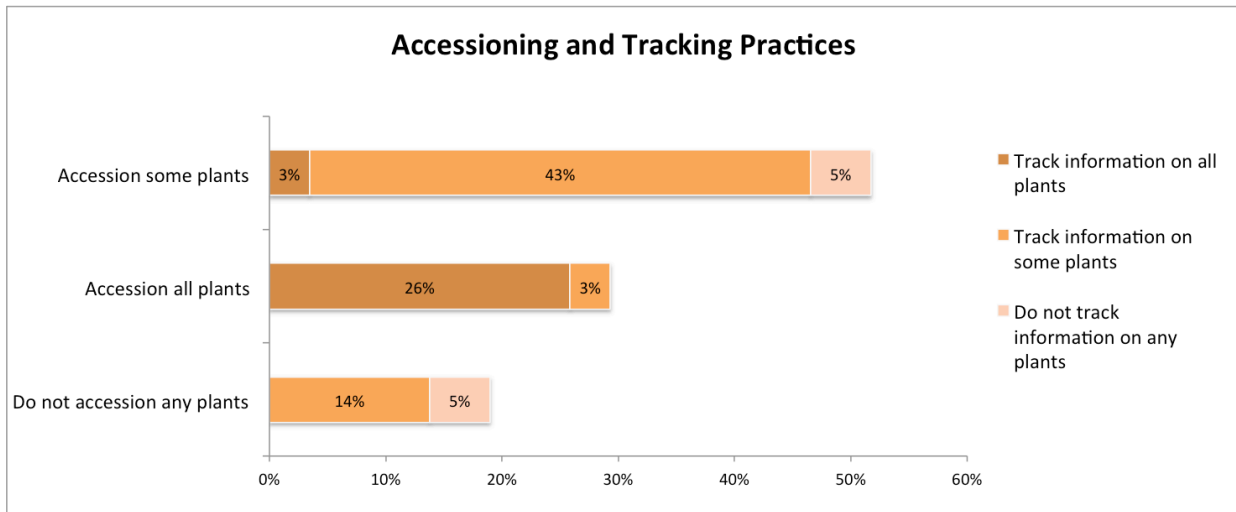
Figure 10. Accessioning and tracking practices at surveyed gardens.

Participants were asked to describe the criteria on which the decisions to accession and track are

based. The following themes were identified from the 29 responses:

Criteria for Accessioning

Woody plants only (trees and shrubs)	66%
Woody plants, and perennials that meet specified priority criteria (e.g. plants in a priority collection, will be in collections a year or more, or have historic significance)	17%
New Plants (recently purchased and/or new taxa for the historic landscape)	7%
Plants replacing historic plants (re-propagation or in-kind)	7%
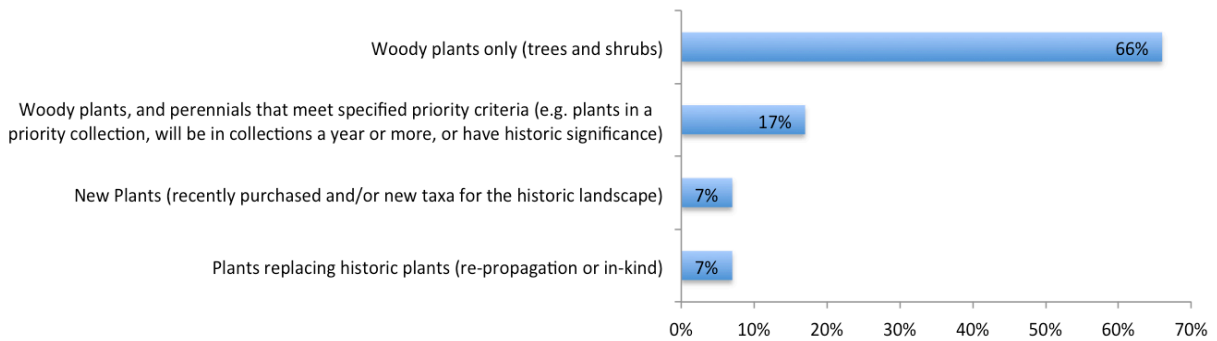
Figure 11. Criteria for creating accession records for plants in collections at surveyed gardens.

The following themes emerged from the 35 respondents who identified criteria for tracking information on plants in their collections:

Criteria for Tracking

Woody plants only (trees and shrubs)	49%
High visibility plants	28%
All that staff have time to (capture quantity variable)	11%
Outside, perennial masses	6%
All accessioned plants	6%
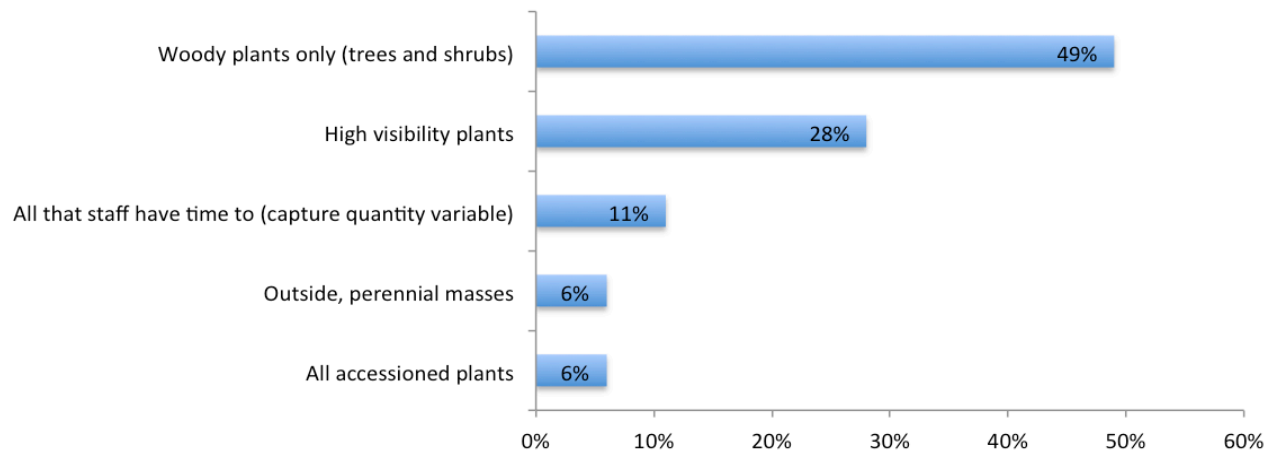
Figure 12. Criteria for tracking information (location, condition, etc) on plants in collections

Timeline for updates

The challenge of recording timely updates to records was a commonly identified theme in the interviews. Gardens that have developed written collections policies and guidelines follow protocols to regularly record updates (accessions, location changes, deaths, etc.). Several gardens

cited the obstacle of limited staff time in making updates, and that changes were subsequently either made whenever the time could be found (not regularly scheduled) or all at once in the winter. Where the latter was the practice, it was communicated that data was sometimes lost or incorrect by the time the update was recorded.

In response to the question of timeline for updates, 45% of survey participants reported that their practice is to update plant records immediately upon a change. Another 37% reported that changes were not made on a regular schedule, but rather whenever the time could be found. One could argue there is imprecision in these survey response options, as "immediate" is relative and could mean whenever the time is found to make an update: a day later, or a month later. However, 0% of respondents selected the option "at least 4 times a year at regularly scheduled intervals." Consideration of responses to all three options reveals an overall lack of established routine for plant records updates. Of the 49 respondents for this question, 18% selected the fourth option: changes are made all at once in the winter.

Staff Positions Responsible for Plant Records

In the interviews, participants were asked how many and which staff positions were primarily responsible for plant records. Responses ranged from 0 to 3.5 positions responsible at least part time for plant records tasks. Titles for those positions at half of the interviewed gardens are specifically curatorial, while the others encompass other responsibilities: plant records manager, GIS specialist, director of record keeping, archivist/librarian, curator, director of horticulture, horticulturist, intern, and volunteer.

Survey participants were subsequently asked if their institution has positions with curatorial titles, defined as containing the terms "curator," "plant records manager," or "curatorial intern, fellow, or apprentice." Less than half (43%) of survey participants reported that positions with curatorial titles are present at their institution. At these 26 gardens, curatorial interns, fellows, or apprentices are the most frequently reported positions (54%), while 42% have curators, and 19% have plant records managers (Fig. 13). Respondents were able to select all options that applied at their institutions. Surprisingly, half of all gardens with curatorial positions reported solely a curatorial intern, fellow, or apprentice (13). Eight gardens have curators only, two have plant records managers only, and two have both curators and plant records managers. Just one garden reported all three positions.
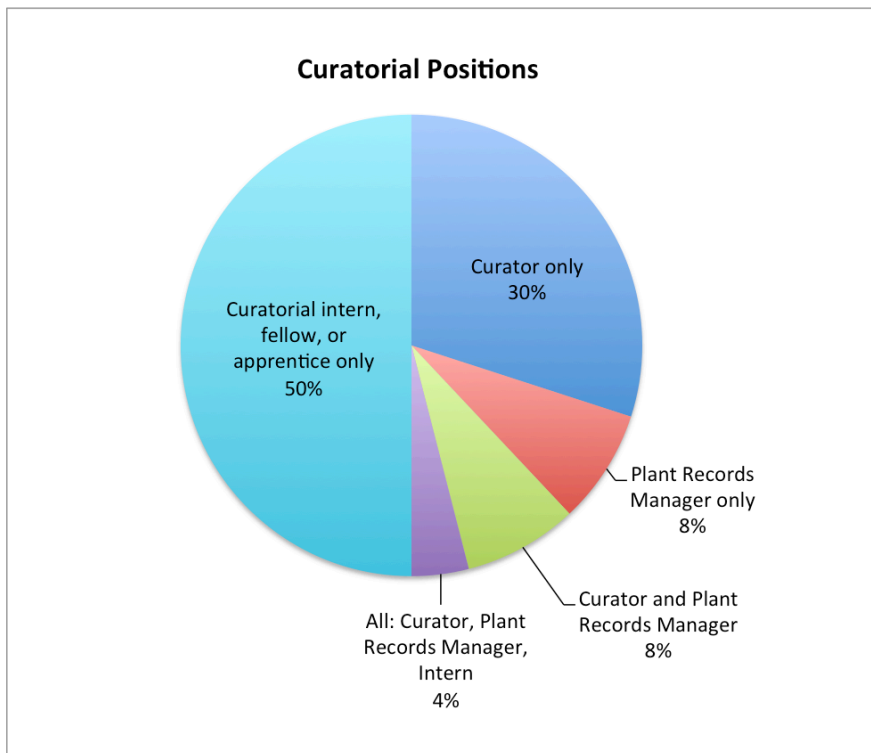
Figure 13. Division of titles at the 43% of surveyed preservation gardens with curatorial staff positions: Curator, Plant Records Manager, Curatorial Intern/Fellow/Apprentice, or a combination (n=26).

Overall, survey respondents indicated that most plant records tasks are most-commonly
performed by part-time, temporary, or volunteer personnel (55%)(Interns/fellows/apprentices
(32%), Volunteers (12%) and part time horticulturists (12%) (Fig. 14). The next most commonly
responsible parties are full-time horticulturists (42%). This is followed closely by managerial
positions (40%), described by participants as Directors/Managers of Horticulture/Living
Collections, Building and Grounds Managers, and Executive Directors. Finally, 27% report that
most plant records tasks are performed by permanent curatorial positions (Curators and Plant
Records Managers). Survey respondents could select all that applied.
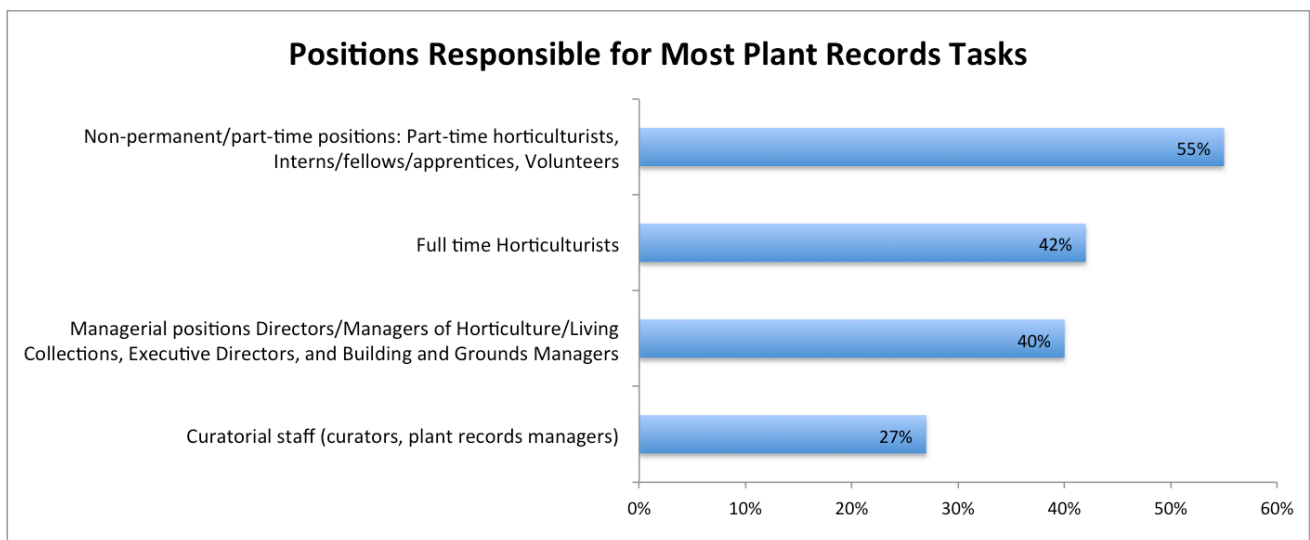
Figure 14. Staff positions currently responsible for most of the plant records tasks at
preservation gardens (n=55).

Plant Records Databases: Systems and Satisfaction

The ten interviewed gardens utilize a variety of database software programs to digitally input and
maintain their plant records: BG-BASE (3), Microsoft Access (2), FilemakerPro (2), Microsoft
Excel (2 (one in transition to Access)), and a custom SQL database designed by an external
contractor (1). Additionally, nearly all interviewed gardens reported maintaining handwritten

documentation either for the short or long-term as a way to communicate and track changes to the collections.

Survey participants reported a similar diversity of database systems (Fig. 15). IrisBG is the most widely used database software; however, it is important to note that 11 of the 13 individual gardens using IrisBG are currently multiple users sharing one license purchased by their preservation organization. Microsoft Excel, which is a flat database, is a close second.

Data Management Systems at Preservation Gardens

System	Percentage
IrisBG	22%
Microsoft Excel	21%
BG-BASE	14%
Microsoft Access	14%
Handwritten/paper	12%
Other	9%
FileMaker Pro	7%
None	1%
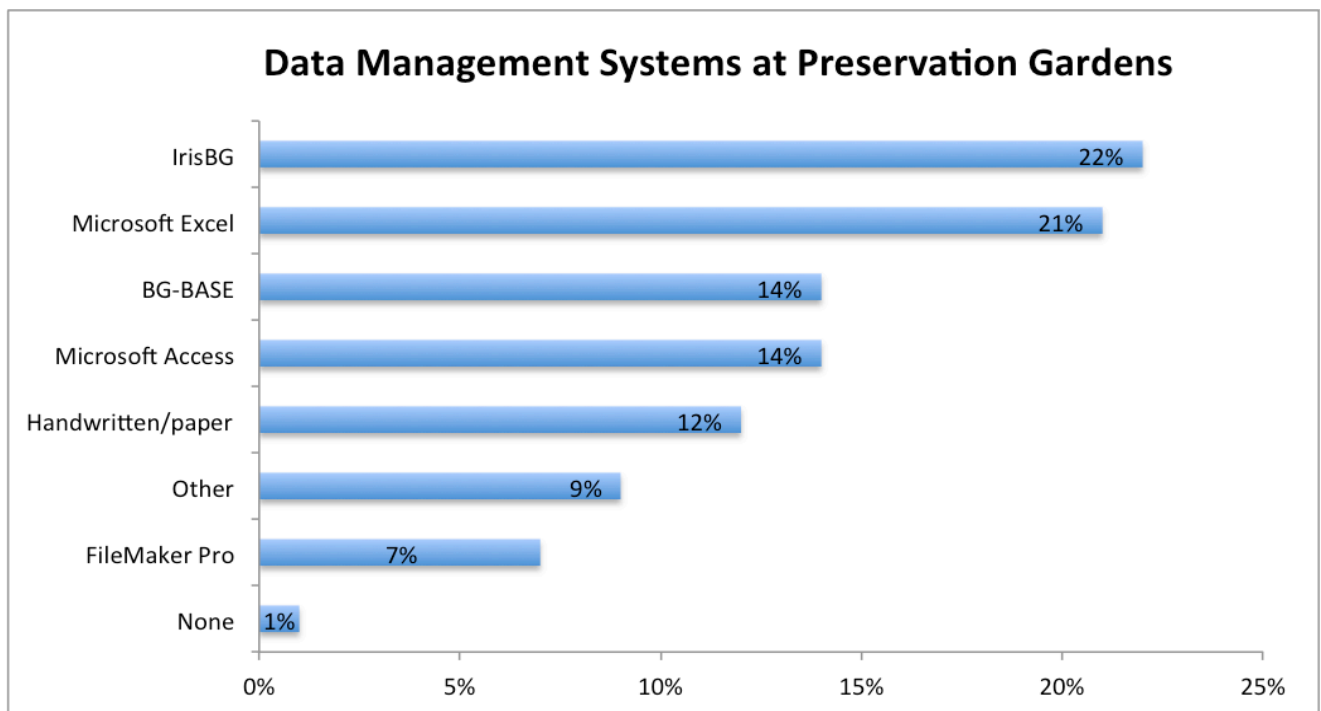
Figure 15. Data management systems currently in use at surveyed preservation gardens (n=58).

Overall, 50% of participants are satisfied with their current data management system. The remaining half are nearly evenly divided between neutrality (24%) and dissatisfaction (26%). However, when satisfaction is examined relative to system in use, there are distinctive differences (Fig. 16). IrisBG users express overwhelming satisfaction. The majority of BG-

BASE users (63%) and Microsoft Access users (57%) also express satisfaction, although Access

users are more polar in their opinions: none are neutral. Only a quarter of FilemakerPro users and

Microsoft Excel users are satisfied with their current system. Institutions at which the primary

data management system occurs on paper with handwritten documentation express the least

satisfaction (14%). Other systems described include Living Collections, Pastperfect, a

combination of handwritten and software, and currently in-transition between Access and

IrisBG. One of the question response options, ArcGIS for Parks and Gardens, was not selected

by any participants and is therefore not graphically represented.
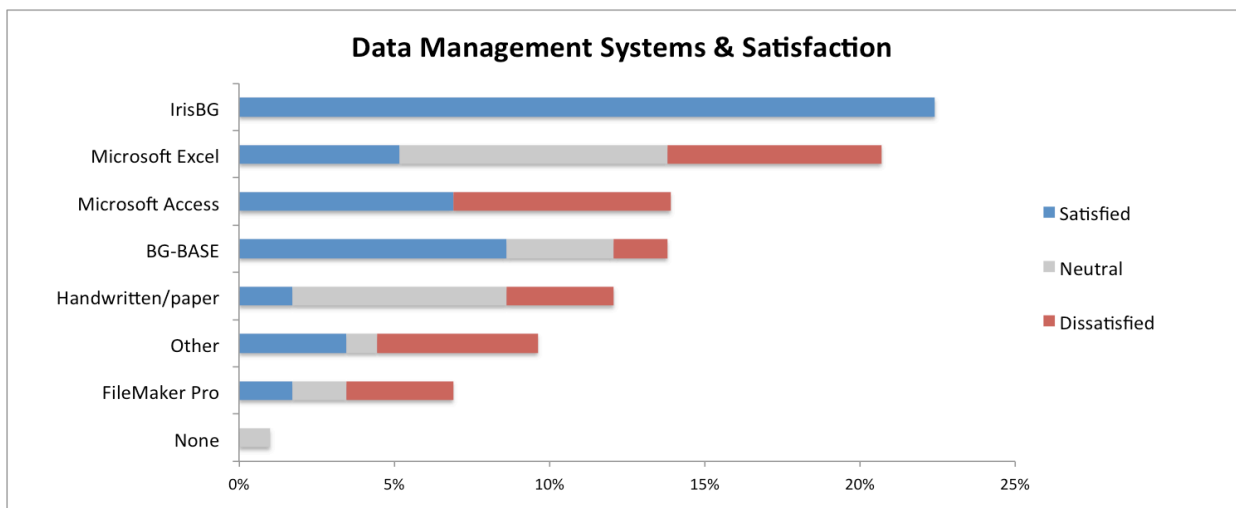
Figure 16. Use of and satisfaction with current data management systems at surveyed
preservation gardens.

Mapping: Systems and Satisfaction

The interviews revealed that fewer gardens map their collections than maintain records on them.

Only four of the ten gardens use mapping software: BG-Map (2) and ArcGIS (2). Of those that

do not, all maintain some level of handdrawn maps, and some have base-maps from land

surveys. One garden is planning to acquire ArcGIS for Parks and Gardens, and another is

working on creating fields in their Microsoft Access database for GPS data.

Of the 67% of surveyed gardens that map their collections, the majority do so by hand on paper (37%) (Fig. 17). This is followed closely by gardens that use IrisBG, which allows users to select from a variety of web-based maps and to integrate mapping with the plant database. All IrisBG users clarified that their base maps are in ArcGIS, while their plants are mapped through IrisBG. Interestingly, while eight gardens report using BG-BASE for their data, only one uses the accompanying BG-Map software. The garden that selected "other" is using Google Earth. One of the question response options, QGIS, was not selected by any participants and is therefore not graphically represented.

Echoing satisfaction ratings for databases, 100% of participants mapping plants in IrisBG express satisfaction with their current system (Fig. 18). The second highest satisfaction ratings are found with ArcGIS, for which 3 of the 4 users are satisfied. The singular garden using ArcGIS for Parks and Gardens also reported satisfaction. Of the 17 gardens not currently mapping plant collections, none expressed satisfaction: 11 were neutral and 6 were dissatisfied with their current lack of system.
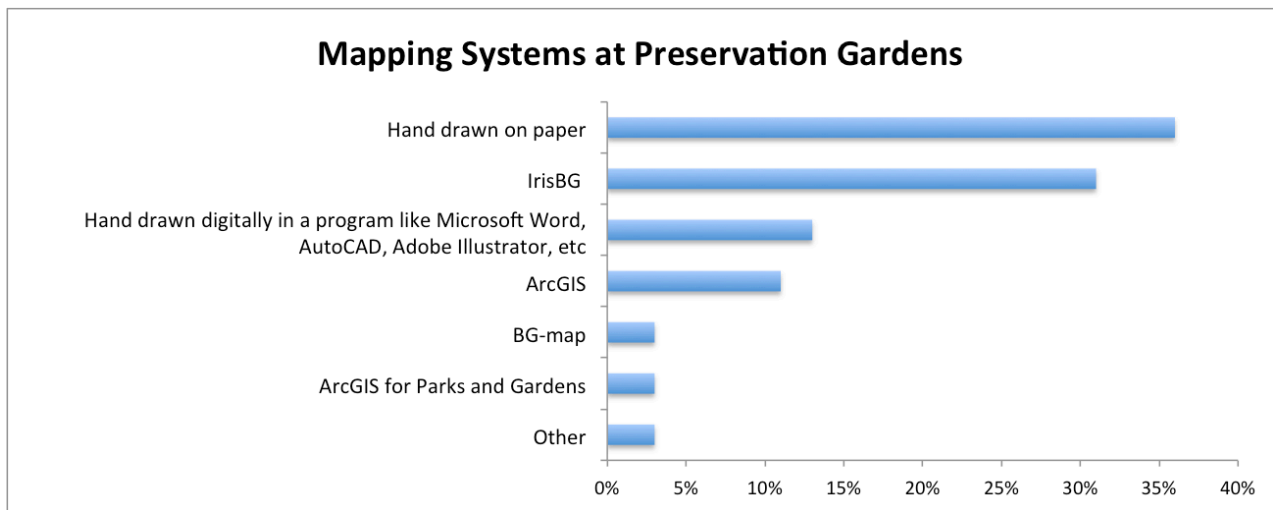
Figure 17. Mapping systems currently in use at surveyed preservation gardens (n=38).

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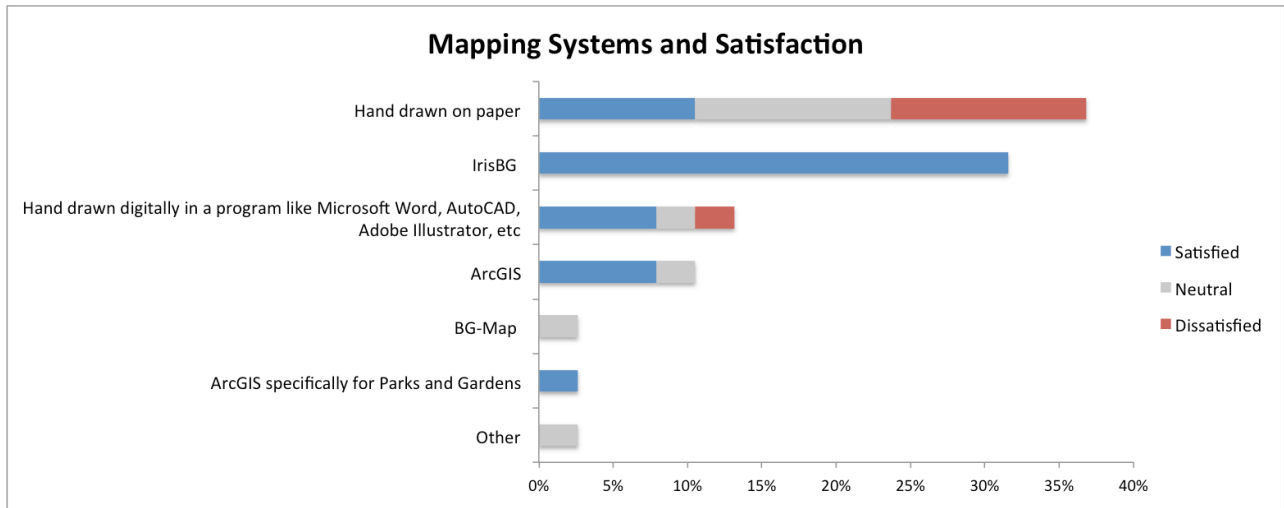
Figure 18. Satisfaction with current mapping system at surveyed preservation gardens (n=55).

Users and Sharing

During the interviews, gardens were asked what data was most used internally and externally from their plant records. Internally, the most critical and commonly sought pieces of information from the plant records were reported to be ID (8), location in the garden (7), source or origin (3), date of acquisition (3), information to share with docents such as history and plant characteristics (3), information that could be used in marketing or PR such as what's in bloom (2), and performance over time (1). The primary users of those data were horticulturists, educators and docents, and marketing staff.

Externally, the most common consumers of plant records data were reported to be visitors (10), industry professionals from other gardens, nurseries, and the design field (8), and researchers (6). Modes of communications were primarily information requested on an individual basis (8), followed by labels (6), exportation of records to a meta database such as BGCI PlantSearch or BG-BASE Multisite Search (3), and the garden's website (3).

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Interview results informed the development of survey questions focused on user groups and data sharing. In the survey, gardens were asked to rank groups based on the frequency of their use of the plant records, where 1 is the most frequent (Table 5). Respondents consistently ranked users in the following order across budget categories, with the exception that large gardens ranked "other professionals" slightly higher than "visiting public" (2.9 and 3.0 respectively).

Table 5. Most frequent users of plant records data at preservation gardens (n=44)

Rank of frequency (1=most frequent)	Users of plant records data
1	Internal (staff, board, volunteers)
2.6	Visiting public
3.1	Other professional in the public garden/green industry fields
3.8	Researchers
4.4	Other: online public

There is a relationship between data sharing practices and data management systems that is not surprising (Fig. 19). Gardens with handwritten records share less commonly than those with software that enables relatively fast exportation of data to flat files (usually Microsoft Excel) which can then be easily shared electronically.
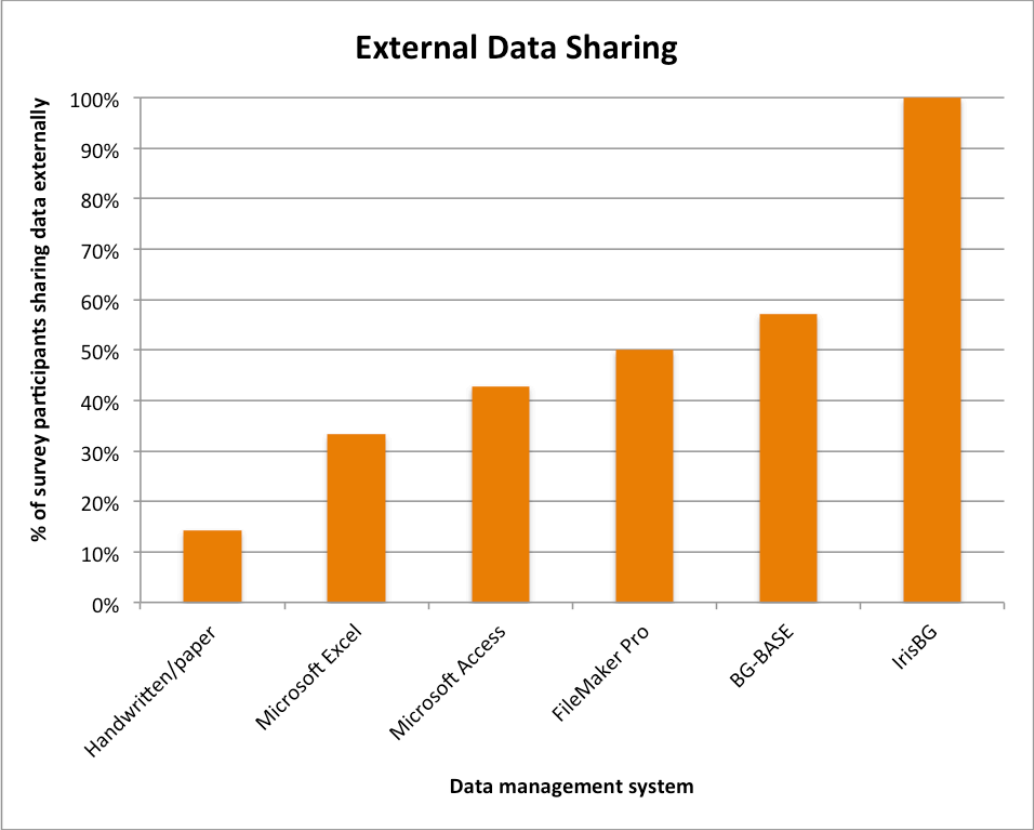
Figure 19. External data sharing relative to data management systems.

While user groups are similar across budget categories, differences arise in data sharing practices (Tables 6 & 7). Overall, 54% of survey respondents share their plant records data externally (n=57). However, 70% of large gardens share externally, primarily by exporting to a meta-database like BGCI PlantSearch. Of the medium budget gardens, 60% share externally, primarily on an individual request basis. Meanwhile, 53% of small gardens share data externally, primarily via their websites.

Table 6. Average rank of external data sharing methods by all surveyed gardens. Overall, 54% of survey respondents share their plant records data externally (n=57).

Average Rank (1=most common)	External data sharing method
1.8	Website
2.1	Individual requests

2.2	Exporting to meta-database
3.9	Other: kiosk in visitor's center

Table 7. Most common external data sharing methods for each budget category. (1 is most common and 4 is least common method.)

Avg. Rank	Data sharing method for Small Gardens (53% share externally)	Avg. Rank	Data sharing method for Medium Gardens (60% share externally)	Avg. Rank	Data sharing method for Large Gardens (70% share externally)
1.5	Website	1.3	Individual requests	1.8	Exporting to meta-database
2.2	Individual requests	2.0	Exporting to meta-database	2.4	Individual request & website
2.4	Exporting to meta-database	2.7	Website	3.4	other: kiosk in the visitor center
3.9	Other	4.0	Other		

Current Challenges

Based on themes of current documentation challenges identified in the interviews, two lists of challenges were developed for the survey population. The first list was composed of overall challenges in documenting the garden's collections. The second list was on the management of specific documentation tasks. Participants were asked to rate the level of challenge on a scale of 0 to 10, where 0 is not challenging at all, and 10 is extremely challenging (Fig. 20). Staff time and financial resources are clearly the top challenges for most gardens in the survey population with mean rankings of 7.3 and 5.8, respectively. However, responses demonstrated a wide distribution relative to mean (SD from 2.4 to 4.3).
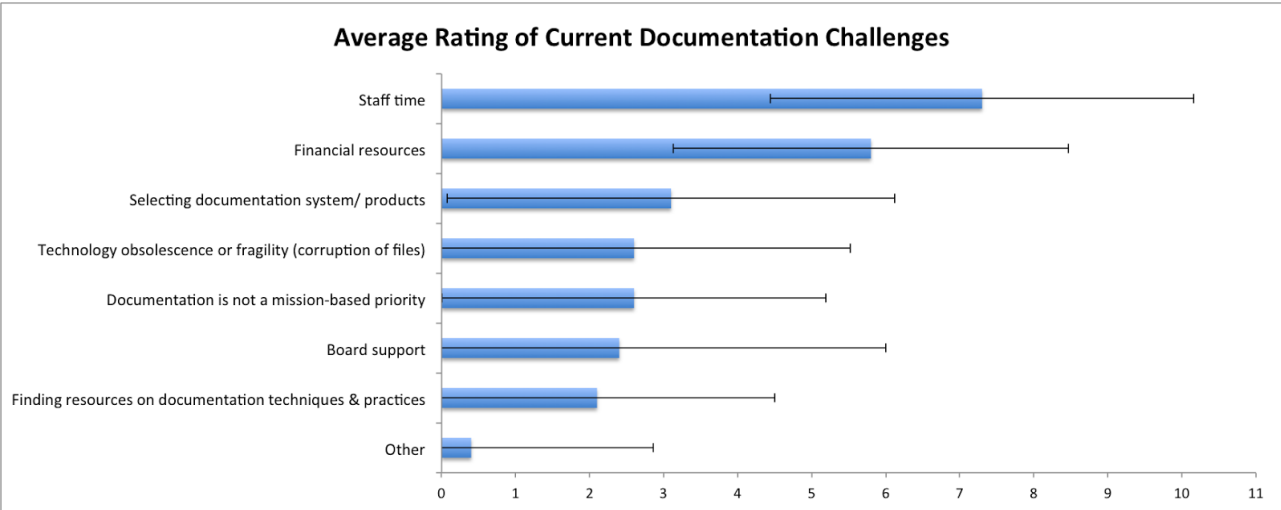
Figure 20. Average rating of current challenges in documenting living collections at surveyed preservation gardens. (Scale: 0 is not a challenge, 10 is extremely challenging).

The order of challenges holds true across all budget categories, although the nuances in ratings vary based on budget (Fig 21).
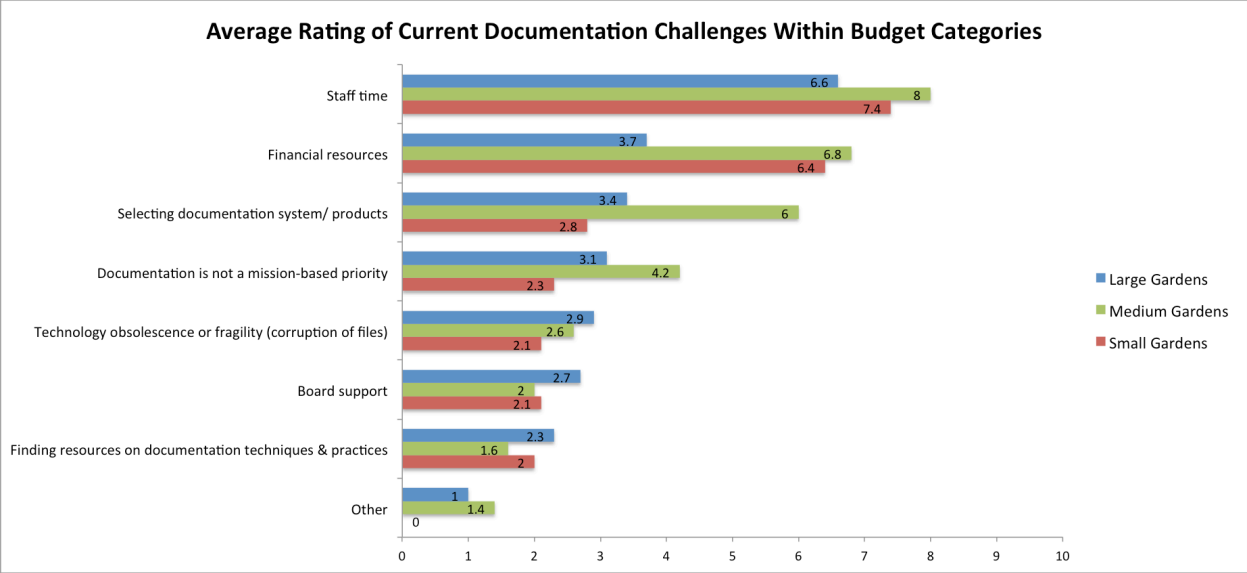
Figure 21.   Average rating of current challenges in documenting living collections within each budget category. (Scale: 0 is not a challenge, 10 is extremely challenging).

Current Challenges: Tasks

The second question about challenges presented in the survey was based on the difficulty of

managing specific documentation tasks as described during interviews. This revealed that

mapping is considered to be the most challenging documentation task by preservation gardens,

followed closely by initial accession input, inventories, then label maintenance (Fig. 22).
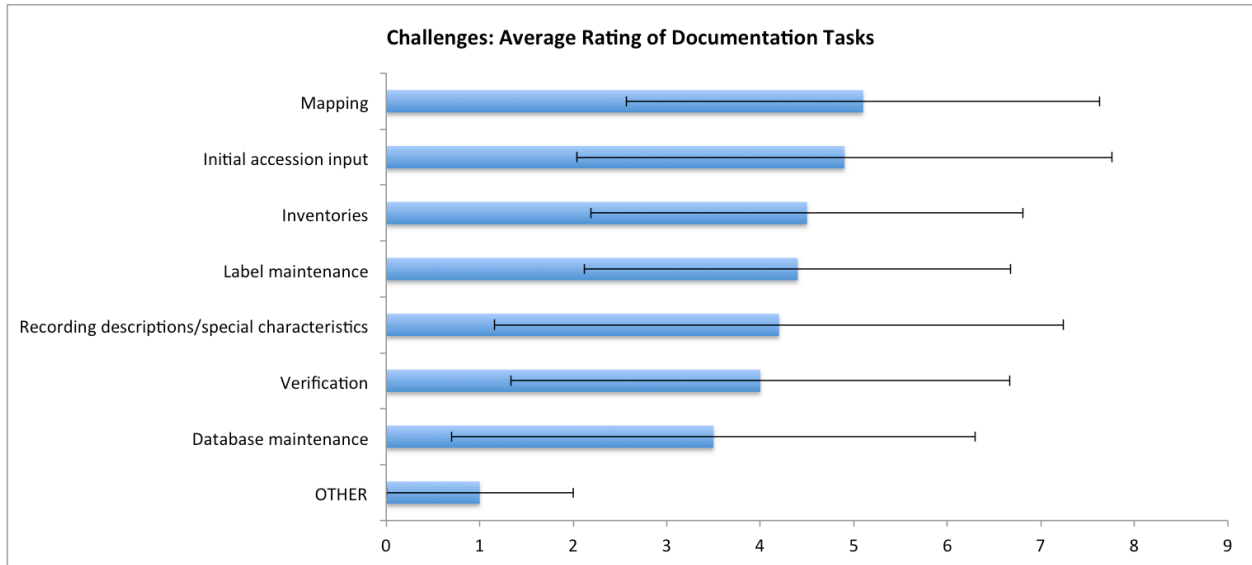
Figure 22. Average rating of the challenges of managing specific documentation tasks at surveyed preservation gardens. (Scale: 0 is not a challenge, 10 is extremely challenging).

In this case, there is less consistency in ratings across budget categories (Fig. 23).
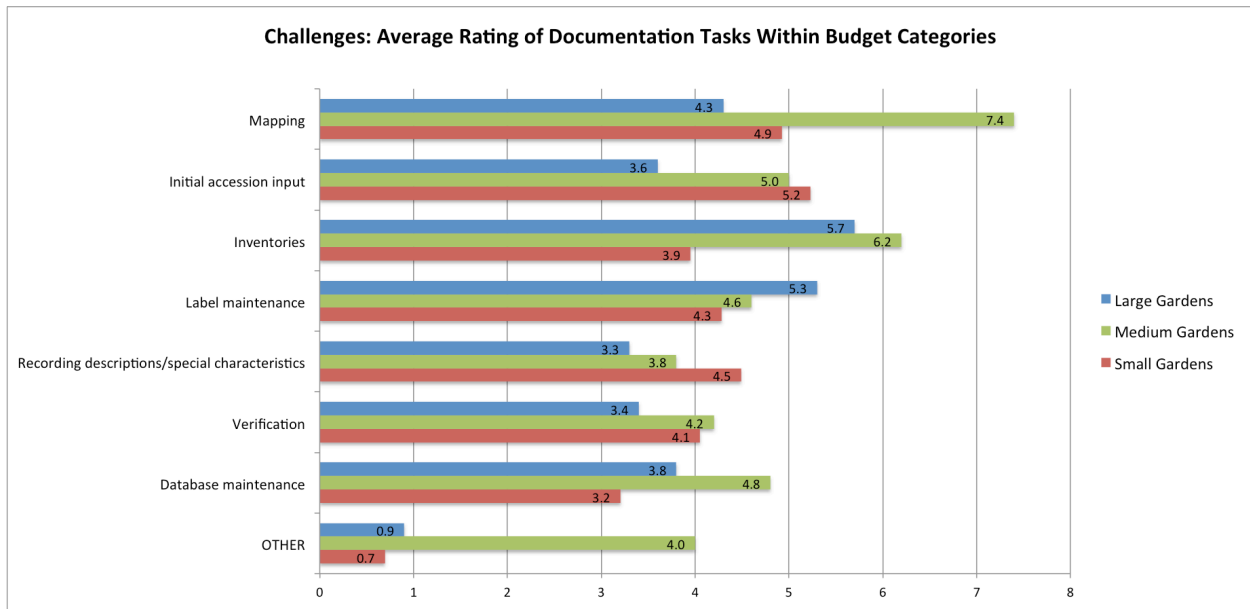
Figure 23. Average rating of the challenges of managing specific documentation tasks at surveyed preservation gardens within each budget category. (Scale: 0 is not a challenge, 10 is extremely challenging).

The outlier of a high ranked "other" in the medium budget category described their challenges as rooted in their current database system, stating that it makes all tasks challenging, especially searching, as records are kept in 22 different spreadsheets.

"Other" challenges identified by survey and interview respondents included:

1. Concern that current and future staff candidates may not be trained in both of the specific skills required to document collections, namely plant taxonomy and database management (4)
2. Creating a current system (3)
3. Flow of communication between staff and plant records manager (2)
4. Transferability of records to other devices (2)
5. A need to see examples of, and correspond with, other gardens of similar means (1)

Staff & Board Attitudes & Importance to Mission

Six of the 10 interviewed gardens discussed staff attitudes. Three participants indicated that staff generally view plant records as low priority, describing situations of little awareness of the value

of documentation, or of apathy. Another three participants described the staff attitude toward plant records as a high priority: one of these gardens attributed this to the inclusion of documentation practices during on-boarding, while the other two had an extremely small total staff amongst which documentation tasks were shared.

Eight of the 10 gardens discussed board attitudes (the topic of documentation has not yet come up for one garden's board, and the remaining garden does not currently have a board). Two gardens said that their board members did not perceive plant records as a priority, commonly explained as a lack of knowledge of how plant records are used, and lack of direct interaction with documentation tasks. Six gardens described board support as high, and attributed this to a process of communication, education, and demonstration of the uses of plant records at their institution.

Based on the findings from the interviews, a question was posed in the survey to inquire about general staff and board attitudes toward plant records, identified as "high priority," "low priority," or "neutral." Only 32% of respondents indicated that staff perceived plant records as high priority, and almost half that amount (18%), reported that the board perceived records as high priority (Fig. 24). Overall, over a quarter of respondents indicated that the staff and board perceive plant records as explicitly low priority (28% and 26%, respectively). The majority of both staff (40%) and board (51%) attitudes were reported to be neutral.
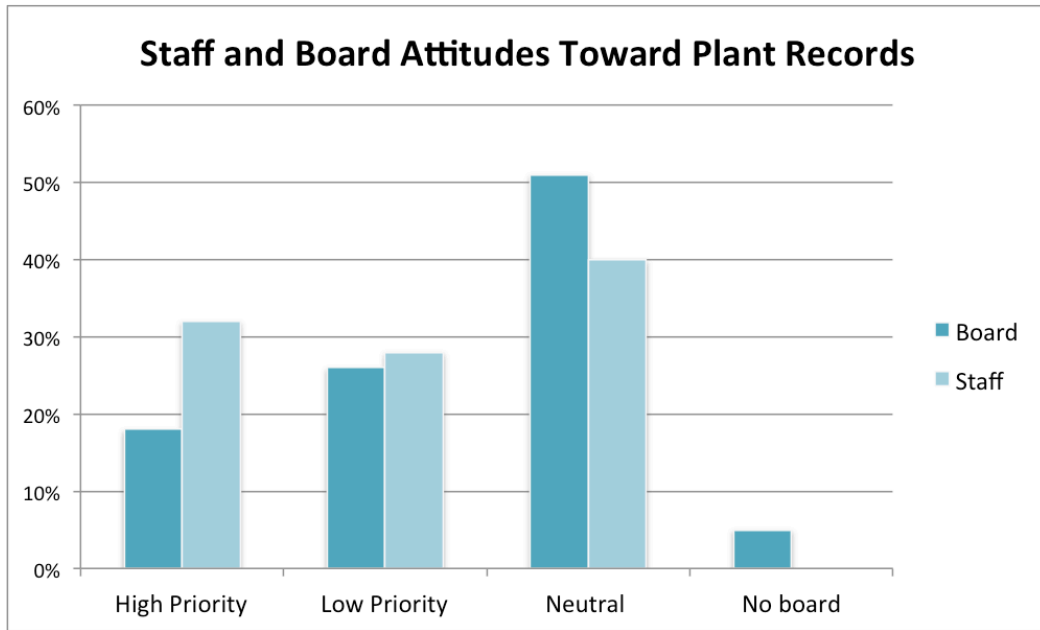
Figure 24. Staff and Board attitudes toward plant records at surveyed preservation gardens (n=57).

While staff perceive plant records as a high priority more frequently than board members, there

is generally a direct relationship between staff and board attitudes, with 56% of gardens

reporting agreement between staff and board attitudes. However, the majority of gardens whose

staff perceive plant records as high priority report their board members are neutral (Table 8).

Table 8. Cross tabulation of staff and board attitudes toward plant records. (n=57) Yellow cells indicate direct relationship between staff and board attitudes. Orange is the outlier, where the majority of gardens with a staff attitude of high priority have neutral boards.

		Staff attitude toward plant records:		
		High priority 18 (32%)	Low priority 16 (28%)	Neutral 23 (40%)
Board attitude toward plant records:	**High priority 10 (18%)**	6 (11%)	2 (4%)	2 (4%)
	Low priority 15 (26%)	0	11 (19%)	4 (7%)
	Neutral 29 (51%)	11 (19%)	3 (5%)	15 (26%)
	Don't have a board 3 (5%)	1 (2%)	0	2 (4%)

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When analyzed within budget categories, the majority consistently report attitudes of neutrality amongst board and staff. Interestingly, the gardens in the highest budget categories report the lowest numbers of staff and board perceiving plant records as high priority (20% in medium-budget gardens and 10% in large-budget gardens). This may be due to a larger staff size, in which specialization of positions precludes interaction of some staff with plant records tasks at all.

Despite the majority of staff (68%) and boards (77%) perceiving plant records as either low priority or neutral, an overwhelming 67% of participants indicate that plant records are important in order to fulfill their garden's mission. The remaining respondents claim they are not important (5%), or neutral (28%). Not surprisingly, 83% of gardens with staff perceiving plant records as high priority report that plant records are important in fulfilling their mission. What is more surprising is that in gardens for which plant records are reported to be important to fulfill their mission, only 24% of board members perceive plant records as high priority, compared to 40% of staff. Also startling is the evidence that 70% of gardens with staff and board neutrality on plant records reportedly work for gardens in which plant records are important in order to fulfill their mission.

Table 9. Summary of practices: overall and by budget size.

Practice & Overall results	Small (n=41)	Medium (n=5)	Large (n=10)
Written Collections Policy 36% Yes	29% Yes 39% In progress 32% No	40% Yes 0% In Progress 60% No	70% Yes 2% In progress 1% No
Written Guidelines for maintaining records 31% Yes	22% Yes (n=41) 44% In Progress 34% No	40% Yes 20% In Progress 40% No	70% Yes 1% In Progress 20% No
Most common database system IrisBG, Microsoft Excel, Access & BG-base	IrisBG (27%), Excel (20%), Handwritten (17%)	Excel (40%), IrisBG (20%), Access (20%), Handwritten (20%)	BGbase (30%), Access (30%), FilemakerPro (20%)
Most common mapping system Hand drawn, IrisBG, digitally drawn	Hand drawn (38%), IrisBG (38%), digitally drawn (15%)	Hand drawn (67%), IrisBG (33%)	ArcGIS (33%), hand drawn (22%); 11% each: digitally drawn, ArcGIS for Parks & Gardens, BG-map, IrisBG
Staff position most commonly responsible for most plant records tasks Full-time Horticulturist	Part-time or temporary staff, interns, or volunteers	Full-time Horticulturist	Head of Horticulture
% with Curatorial positions 43%; 50% of those are internships	45%; 66% of those are internships	40%: curators	60%; 67% of those are curators or plant records managers
Primary users Top 3: Internal, Visitors, Professionals	Internal, Visitors, Professionals	Internal, Visitors, Professionals	Internal, Professionals, Visitors
External data sharing practices 54% share externally	53% share externally, primarily via website	60% share externally, primarily by individual requests	70% share externally, primarily by exporting to meta-database
Top 3 challenges in documenting collections Staff time, financial resources, selecting system	Staff time, financial resources, selecting system	Staff time, financial resources, selecting system	Staff time, financial resources, selecting system
Top 3 most challenging documentation tasks Mapping, accessioning, inventories	Accessioning, mapping, recording special characteristics	Mapping, inventories, accessioning	Inventories, label maintenance, mapping
Staff attitude toward	36% High priority	40% High priority	20% High priority

priority of plant records 32% High priority 28% Low priority 40% Neutral	28% Low priority 38% Neutral	0% Low priority 60% Neutral	30% Low priority 50% Neutral
Board attitude toward priority of plant records 18% High priority 26% Low priority 51% Neutral	21% High priority 28% Low priority 46% Neutral *3% do not have board	20% High priority 0% Low priority 80% Neutral	10% High priority 20% Low priority 70% Neutral
Importance of plant records in fulfilling mission 67% Important 5% Not important 28% Neutral	67% Important 5% Not important 27% Neutral	60% Important 0% Not important 40% Neutral	80% Important 10% Not important 10% Neutral

CHAPTER FIVE: DISCUSSION

Preservation gardens in the United States, as previously described, are a unique category of public gardens. Much of what is known about these gardens is shared as case studies within professional networks, is regionally specific (e.g. historic gardens of the Hudson Valley), or is interpreted through the lens of a preservation organization (e.g. The Garden Conservancy). While these descriptions provide valuable insight, no studies have been conducted across geographic regions and preservation organizations to glean data specifically on the current practices of institutions that have transitioned from private estates to public gardens. The primary objective of this study was to investigate and describe current plant records practices, challenges, and solutions at preservation gardens. The secondary objective, based on findings, was to develop recommendations for plant records practices, with the intention to both improve internal organization and increase potential for historic gardens to contribute to larger-scale efforts by sharing data with researchers, other institutions, and the public.

Limitations

There is a lack of contemporary data available for comparison to results of this study, both specifically on this group of gardens, and in the larger public garden field. The newly created annual benchmarking study performed by the American Public Gardens Association, which will be a valuable tool in the future, has thus far only captured data for about a third of the organization's membership.

Self-reported data is limited by the fact that it rarely can be independently verified; the author had to trust that the qualitative accounts supplied by interview and survey respondents reported

was accurate. There is the potential for selective or flawed memory, exaggeration, and attribution (attributing positive events and outcomes to one's own agency but attributing negative events and outcomes to external forces). This risk was reduced by the use of constant comparison of Grounded Theory Methodology, in which participants' qualitative responses were compared against and verified through quantitative institutional data, as well as to the responses submitted by the group as a whole. The purposive survey sample, while thorough, does omit gardens not affiliated with one of the organizations specified.

Overview of preservation gardens

Location, Size, & Age

Overall, the majority of survey participants fall into the smallest annual budget bracket (less than $1 million), cultivate a small area (50% with 6 acres or less), and have been open to the public for a range of years that is reflective of the greater botanic garden community. Yet there is not an obvious relationship between any of these three variables, which was reinforced by the survey results. Of the interviewed gardens, the two that cultivate the most land operate on a mid-range annual budgets ($1-2 million), and the garden with the largest budget, well over $2 million, cultivates just 16 acres. This lack of correlation is likely due to the wide variety of individual circumstances in which gardens are founded, funded, and operate, and may depend on location, governing bodies, audience, and many other factors. Because institutional practices are assumed to be most influenced by annual operating budget, that is the main variable that was cross-tabulated with findings.

Collections Content

> "The trick is you can be more than just one thing. You can be a complete collection with conservation value and at the same time be an awe inspiring beautiful garden. Then you can use that garden as a living classroom, and you can use that garden as a research laboratory. I think we might be selling ourselves short if we just try to fit into one thing."
>
> -- Amy Highland, Curator, Mt. Cuba Center; personal interview, 2015

There is often a perception that the purpose of preservation gardens is display only, with a focus on aesthetics, experience, and education concerning the history of the site and related material. Seven of the 10 interviewed gardens' mission statements indicate a focus on horticultural display (terms include aesthetics, pleasure, enjoyment, inspiration, tranquility, and historical education). This is supported by the survey participants' ranking of priorities (discussed below), in which conservation and research fall at the bottom of the list. According to Wyse Jackson & Sutherland's (2013) classification of botanic gardens, preservation gardens are in the category of ornamental gardens, which are often "very beautiful establishments with diverse plant collections that are documented; they may or may not currently have research, education, or conservation roles." Yet display does not preclude other potential uses of a plant collection. The authors go on to say "many botanic gardens have multipurpose roles and consequently, do not fit neatly into any well-defined category" (Wyse Jackson & Sutherland, 2013). Survey results revealed that the living collections of preservation gardens often do include specimens and taxa of unique conservation and preservation value, offering opportunities for conservation and research and dispelling myths that these gardens are only for display. A lack of mission focus on research and absence of internal conservation and research programs does not prevent preservation gardens from participating in larger scale efforts or their collections being utilized by external researchers. In one case, plant researchers conducting a pond study collected *Acorus* seeds from

an interviewed garden; in another, rare fruit specialists collected scion wood of heritage cultivars. Additionally, as one interviewee described, preservation gardens "can be seen more as a repository for unusual things that other gardens...cannot accommodate due to space limitations."

Operational Priorities and the Current Perception of Plant Records

The order of operational priorities in public gardens and arboreta depends largely on the mission of the organization. While there is no data with which to compare the order of priorities of public gardens more broadly, it can be concluded from the survey results that preservation gardens across all budget categories rank operations in a consistent priority order. On a scale of 1 to 8 where 1 is highest priority, horticulture and landscape maintenance were, not surprisingly, at the top of the list. This response was followed by visitor-centered priorities (programming & events, interpretation & education, and expanding audience). Conservation and research were consistently ranked last on the list of priorities for preservation gardens, with no relationship found between budget and the few outliers that did rank either of these two categories higher than a 4. In hindsight, the inclusion of "plant records" as an independent category may not be representative of its priority, as plant records play an integral role in each of the other operational tasks listed in the survey question. Records were ranked as a mid-level priority, receiving a mean rank of 4.8.

During the interviews, it became evident that current institutional attitude toward the priority of plant records tasks is either a challenge or a reason for success in documenting collections. (This is distinctive from the priority designated to the concept and implementation of plant records in the garden *at the time of transition* as reported in the Transition Period section of the Results.) As

one interviewee said about attempts to gain board support for plant records expenditures, "everyone understands the revenue from sales, but not everyone understands the value of plant records."

Responses to interviews and the survey also showed a relationship between institutional and staff attitudes toward plant records. Gardens at which the staff perceive plant records as "high priority" rank plant records an average of 3.5 on the operational priority scale, for which one was highest priority. Comparatively, gardens at which the staff attitude toward plant records is "low priority" gave plant records an average of 5.2. Similarly, there is generally a direct relationship between staff and board attitudes toward plant records within gardens. This points to a consistent institutional perception of the priority—or lack thereof—of documenting collections. While such a phenomenon is not surprising, it's difficult to determine the flow of influence: do staff and board perceive plant records a priority when it is designated as such within the culture of the institution, or does the culture of priority in an institution reflect the attitudes of the staff and board? One could argue that the higher a priority something is declared to be, the more institutional time is dedicated to it; conversely, the more time is dedicated to something, the higher it becomes in priority. In other words, "if you measure and manage something, it becomes a priority regardless of its importance" (Bevin & De Smet, 2013).

In general, more staff members perceive plant records as high priority than board members. This is perhaps a result of the board's distance from the daily operations that involve plant records. Additionally, board members are less likely to have a background in curatorial practices than staff members at public gardens. A nonprofit public garden's board of trustees is primarily responsible for the governance, finances, and legal operation of the garden (Matheson, 2011).

Yet overall, the majority of both staff and board are neutral toward plant records. Neutrality is a difficult attitude to interpret, as it may result from unfamiliarity, a lack of interaction, or from apathy. These sentiments may in turn be a result of divisions of labor within organizational structure, inaccessibility, or lack of communication. The organizational culture of public gardens in an area that is ripe for future research.

Perhaps the most interesting analysis regarding institutional attitudes toward plant records reveals the disconnect between the perception of their priority and their role in fulfilling mission. While staff at only a third of gardens and board members at less than a fifth of gardens perceive plant records as high priority, 67% of survey participants said that plant records are important in order to fulfill their mission. The fulfillment of mission is paramount to the success of a public garden. "Corporations are measured by their profitability; nonprofits are measured by the fulfillment of their mission" (Matheson, 2011).

Transition Period: Successes and Challenges

As previously described, the transition period from private estate to public garden is a variable process, but typically involves many steps and takes an indeterminate amount of time. Documenting the living collections is one step in the process. Interviews revealed that the practices and challenges occurring during preservation gardens' transition periods were unique to that moment in time, and in many cases different than their current documentation practices and challenges. As a testament to the overarching complexities of transitioning a landscape from private ownership to a public-facing organization, one survey participant simply responded, "nothing worked well."

Depending on their presence or absence at the time of transition from private to public, four key variables led to either success or challenges with plant records: historic records, early development of practice, prioritization of documentation at time of transition, and an inventory.

Historic records & Capture of Institutional Knowledge

Not surprisingly, the preservation of historic records was most commonly cited as the most important factor in plant records success during transition. Conversely, the absence or loss of those records was reported to be the greatest challenge. Of the surveyed gardens without historic records, 45% expressed regret that their institution did not salvage anecdotal knowledge or plant records from previous owners or property managers. While missing the window of opportunity to capture that institutional knowledge was a significant cause of loss, lack of historic records also resulted from personnel transitions. Losing information held in the memories of past gardeners may have significant impact on the loss of the institution's knowledge assets (Cady, 2015, p. 3).

There are many confounding factors for why gardens did or did not consult people with prior experience in the garden concerning data on historic plants, such as there being no family/former personnel available, or a recent inventory already existed. In fact, 6% of respondents reported that there were absolutely no records about which to consult. Whatever the cause, with over a third of respondents reporting no consultation with previous personnel at time of transition, it is not surprising that there is an expressed loss of historic data and institutional knowledge. The extent to which a garden can control the quality of historic records is ultimately dependent on what records and institutional knowledge are available at the time of transition. However, decisions and actions taken during the transition affect what existing data is transferred to the

new governing body. A review of Cady's thesis (2015) is recommended for gardens wishing to explore the concept of capturing institutional knowledge further.

Not surprisingly, most existing plant records at preservation gardens are handwritten on paper at the time of transition. The manual input of paper records into a digital format is a necessary task. Gardens that transitioned to public before electronic databases were commonly available must at some point retroactively accession plants and digitally input historic data; gardens that are currently transitioning should make this one of their first steps. All study participants who have embarked on this process emphasized that the manual data migration from paper to electronic format is a massive undertaking that should not be underestimated; nor should it be postponed. It was recommended that input into at least Microsoft Excel spreadsheets (widely available software) should be done as soon as possible while a more comprehensive plant records database is being decided upon. This will be expanded upon in the Recommendations chapter. Additionally, Abell-Seddon's (1989) concept of a 'reference framework for organizing records in museums' (REFORM) is a useful text for organizations dealing with large quantities of written historic data to be organized into formatted and maintainable fields (Abell-Seddon, 1989).

While lack of records altogether is certainly a challenge, existing but inaccurate historic records might also create a challenge. The process of verifying historic plant collections is discussed in Michener's 1989 article: *To Each a Name: Verifying the Living Collections.* According to Michener, the purpose of verifying living collection is to ascertain that the plants are what they claimed to be. This involves seeking each accession's source documentation, its identity and name, and evaluating the level of confidence in both of those pieces of data. It is important to

document the process—the paper trail—of verification for reference by future gardens staff (Michener, 1989).

Development of Practices: Policies, Methods, and Selection of Database

All of the other challenges described by participants are much more within the capacity of the newly public garden to regulate. New management has the opportunity to prioritize inventorying collections at the time of transition by influencing effort put forth in facilitating the transition of documents to the new managing organization, and by the development of an appropriate plant records system and guiding documents moving forward. The degree to which plant records systems (methods, protocols, database selection) were developed at the time of transition was directly related to the personnel or management (founders, staff, or in some cases, volunteers) involved in those decisions, and their curatorial background knowledge and training.

Priority of Plant Records during Transition

Closely related to the development of good practices, the level of priority designated to the concept and implementation of plant records in the garden at the time of transition can be a contributor to success or a challenge. (This is distinct from the current perceptions of plant records priority by staff and board as reported in Part 1 and Part 3 of Results.) Gardens citing preservation of historic records as a success also described founders who prioritized documentation. Like many other aspects of the founders' vision, this too is transitioned to the new organization. If records existed and were historically well managed, it is more likely the new organization will carry on with this work. If, however, records were lost or were never systematically kept, there is less of an organizational awareness or priority given to developing a system immediately upon transition. The more time that passes before a system is developed, the

harder it is to catch up on inputting data that accrues after transitioning, and the harder it becomes to track down information on extant plants in the garden.

In addition to a founder who prioritized records, three other key characteristics were identified at gardens where documentation was made a priority during the transition period. First, documentation was made a regular part of a paid staff member's responsibility, rather than performed "when we could find the time," or exclusively by volunteers. Second, knowledge was captured and plant records retained when gardeners left. Like the continuation of a founder's approach to documentation, the establishment of a protocol for capturing institutional knowledge sets a precedent of priority. Third, newly selected board members were well versed in documentation policies and practices. This can occur when board members bring a knowledge of curatorial practices with them, or when an organized effort is made by management to communicate the role and importance of plant records to them at the onset of strategic planning.

Inventories

Inventory and documentation, as well as analysis of existing conditions and overall integrity of the property, should precede any work in a historic landscape (Meier, 1990). Inventories were identified by study participants as playing a crucial role in the preservation of historic plant records, and were cited by interview and survey participants as being either a challenge or success during transition. Described as challenging and rarely complete, an initial inventory is extremely beneficial for laying the groundwork. It requires knowledge of both plants and databases/mapping techniques, which may be found internally, but more commonly was a success when contracted out to survey and taxonomic experts.

It is notable that certain expected contributors to challenges and successes during the transition period were absent from participants' responses. While funding and staff time are frequently cited as *current* challenges with plant records, only one study participant specifically cited funding for plant records digitization as an integral component of plant records success during the transition period. None of the gardens mentioned the involvement of board members either positively or negatively. Five participants alluded to mission-based decision making by referencing adherence to original planting plans or guiding documents developed by the organization, but none specifically referenced mission as a factor in plant records challenges or success during the transition. This is possibly because missions and boards were being developed at the same time or immediately after transition, so they did not factor into early decision making surrounding plant records. If this is the case, this early lack of direction could be the cause of the chronic problem of lost records. "The development of a mission is crucial, as it identifies the primary purpose for the garden, the means by which the purpose is served and the core values (Matheson, 2011, p. 53)." It is imperative that the capture of historic records and a landscape inventory occur early in the preservation process.

Current practices

Policies & Procedures

Collections management policies govern the growth and care of collections and how they are made available to the public (Simmons, 2006). It is important to make the distinction between collections policies and procedures, which should be two (or more) different documents. Policies establish standards that regulate activities, identify what needs to be done, and provide a framework for making decision. Policies are accompanied by procedures, the detailed

instructions that specify how staff should apply policies in their day-to-day activities. Procedures are a series of succinct and unambiguous action steps. While collections policies are approved by a governing authority, procedures, or the written guidelines, are typically developed at a staff level (Simmons, 2006). Ideally, a garden might have a collections policy to guide standards and vision; a collections management plan to guide the care and maintenance of collections; and a documentation procedures manual that details the "succinct and unambiguous" steps required for plant records.

Just over a third (36%) of preservation gardens in this study currently have a written plant collections policy, but nearly half of those that do not are in the process of developing one. This is not far from the broader industry percentage: Aplin's (2014) recent global survey of botanic gardens found that worldwide, 39% of respondents have a collections policy. Similarly, only 32% of participants currently have written guidelines for maintaining plant records, but half of those that do not are in progress. The wording of this question did not take into account quality or age of the policy, merely the existence of one. The survey did not ask when the policy was developed, if it was board edited, or how comprehensive it was. This survey also did not gauge the thoroughness, quality, or age of the written guidelines, merely the existence of them. Based on a review of plant record policies from participating gardens, it is clear that these characteristics can vary greatly across institutions.

Not surprisingly, the majority of gardens with a written collection policy also have written guidelines for maintaining their plant records, and those with no collections policy have no written records. For some gardens, they might be incorporated into the same document. However, almost a quarter of the gardens that do have policies, do not currently have written

guidelines, suggesting that there might not be consistent protocols in place for managing the data. The number that selected "in progress" is surprisingly high, and raises several questions: are they long-term loose ends or on the verge of completion? Why are they currently in progress? Does it relate to other challenges; is there something preventing their completion? Further research could be done comparing the prevalence of collections policies and procedures manuals in the public garden field to the museum field, and examining reasons for lack of guiding documents by a majority of institutions.

Accessioning & Tracking: Selection & Timeline

Most gardens accession and track only some plants in their collections, and most prioritize woody and perennial plants. One participant, revealing inconsistencies that arise from the challenge inherent in attempting to maintain data on every single plant in a garden, responded "we try to track them all, but have not been as thorough in the past few years. We do not have the staff." This response was echoed by others attempting to accession and track "all" plants in their collections. Excluding plants based on lack of time, rather than their priority level, results in the loss of critical data and time spent tracking less important holdings.

Preservation gardens rarely follow a schedule for regular updates of plants in their collections. While 45% of surveyed gardens reported that they update records immediately upon a change, 37% do so whenever they can find the time, and 18% do all at once in the winter. This practice both creates a potential loss of data integrity over time when changes are not made immediately, and creates a gap in knowledge of what is current. Public gardens, as living museums, should know at any time exactly the items for which they are legally responsible and where each item is located (Museums and Galleries Commission, 1995).

Staff Positions Responsible for Plant Records

Only 26 preservation gardens (43%) reported staff positions with curatorial titles, and half of those were solely interns, fellows or apprentices. Overall, documentation tasks are reported to be most frequently performed by individuals working at the gardens on a temporary, part-time, or volunteer basis. While these individuals may be very skilled and dedicated to these tasks, there is an inherent issue of consistency with positions characterized by more frequent turnover than a permanent staff position. Moreover, lack of a dedicated position for plant records suggests low priority to other staff and board members. Nonprofits often have to make decisions based on available resources, but it is important not to cut corners on crucial positions. "Curator" is one of the "five commonly prioritized positions" described by Donnelly and Peske in *Public Garden Management* (2011). "If the mission of the garden includes the creation and management of plant collections for botanical, horticultural, or conservation purposes, the hiring of a curator is a significant priority" (Donnelly & Peske, 2011, p. 85). Please see Key Terms for a more complete description of a curator.

Plant Records Databases: Systems and Satisfaction

IrisBG is the most widely used database management system reported by surveyed gardens. However, it is important to note that 11 of the 13 individual gardens with IrisBG are currently multiple users sharing one license purchased by a preservation organization. Therefore, while these results are representative of the number of individual gardens using IrisBG, the decision to purchase the software was only made once, and the cost for each garden is significantly reduced by sharing a license. *IrisBG* was developed by Digital Forvaltning AS in close collaboration with Oslo University Botanical Garden and introduced to the Norwegian market in 1996, then was

introduced to the global market by Botanical Software Ltd in 2007 (IrisBG website, 2016). Like

BG-BASE, developed in 1985 at the request of the Arnold Arboretum of Harvard University and

the Threatened Plants Unit of the World Conservation Monitoring Centre in Cambridge,

UK, IrisBG is a relational database software package has been designed specifically to meet the

needs of botanical gardens, arboreta, and private gardens worldwide. Microsoft Excel, a flat

database, is a close second to IrisBG, followed by BG-BASE, which was tied with Microsoft

Access. In 2005, Dawson's survey results from 177 members of the AABGA revealed that at the

time, the four most commonly utilized computerized database systems for managing plant

records data were BG-BASE, Microsoft Access, FileMaker Pro, and Microsoft Excel. Just 7% of

preservation gardens report using FilemakerPro in this study; more (12%) manage their plant

records on paper. Microsoft Access and FilemakerPro are relational database software platforms

that can be customized by individual users to meet their data management needs. As such, they

require knowledgeable personnel to update, maintain, and back them up in house. IrisBG and

BG-BASE offer customer support, maintenance, and the option to back-up data externally, for an

annual fee.

The highest satisfaction is found among users of IrisBG, and the least satisfaction,

proportionally, is reported by gardens using handwritten paper records. It is important to keep in

mind that satisfaction is less an indicator of quality of system than it is an indicator of

appropriate selection. Inappropriate selection of database software was cited by participants as a

challenge during the time of transition: either the software selected was powerful but ultimately

too cumbersome to be effective and accessible for the staff, or the software was the most

affordable and accessible option but not robust enough for data management needs. In the words

of computer scientist Joseph Weizenbaum, "a computer will do what you tell it to, but that may be much different than what you had in mind" (quoted by Simmons, 2006, p. 91).

Mapping: Systems and Satisfaction

While only one garden in the study reported not having a data management system for their plant records, 33% of preservation gardens do not currently map their collections. Of the 67% that map, the majority do so by hand on paper. While quick to generate, hand drawn maps are best as temporary, intermediary documentation between field and office. Maps displaying or illustrating a botanical garden must change frequently as the gardeners create new displays and replace dead plants. Dawson (2005) describes the inescapable limitation of hand drawn maps: "Historically, when plants died or were removed, many garden cartographers updated their maps merely by erasing those plants from the map, leaving no record of the plants' spatial location. Even if a voluminous archive of historical maps was held in a botanic garden, no efficient system existed to answer where a particular plant had been or which plants had occupied a specific space in the past."

Perhaps reflecting frustration with this obstacle, less than a third of gardens mapping by hand report satisfaction with their current system. Highest satisfaction is again expressed by gardens mapping their plants in IrisBG (with base-maps generated in ArcGIS).

The survey question on mapping offered respondents a list of systems that had been identified by the interviewed gardens and the author as the most common systems currently in use at public gardens, but was not meant to be an exhaustive list. For example, Plants Map, a website community that "hosts botanical collections with customized tools for documenting, organizing,

mapping, tagging and sharing information about plants" (Plants Map, 2016), is a relatively new tool and was not included as an option. The opportunity to select "other" and to fill in a response allowed the capture of all current systems in use by preservation gardens.

Users and Sharing

A survey performed in 2001 and 2004 by the Institute of Museum and Library Studies (IMLS), revealed a fundamental shift in museums' reasons for digitizing collections (IMLS, 2005; referenced by Gorman & Shep, 2006). Between 2001 and 2004, there was a 56% increase in the selection of "Increase access to collections/materials/files" as a reason to digitize. A similar increase was found in libraries. According to Gorman and Shep, results of the survey demonstrate a shift away from digitization as electronic marketing of the organization toward a concern with public access to materials, as well as a shift from targeted preservation to increased public access. The authors note the emergence of a "long-term constant of growing demands for rapid, simple access" in the museum and library fields.

At preservation gardens, data from plant records is used most frequently internally (by staff, board, or volunteers). Just over half of preservation gardens share their data externally. For those that do, the most frequent method of sharing varies depending on budget category. Small gardens tend to share most frequently by posting information about their collections on their website, while large gardens export records more frequently to meta-databases like BGCI PlantSearch. It's important to note that, as Curator Amy Highland pointed out, adding your data to these groups is very useful, but it has its limitations: ArbNet is for the Arboretum community, and BGCI is the conservation community (Highland, personal interview 2015).

There is a relationship between external data sharing and data management systems that suggests that gardens with relational databases (IrisBG, BG-BASE, FilemakerPro, Microsoft Access) share their data more commonly than gardens with flat databases (Microsoft Excel) or handwritten records. Relational database software enables easy queries by different categories of data, then exportation of data to flat files (usually Microsoft Excel), which can then be easily shared electronically. However, it is interesting to note that only a third of institutions using Microsoft Excel as their primary data management system share records externally. This perhaps speaks to the greater ease with which queries can be made in relational, versus flat, databases. It is important to note that software alone does not determine the data sharing practices of an institution. There can be many reasons why a garden may not share data externally, including the decision of management, a nascent plant documentation program, or limited staff time.

Current Challenges

One must wonder if there is any task undertaken by a nonprofit in which the primary challenges are not described as "funding and staff time." According to the Nonprofit Finance Fund's 2015 State of the Sector Survey, nonprofits' success and impact continue to rely on unsustainable trends, including "overworked and underpaid leaders and staff, a never-ending fight to balance shaky budgets with fickle funding streams, and little money for professional development and growth. These are not new challenges for the sector, yet they continue to be chronic issues" (NFF, 2015).

Empirical evidence in this study confirms the application of these broader industry challenges to documentation in public gardens. Participants rated staff time and financial resources as greater challenges on average than the selection of products, technology obsolescence, priority of

documentation as dictated by mission, board support, or the ability to find resources on documentation techniques. As one interviewee summarized the ongoing question for gardens struggling with these challenges, "how do you best utilize the talents of your staff team without overburdening them, while providing the resources necessary to actually complete the project?"

Predictably, staff time and financial resources are rated as less challenging at large gardens than at small and medium gardens. However, large and medium gardens consistently rate the selection of systems, priority assigned to documentation, board support, and finding resources on techniques and practices as greater challenges than smaller gardens rate them. The fact that large and medium gardens rank technology obsolescence as a greater challenge than small gardens could simply be because smaller gardens may not have technology to begin with, and have not yet dealt with data migration or updates.

The financial obstacles are threefold: there are limited grant resources available to public gardens specific to documentation; finding a donor for plant records can be difficult since they are one of the more behind-the-scenes functions of a garden; and it is difficult to quantify the benefits of plant records in order to justify the expense of the software, hardware, and personnel required.

The challenge of staff time is easily understood given the results of survey questions 20 and 21 about responsibility for plant records tasks. Less than half of preservation gardens have a staff member dedicated to curatorial tasks, and the majority rely on temporary, part-time, or volunteer workers to document their collections. It iss also commonly made part of the responsibility of full time staff with other job titles, destined to fall in priority relative to their primary responsibilities. To be sure, staff time and financial obstacles are closely tied. Yet interestingly,

large gardens, while ranking financial resources as less of a challenge on average, still rated staff time higher on average than any other option presented in the survey. However, the standard deviation from the average rankings of each challenge were so great, it is difficult to determine decisively what the overall order of challenges is for preservation gardens. This again underlines the fact that many variables unique to each garden's situation makes generalizations difficult.

Similarly, when asked to rate the level of challenge for each documentation task, survey participants selected a wide range of responses for each, making conclusive statements impossible. However, on average, mapping is considered to be the most challenging documentation task by preservation gardens, followed closely by initial accession input, inventories, then label maintenance. For the last three tasks (descriptions, verification, and database maintenance), ratings could be lower either because these tasks are not considered challenging, or simply because these gardens do not perform these tasks in house, or at all. Based on survey responses to previous questions, the top four challenges can be attributed to:

Mapping: lack of technology, software expertise, and time dedicated to it (resources and priority)
Initial accession input: lack of regular schedule for updating records as determined by a plant records procedural manual and the time dedicated to it (guiding policies and priority)
Inventories: lack of taxonomic expertise, time dedicated to it, and enforcement of a regular schedule for updating records (resources and priority)
Label maintenance: lack of appropriate system and staff time (resources and priority)

The issue of label maintenance is an ongoing challenge that merits further research of current methods and solutions. This description of an ideal plant label, while accurate, reveals some of

the contradictions that make plant label solutions elusive: "Perhaps the best description of the ideal plant label is... it is easy to read but unobtrusive, cheap but indestructible, accurate, informative, and concise, easy to install but difficult to steal, and individual in style and materials without being tempting as a souvenir" (quoted by Maurer, 1999).

After being asked what his garden's greatest challenge was regarding plant records one interview participant replied, "the challenges are too numerous to go over." He went on to describe issues with missing labels, having labels at all in a preservation garden, verification, locating and tracking small specimens and cultivated hybrids, lack of a unified database system, and maintaining consistency with founder's vision. In the end, perhaps best summing up sentiments of many participants, he simply said, "Our challenge is funding, time, and finding the right system for those needs."

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

Conclusion and Recommendations for Future Research

It has been said both in this paper and the literature that there is no one size fits all solution to plant records, no silver bullet of a database software program, no secret to success that applies to every garden. Practitioners know from their own professional experience, interactions with colleagues, and published literature that one common factor public gardens share is that they are all different. The results of this study support the broad conclusion regarding the keeping of plant records that "it's expensive, it's time consuming, and it requires a lot of expertise" (Hohn, personal interview, 2015). It is up to each individual garden to determine the details of their documentation program, such as the best technology to organize and store it and the source and quantity of financial resources to dedicate to it. For those seeking industry standards, there is published literature that thoroughly details the process of drafting curatorial policies and essential data to record. Additionally, gardens are encouraged to seek resources from the broader museum, library, and zoo fields on collections management to inform approaches to policies and plans. Some of this literature may be found in the Works Cited for this paper.

By focusing on a particular type of gardens—preservation gardens—this study has attempted to gather data on current plant records practices and challenges so that more tailored recommendations might be set forth. The hope is that the baseline results of this exploratory study, along with the recommendations to follow, will inform the strategic planning of individual gardens as they tackle documentation at their institutions; the development of resources by professional organizations that support and preserve public gardens and historic landscapes; and manufacturers of products, such as software and labels, used by public gardens. Additionally,

gardens can reference this study when communicating with board members, staff, granting agencies, donors, and other constituents about the practice of documenting living collections. Lastly, it is the hope of the author that this study brings to light new questions and more applied research in the public garden field with a focus on curatorial practices, documentation of living collections, and preservation gardens. "Analysis finally makes clear what would have been most important to study, if only we had known beforehand" (Patton, 2002).

This paper is concluded with the presentation and explanation of three grounded theories about practice that are empirically supported by the data gathered for this study. They have been presented as recommendations: starting simple and staying current, developing a plant records plan, and creating a culture that supports plant records. The recommendations have been compiled from three sources:

1. Preservation gardens: survey and interview results from this study
2. Interviews with other professionals in the field
3. Published literature

While the interview and survey responses collected for this study were anonymized, botanic garden professionals interviewed specifically for recommendations are identified by name and organization in order to offer mini-case studies on plant records practices. All interviewees signed a consent form indicating their willingness to participate (Appendix A).

Based on a review of literature and the conversations with professionals that this research opportunity provided, the author suggests future research in the following areas.

- Longitudinal studies of plant records practices at public gardens
- Survey of current documentation practices in other subsets of public gardens besides preservation gardens, and comparison across sectors
- Plant labels: materials, maintenance and implementation
- Creative fundraising to support plant records
- Exploratory studies on a variety of contemporary professional practices at public gardens
- Organizational culture of public gardens

Recommendations for Practice

1. **Start Simple and Stay Current.** As a newly public garden, it is critical to begin recording information on living collections immediately, in any format that is most readily accessible, and to begin maintaining that data on a regular basis.

   "Start where you are. Use what you have. Do what you can."

   -- Arthur Ashe

What might seem like an obvious statement still clearly needs to be stated, based on the frequency of suggestion by survey and interview participants. Whether it was expressing regret for what was not done at their own institution or because of its contribution to their success, preservation garden staff and curatorial experts alike repeatedly emphasized the importance of starting somewhere, *anywhere,* and not falling behind. A unique challenge of preservation gardens is the management of historic plant holdings while building new collections. This necessitates preservation of historic documentation, the migration of that information into an accessible and updatable format, and at the same time, the accession and maintenance of records on new plants being added to the collections. There are many reasons why a newly public garden might not start documenting their collections immediately, not least of which are well-intentioned but time-consuming goals to develop a comprehensive curatorial plan, raise funds,

and purchase efficient software, hardware, etc. There is a fine line between choosing wisely and stalling out.

The first step toward good plant records can be simple. In a personal interview, Timothy Hohn (2015) encouraged gardens to move forward with whatever technology is most available to them, even index cards, if it maintains the most necessary records and is accessible to staff. Hohn referenced economist E.F. Schumacher's influential book *Small Is Beautiful: A Study of Economics As If People Mattered* (1973), which expounds the philosophy of "enoughness," appreciating both human needs and limitations, and appropriate use of technology. There needs to be a realistic view of what small gardens' needs are and what will really accomplish those needs, instead of "what happens to be in vogue, in terms of technologies that other institutions are using" (Hohn, personal interview, 2015). Hohn described an issue at the beginning of the conversion to electronic documentation of gardens adopting whatever was available in the way of powerful, relational databases. For smaller gardens the programs were bigger than what they needed. Time was spent trying to fill out all the available fields, and "they'd never get around to doing the documentation." This perspective was corroborated by several survey respondents who cited the purchase of powerful but ultimately inappropriate database software as a challenge encountered during their transition period. Perhaps it is wise to remember that "digitization does not 'solve' the 'problem' of preservation, but it has added another powerful weapon to the armory of solutions" (Feather, 2006). Any computer program will only be a success if it meets the requirements of the user (Wyse Jackson, 2003).

In fact, a simple system for documentation is optimal, until the appropriate research and planning have been completed for a long term plan (discussed in the next section). According to a

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preservation garden that was in the process of overhauling an elaborate older system at the time of the interview, it was "very much like trying to rebuild an engine while the engine's still running. Really a challenge." Their old system had become "a nightmare: we had tons of plants in the garden without numbers, tons of numbers without plants, and then piles of numbers that had been raked up over the years then just stored in pots. It would have taken us five years of not planting anything to just sort out the system." Another preservation garden described success with a very simple system that was meant to be in place temporarily until a more robust system was decided on and the funds were available to move forward. That was nearly a decade ago, but over that time they have been able to maintain the minimally necessary records with diligent practice: "We just started with the Excel spreadsheet, which we still haven't moved beyond, but at least it's something. And we update it on a regular basis." Furthermore, Excel is the intermediary step when migrating between virtually any database software. Boyce Tankersley, who is Director of Living Plant Documentation at the Chicago Botanic Garden, where they have migrated their plant records between at least three software programs since 1986, suggests that Excel is the best tool for gardens just starting to keep records.

Once a garden begins to keep plant records, it is critical to stay current on data input. Data entry takes commitment, and cannot be done successfully if it is just an extra chore that is done when there is a bit of spare time (Wyse Jackson, 2003.) Study results reveal that while 45% of preservation gardens update changes to data "immediately," most preservation gardens do not have a regular schedule for updating their records. In the words of one interviewee, "it seems no big deal [to wait], and I've done it, and it's what precipitated my grand demise: 'Oh there's only 5 things, I'll do it next week, then next week it's 10 things, and I don't really have time to do 10 things,' and then…" Another preservation garden recommends finding even just 5 minutes in

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every day to update records. At the Bellevue Botanical Garden staff leave a notice of changes on the desk of Garden Manager, Nancy Kartes, who makes it a priority to enter all changes by the end of each day. Overall, the most important steps for any newly public garden in documenting their collections are to begin immediately with a simple, easily implementable plan, and to regularly schedule data input and other documentation tasks in order to stay current with additions and changes.

2. **Develop a Plant Records Plan.** Looking to the past and to the future, inward and outward, preservation gardens should develop a plant records plan to identify current assets and needs, to plan the future of their documentation system, and to detail specific procedures for recording data.

"Astute planning and deliberate progress leads to excellence."

-- Galen Gates, *Characteristics of an exemplary plant collection*, 2006

In *Curatorial Practices for Botanical Gardens* (2008), Hohn describes three documents that guide the well-managed collection: a collections management policy, a collections management plan, and a collections management manual. Similarly, in *Curatorial Notes: An Updated Living Collections Policy at the Arnold Arboretum* (2008b) Dosmann makes clear the distinction between a collections policy (defining scope of collections), a collections development plan (specific items to acquire), and a separate procedural manual that guides "the tactics of curation, such as the means of acquisition, intricacies of database management, standardization of nomenclature, or tasks related to plant maintenance" (Dosmann, 2008). Simply put, a policy describes the substance and a manual describes the process, and all documents are rooted in the mission of the organization (Fig. 25). Once these documents are developed and approved by the

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garden's governing board, the garden's staff are accountable for conforming to the direction provided by them (Hohn, 2008).
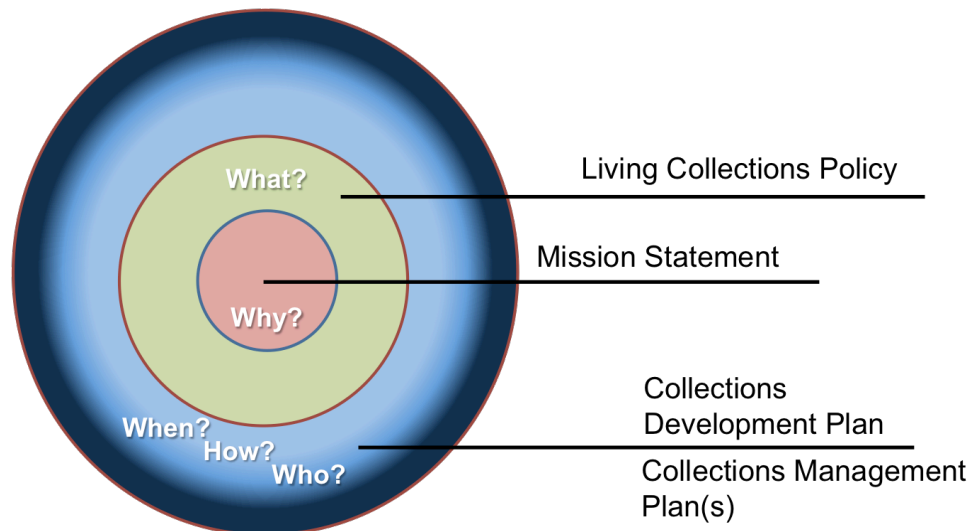
Figure 25. Policies and Plans: *A Hierarchy of Governance* (Dosmann, 2015).

The focus of this study was on the details involved in a collections management manual; even more specifically, it relates to the section of a manual that describes the documentation of the collections. There are fewer resources on this particular topic, likely again because of the variation of implementation from garden to garden. Yet a procedural manual is a critical tool for every garden. Hohn suggests that one reason for inefficiencies documented in the nonprofit sector is insufficient program planning and uncertainty about how program activities should proceed. A manual should outline these details in a way that will significantly reduce staff uncertainty and disorientation (Hohn, 2008).

Because of the unique challenges preservation gardens face in documenting their living collections, it is recommended that preservation gardens develop a plant records plan. It is up to

individual gardens whether this document is integrated into one of the documents described above, or stands alone. The goal should be to identify current assets and needs, describe the short and long-term goals of a plant records program for the garden, and ultimately to detail a set of protocols guiding documentation tasks. This should be revisited frequently to be sure it is current with the needs and mission of the organization.

For most gardens that transition from private to public, strategic planning is a natural and necessary phase early in the process that identifies the overall view for what the garden is and will become and how it will get there. Strategic plans, generally laid out as three to five year, long-term plans, translate policies or objectives into real actions (Leadlay and Greene, 1998). Gardens that have already been in operation for some time may also undergo a strategic planning process. The National Council of Nonprofits advises revisiting the plan periodically to make adjustments and adapt (National Council of Nonprofits, 2016 (website, visited 4/9/16). Strategic plans for public gardens are divided into different program areas, one of which is invariably the living collections, which might be further divided into sections such as horticulture, landscape, and plant record keeping. Whether a garden is just emerging or well-established but developing a new plan, the strategic planning process is an optimal moment in time for a garden to identify a plant records plan.

In order to help guide the process of developing a plant records plan, a series of questions are offered below. These are adapted from the models developed by Donnelly and Feldman (1990) for writing collections policies; Maney-O'Leary (1990) for preserving the design intent in historic landscapes; and Cady (2015) for managing organizational memory in public gardens. Additionally, questions were informed by the results of this study and recommendations from

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participants. They have been divided into four sectors: looking to the past, future, inward, and outward. The intent of this model is to encourage the development of documentation practices that take into consideration a variety of factors encountered by other gardens. The anticipated result is a comprehensive approach to the planning and implementation of plant records at preservation gardens.

Guiding Questions for Developing a Plant Records Plan

Look to the past:

What records exist that relate to the site? Are there maps, drawings, photographs, journals, planting plans, invoices for materials, or correspondence? Where are they located? Are they being transferred with the garden?

Are there individuals or organizations that have relevant historic data on plants in the collection? How will they be consulted?

What data about the plants are most important to the founder's vision and the history of the site, both to preserve and moving forward?

Was there a recent plant inventory performed on the site? Does a recent base map of the property exist?

Look to the future:

Where are the historic records kept and by whom? Are they stored under archival conditions? Do copies of key documents exist and are they kept in a separate location?

Who will manually input the archival data into a digital format? When and how? Who has responsibility for retrospective inventories of the collections?

If there is no recent inventory and basemap of the site, what approach will be taken to perform one?

What staff position will be responsible for the administration and accuracy of the documentation system?

What essential records, files or fields of information will be collected and preserved for each item in the collections?

When will these records be made: daily, weekly, monthly?

How will collections data be verified?

How would we like to see our plant data used both internally and externally? By whom? What information will be most useful? How will it be most accessible?

Will periodic evaluations of plants be made? If so, how will the evaluations be used?

What information will go on the plant labels?

How will plant labels be manufactured and maintained?

What are the best hardware and software acquisitions to meet all of these needs? How will data be migrated when needed? How will digital data be securely backed up?

What are the skills we will need our current and future staff to possess? How will we train them?

How will we develop protocols for plant records, pilot them, adapt, then set them as policy?

How will we capture and preserve institutional knowledge moving forward? (see Cady, 2015)

Look inward:

What is the institution's commitment to collections documentation?

What is the organizational culture regarding plant records? Does it need to be changed?

Why are plant records important? Are budget forecasts made based on last year's records? Is funding determined by adherence to professional museum standards and accurate data?

What programs do/can plant records support? How can the value documentation adds to the garden be tracked, measured, evaluated, and communicated?

Who needs to access the records internally, and what information do they need?

How does communication flow between staff, both for input and access of records?

What are the current procedures and protocols for communicating and entering accessions, changes, deaccessions, etc.?

What institutional knowledge is present that has not yet been captured? How should it be captured?

What are our current assets in terms of technology infrastructure (hardware, software, storage and back-up capacity) and technical expertise? What are our weaknesses?

Can surveys and basemaps be generated internally or should experts be contracted?

How much funding can be allocated to support plant records on an annual basis? On a one-time basis?

Look Outward:

What gardens are similar to us and what are they doing to document their collections?

What can be applied from models at museum, library, or zoos?

How can partnerships be formed with gardens in our region? Can we share label making or exchange plant material?

Are there opportunities to collaborate with more distant gardens that we have not considered? Could we be part of a PCN multi-site collection?

What research, projects, or other efforts are happening outside of our walls that are related to our mission? What taxa, recorded history, data, or other elements could our garden contribute to

these efforts? How could our plant records system support our contribution? How can we track,

measure, evaluate, and communicate these contributions?

How can we be creative in finding resources? Are there technically skilled entities in our area we

can partner with, such as academic programs, local businesses, or volunteers with specific

expertise? How can we pitch the idea of supporting plant records in non-traditional ways to

donors, organizations, or grant makers?

3.   **Make it a Priority: Create a Culture of Plant Records**. To successfully implement a
collections policy and plant records plans, public garden management must create a
culture that supports the priority of documentation through three key steps: educating
staff and board about plant records, demonstrating the value of plant records, and
dedicating a staff position to plant records tasks.

"If you want to be a botanical garden, you have to keep records and make sure
they're accurate. There are never enough resources, or at least there aren't around
here. It means making it a priority, and it's helpful if everybody buys into that. . .
it's important to have as many people as possible understand the difference and
why that's important before heading into it."

-- Mary Anne Payne, personal interview, 2015

In her closing remarks at the 2014 APGA Historic Landscape Symposium, Curator Amy

Highland said one of the questions she wished people would ask after her talk was "how can I

build a culture of plant records in my organization?" (Highland, 2014). While plans, policies, and

protocols are essential building blocks for a documentation program, they are useless if the

culture of the organization does not support plant records activities. Organizational culture is a

set of shared assumptions that guide what happens in an organization by defining appropriate

behavior for various situations (Ravasi & Schultz, 2006). It is also the pattern of collective

behaviors and assumptions that are taught to new organizational members as a way of

perceiving, thinking and feeling.

Study participants vocalized either success maintaining plant records because they were

perceived as a priority by the staff and board, or challenges accomplishing plant records because

they were not. One interview participant reported that, "they get it, luckily, because they know

how closely having those records is tied to the mission." Conversely, another interview

participant described the gardeners' perception of plant records as "when the one guy is sitting in

his office playing on the computer and they're out in the rain." If employees don't trust one

another, they may not share information, and if information is not shared between people, less

knowledge is generated (Cady, 2015).

During a personal interview with Highland (2015), three aspects emerged that contributed to the

success of the comprehensive documentation program at Mt. Cuba Center: support from the

board and leadership, involvement from all horticulture staff members in systematic

documentation procedures, and at least one staff member dedicated to plant records and

mapping.

Educate and Involve

> "You need a flag bearer in the curatorial department. It's easy to come up with
> curators who are flag bearers for different taxa, but it's hard to find someone
> who's also the flagbearer for the documentation program."
>
> -- Timothy Hohn, personal interview, 2015

> "I try to put [plant records] in a greater context every time I speak with my board.
> You run the risk of sounding a little grandiose, but really you have to give them
> the context for the resources that they're putting into a project. It's not just me, not
> just us, it's all that we can accomplish together as a community."
>
> -- Amy Highland, personal interview, 2015

It is imperative that all staff and board members of a public garden understand both the role of plant records and the tasks involved in maintaining them. These concepts should be clearly communicated by individuals in management positions. However, voices in support of plant records can come from many different places, such as staff involved in fundraising, researchers, or visitors.

Staff

Highland attributes the present priority placed on plant records by board and staff to the legacy of the founders of what is now Mt. Cuba Center. Mr. and Mrs. Lammot du Pont Copeland. The Copelands were well versed in the practices of public gardens. Mrs. Copeland's understanding that documentation was an integral part of a living museum carried on through the subsequent directors and staff of the gardens. "They know they're a part of something bigger, a part of this living museum, and that's one of the things you do. It makes your collection so much more valuable when you document them, and I think that's why they're in public gardens, to make their work meaningful to the greater community" (Highland, personal interview, 2015). A critical component of staff's comprehension of the role of plant records at Mt. Cuba is their orientation during on-boarding. As part of their training process, new staff spend time with the plant recorder and "they get the talk of this is what plant records is, this is how we do it, this is how you fit into it." Plant records are routinized, so that the process is the same every time. Horticulturists turn in a formatted plant change log on the 10th of every month, and their annual calendar includes rotational inventory and mapping with the plant recorder, who has developed an exemplary methodology for her system. Together, the horticulturists and curatorial staff inventory core collections roughly every five years, and natural areas roughly every 10 years.

Nancy Kartes, Garden Manager at Bellevue Botanical Garden and primary executor of records

tasks, creates a culture of priority around plant records with immediate action when her grounds

staff communicate a move or death to her. "If they make a correction and they put that on my

desk, it goes to the top of my priority list, because I promised them if they were good about

communicating with me, then I wouldn't be a block to getting that information into the system"

(Kartes, personal interview, 2015). Additionally, the entire staff is motivated by the immediately

public nature of their plant records: because the records from their custom FilemakerPro

database are updated live on their website, visitors are able to see a change "the minute I make

that change. It's got to be current, and careful, and accurate." Additionally the information

horticulturists are capturing is useful to them. Horticulturist often need to know information on

plants in their gardens and collections; information should be accessible to them that is timely

and useful, thus reinforcing the benefit of putting time and energy into capturing data for the

plant records (Highland, personal interview 2015).

While a culture of priority needs to be established by leadership, it also needs to come from the

innermost circle of day-to-day users. Curatorial and horticultural staff, as the individuals who are

most frequently recording and accessing information about plants in the collections, must be well

grounded in the essential nature of the documentation. In order for them to do that, they must

feel very competent in its workings (Hohn, personal interview, 2015). This requires not only

education and involvement in established routines, but an ongoing process of revisions when

necessary. Staff should be asking "is it doing what it's supposed to be doing? If there is a feeling

of a loss of value in it, it may be because it's not being effectively applied" (Hohn, 2015).

Communicating standard procedures to staff, as well as accepting feedback from them, is critical

to the ongoing success of a plant records program.

Board

> "Everyone understands the revenue from sales, but not everyone understands the value of plant records."
>
> -- Preservation garden interviewee, 2015

According to Cindy Newlander, Associate Director of Horticulture & Plant Records at Denver Botanic Gardens, one of the keys to success is that the people at the top of an organization, the directors and board, are truly in agreement and understand the strength of having the information documented digitally (Newlander, personal interview, 2015). As previously mentioned, boards members may or may not bring with them a knowledge of curatorial practices and standards in living collections: a nonprofit public garden's board of trustees is primarily responsible for the governance, finances, and legal operation of the garden (Matheson, 2011). This is supported by the overwhelming neutrality toward plant records expressed in the survey.

It is important that the concepts of documentation be presented early and continuously. As one interviewee who described a disconnect between board and documentation tasks pointed out, board members cycle on and off, thus often moving on by the time they "get it." Another preservation garden with a board that now fully supports putting energy toward plant records said that it was "a real learning process" for their board to understand the importance of records to even a non-collections oriented garden, and what their responsibility is in helping to advocate. In retrospect, as their board grew from 10 to 25, "it would have been good early on to give them a primer on plant collections, plant collections policies, and the challenges that we were going through." Now, the garden has a grounds and facilities committee that is responsible for understanding and ensuring proper documentation, but since they don't have expertise in this, it

is up to the garden management to orient them. On the other hand, a garden that reported no challenges with board communication developed a garden advisory committee of experts that included a former arboretum director, landscape designers and architects, and "plant geeks of every stripe." In this case, education from management to board was not needed; rather the advisory committee brought that perspective to both the board and management.

In order to best educate board members about plant records, Hohn suggests talking to people at museums and zoos to glean perspectives that have resonated with their boards, leadership, and stakeholders. On a more existential level, Director of Living Plant Documentation at the Chicago Botanic Garden Boyce Tankersley suggests that when emerging gardens are struggling with committing what might be scarce resources to documenting their collections, they should think about the legacy they are building. This legacy will go "well beyond your lifespan, your children's lifespan, your grandchildren's lifespan. That little bit of extra effort is really critical early on in the system, and what you create is an institution of excellence...Then that philosophy and management plan has a strong foundation." (Tankersley, personal interview, 2015).

Donors and Visitors

Furthermore, when the staff and board of a public garden are well versed in the roles, value, and required tasks of plant records, they are able to communicate them more effectively to two other important constituents: donors and visitors. Multiple interviewees noted that plant records are not "sexy," and that it requires a bigger-picture explanation of their role to interest those less familiar with the documentation of living collections. Since financial resources are reported to be one of the leading challenges of documentation, educating and exciting donors with the needs and uses of plant records is a worthwhile pursuit. One preservation garden in this study has received

annual support for their documentation for nearly two decades in the form of an endowment left by an individual interested in plant records. Visitors, the most common consumers of plant records data, are likely less familiar with the methods, tools, and time that goes into documenting living collections than they are with methods in the museum and library fields. "The public isn't going to place a lot of value on that unless there's somehow some direct pipeline there, some thread drawn between what they learn when they're at the garden and where that information comes from, where it's stored" (Hohn, personal interview, 2015). Furthermore, an appreciation of robust data will lead in turn to appreciation of the collections from which those data were taken (Lane, 1996). As an integral part of what botanic gardens do, and in order to demonstrate their value to the public, it is in the interest of public garden staff and boards to be able to clearly and effectively communicate the concept of plant records to garden visitors.

Demonstrate the Value

> "If [the documentation system] is working hard then the inherent value of it grows and it's easier to make a compelling case for it...you can turn back and say 'this is what it's done.'"
>
> -- Timothy Hohn, personal interview, 2015

One part of educating staff, board, and constituents about plant records is explaining the context of documentation in the museum field and simple familiarity and procedural details; the other part is demonstrating their measurable value. This is twofold: their contribution to both the mission of the organization and financial gain or savings. Demonstrating value requires first recognizing what the resource and product value is, then capturing and communicating it. There need to be a shift from "assumed value" to "evidence of value." A lesson can be taken from the

library field, which has recognized the need for this shift to demonstrate the value of their special collections in order to secure resource allocation and to identify new directions. (Carter, 2012). The Association of Research Libraries has begun exploring concrete means of demonstrating value and return on investments of academic library collections through its LibValue project (www.libvalue.org).

Anthony Aiello, Director of Horticulture and Curator at the Morris Arboretum of the University of Pennsylvania, acknowledges that very few organizations do everything they want to do with plant records. There is always a need to prioritize. He recommends finding something central to the mission of an organization as the starting point to "sell" the idea of plant records. Measuring and managing an activity is one way to make it a priority (Bevins & De Smet, 2013). The Morris Arboretum keeps track of what they call "scientific use:" any plant samples that are sent or collected on site for research. They've publicized some accounts of those uses, in annual report or elsewhere, but there is a need for better internal communication of the collections' uses. "I think maybe even the board is not as aware of that value as they could be. One of my goals is to make them more aware of the kinds of research that happens here" (Aiello, personal interview, 2015).

Tankersley points out that it's in the Chicago Botanic Garden's mission to not only provide a beautiful garden for people to enjoy, but also to advance plant science and knowledge of the natural world. CBG's plant records capture knowledge of plants, how they perform and survive, and where they grow and don't grow. By sharing their data with other institutions and receiving data in return, resources are saved and planning for the future occurs in a more global context (Tankersley, personal interview, 2015).

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Being able to share plant records with researchers and using them as leverage for creating

nationally recognized collections, such as a Plant Collections Network (PCN) collection, can

help gardens with fundraising by letting members and funders know "you're doing right by your

collections" (Newlander, personal interview 2015). In fact, the desire to create a PCN collection

to add value to a garden can be a driver for developing a collections policy and tighter plant

records program. The Idaho Botanical Garden did just that, and built their collections policy to

meet the robust requirements to be eligible for PCN status. Having this goal made it easier to

pitch the idea of support to funders. According to Horticulture Director Toby Mancini, "If you

have a clear plan and purpose, it's easy to get board and funders involved. Without a clear reason

why it's important, it's going to be uphill battle." (personal interview, 2015).

There is little research on measurable financial benefits of maintaining plant records. This is an

area where more research could be done, specifically on the programmatic activities they support

and the monetary value of those to public gardens.

Create a dedicated staff position

Many survey and interview participants recommended to gardens transitioning from

private to public that they dedicate a staff position to plant records. Several reported that

the amount of time required to perform documentation tasks was greatly underestimated,

in hindsight. Others reported that inaccuracies in data collected by poorly directed

volunteer groups led to greater challenges than they had before. One survey participant

described a garden that has been entirely maintained for the past 37 years by a group of

volunteers without any financial or manual support. The gardens are physically well-

cared for, "but are basically not documented." To be sure, volunteers, interns, apprentices, and temporary or part-time staff members frequently make extremely valuable, accurate, and meaningful contributions to the documentation of living collections. In fact, individuals in these positions perform the bulk of plant records tasks at many of the gardens in this study. The key, however, is organized leadership and a system of clear protocols. When plant records are performed *only* by volunteers, interns, apprentices, or temporary staff members, the result is not only a documented lack of accuracy and consistency, but also the perpetuation of a perception of plant records as low priority.

Both Bellevue Botanical Garden, a relatively small, display-focused garden, and the Chicago Botanic Garden, a large, research and conservation focused organization, rely heavily on volunteers for the maintenance of their plant records. At Bellevue, Kartes does the curatorial work assisted by a group of "highly trained volunteers," who perform tasks such as taking photographs and research attributes, then enter them into the database (Kartes, personal interview, 2015). At the Chicago Botanic Garden, there is a team of 85 volunteers working on plant records. They are coordinated by volunteer team leaders, who are coordinated by a volunteer director and working within a curatorial department with a Director of Living Plant Documentation, a Plant Records Supervisor, a GIS Specialist, and a Labeling Coordinator.

Finding the funds for a new staff position is challenging, and re-writing a current position can also be difficult. A staff member who is currently both gardening and maintaining records at one preservation garden sees the need for a position dedicated to plant records

but says, "it's a pretty hard sell, to create yet another position that's just kind of like a

back office position." What she as a staff member knows to be true must be

communicated to board members and management: "The value making this garden

important to the world is the value of its plant collection. It's only as valuable as the data

that's behind it. So that needs to be accurately maintained" (personal interview, 2015).

For the Mendocino Coast Botanical Gardens, which operates on $1.5 million annually

and has 11 full time staff including garden, cafe, store, and administration, having the

funds to provide staff and focus for plant records has been difficult. According to then-

director Mary Anne Payne, "record keeping has always been a priority, it's just hard to

stay focused on it when there are also so many other priorities vying for attention." To

overcome that challenge, a new full-time position with benefits was recently created by

collapsing a number of part time positions into one "so that we can really give this the

sustained focus that we need for a botanical gardens" (personal interview, 2015).

In Conclusion

As a newly public garden, it is critical to begin recording information on living collections

immediately, in any format that is most readily accessible, and to begin maintaining that data on

a regular basis. Looking to the past and to the future, inward and outward, preservation gardens

should develop a plant records plan to identify current assets and needs, to plan the future of their

documentation system, and to detail specific procedures for recording data. To successfully

implement a collections policy and plant records plans, public garden managers must create a

culture that supports the priority of documentation through three key steps: educating staff and

board about plant records, demonstrating the value of plant records, and dedicating a staff position to plant records tasks.

The recommendations developed for gardens transitioning from private estates to public gardens may also be applicable to any organization with living collections navigating the documentation process. It is the hope of the author that the recommendations, along with the results of the study, literature review, and a bibliography of relevant resources, will offer more relevant and current resources on plant records to preservation gardens in the United States.

"Conserving historic flower gardens is at least as much about . . . aspiration as preservation; as much about observation as archive; as much about systems as solutions; as much about process as product . . . as much about pragmatism as principle; . . . and as much about the future as the past."

-- John Sales, in *The Conservation and Management of Historic Flower Gardens of the 20th Century* (2009, p.225)

Explanation of Research and Consent to Participate *(signed by all interview participants)*

You are being asked to participate in a research study about the documentation of plant collections at botanic gardens. I am requesting your participation because I believe your garden has a unique perspective to offer to the public garden field, and because you expressed interest in participating via email prior to this site visit. Your garden fits one or more of the following criteria:

a. Holds historically private plant collections that have recently, are currently, or will in the near future transition to public gardens

b. Includes as part of your mission one or more of the following themes: plant conservation, research, environmental education

c. Maintains a website expressing your mission and allowing public access to information about plants in your collection

Objectives of this study:

1. To document, analyze, and compile practices related to collections documentation among historic gardens transitioning from private to public in order to create a set of accessible, applicable resources on such practices;

2. To bridge an informational gap between practitioners that would enable collections like these to be more readily accessible for research and conservation

Primary research questions:

● How and why do gardens transitioning from private to public document their historic plant collections?

● What are the best practices for historic gardens transitioning from private to public to document their collections order for them to be accessible for research and conservation?

● What are the unique challenges that gardens in this position face in terms of documentation?

Risks and benefits: There is a risk that you may find some of the questions about your institution's practices to be sensitive. Please note that the intention of this study is not to critique your garden's performance, but rather to gain insights into the practices, challenges, and creative solutions that are currently present in the public garden field. The benefit to your garden is that you will be participating in a study that will offer examples and resources to fellow gardens, elevate the value of public gardens for research and conservation, and become a part of a network of gardens around the country working to advance curatorial practices for living collections.

Taking part is voluntary: Taking part in this study is completely voluntary. You may skip any

questions that you do not want to answer. If you decide not to take part or to skip some of the questions, it will not affect your current or future relationship with the researcher or Cornell University. If you decide to take part, you are free to withdraw at any time.

If you have questions: The researcher conducting this study is Emily Detrick. Please ask any questions you have now. If you have questions later, you may contact Emily at *(removed for privacy)* If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) at 607- 255-5138 or access their website at http://www.irb.cornell.edu. This project is not considered human participant research because the focus is on methods, policies, and organizations instead of individuals. You may also report your concerns or complaints anonymously through Ethicspoint (www.hotline.cornell.edu) or by calling toll free at 1-866-293-3077. Ethicspoint is an independent organization that serves as a liaison between the University and the person bringing the complaint so that anonymity can be ensured.

You will be given a copy of this form to keep for your records.

Statement of Consent: I have read the above information, and have received answers to any questions I asked. I consent to take part in the study.

Your Signature _____ Date _____

Your Name (printed)

_____

In addition to agreeing to participate, I also consent to having the interview filmed.

Your Signature _____Date _____

Signature of person obtaining consent _____Date _____

Printed name of person obtaining consent _____Date _____

This consent form will be kept by the researcher for at least three years beyond the end of the study.

Interview Questions

History and background of plant records:

1. Please tell me about the evolution of your garden's plant records.
   - When were records first kept, and by whom?
   - What kind of system was used?
   - What caused systems to change?

2. What challenges has your garden encountered in the process of documenting plant collections?
3. How has your garden overcome those challenges? (Or have you not been able to? Why not?)

Current Use:

4. What information in your plant records do you find most useful internally?
5. What information in your plant records is most sought after externally?
6. By whom? (Visitors, other gardens, educators, students, researchers, conservationists, other?)
7. How frequently are plant records updated? (Inventories)
8. What areas of your recording does your garden find the most challenging (e.g., natural areas, annual plants, issues with labels, etc.)

Desired use:

9. What would your garden do differently if it could?
10. What's keeping your garden from doing that?
11. How would you like to see your collections and records used internally?
12. How would you like to see your collections and records used externally? (By other gardens, by educators, by students, researchers, conservationists, other?)

Recommendations:

13. What advice would you give to gardens just beginning or struggling with the process of documenting their collections?
14. What do you wish was available or possible to make documenting your collection easier or more effective?

Can you please share a "success story?" An example of how having accurate and up to date records about a plant or group of plants has led to a discovery, increased the value of a collection, solved a historical mystery, made that plant useful for research or conservation, or the like?

APPENDIX C

Survey Questions

Plant Records: Practices and Challenges

Your participation in the following survey will help to inform the development of recommendations that will be accessible to many other gardens. Thank you!
By participating, you will be entered into a drawing to win a $25 gift certificate to Amazon. The survey will take about 15 minutes to compete.   The survey responses will be reported anonymously. All gardens participating in the study will receive a copy of the final report with analyzed results.

The Project: My graduate research is on the practices and challenges of documenting living botanical collections. I'm focused specifically on historic landscapes in the United States that have transitioned from private ownership to public gardens. My objective is to document, analyze, and compile plant records practices among historic gardens in order to create a set of accessible recommendations for emerging gardens, as well as for established gardens struggling to navigate the documentation process. Plant records are often a "back end" operation - it's hard to find out what other gardens are doing without a personal call to ask questions. This is a unique opportunity to share that information. While you may find some of the questions about your institution's practices to be sensitive, please note that the intention of this study is not to critique your garden's performance, but rather to gain insights into current realities for public gardens.   If you have questions: The student conducting this study is Emily Detrick. You may contact Emily at efd46@cornell.edu.

I. Background

Q1   How many years has your garden been open to the public?
(select a number)

Q2   What is your garden's annual operating budget?
❍ Less than $1 million (1)
❍ Between $1 - $2 million (2)
❍ Over $2 million (3)

Q3   How many acres does your garden cultivate?
(select a number)

Q4   Are there plants in your collection that (Choose all that apply)
❑ Are classified by state, regional, or national standards as rare, endangered, or threatened? (1)
❑ Your garden considers to be of unique historic significance? (2)
❑ Have another type of preservation value? Please describe (3) _____

II. Current Practices: Plant Records

Q5 Does your garden have a written plant collections policy?
❍ Yes (1)
❍ No (3)
❍ It's currently in progress (4)

Q6 Does your garden have written guidelines for maintaining plant records?
- ○ Yes (1)
- ○ No (2)
- ○ They're currently in progress (3)

Q7 Does your garden create accession records for plants added to your collections?
- ○ Yes, for all plants (1)
- ○ Yes, for some plants (4)
- ○ No, none of them (2)

Answer If Does your garden create accession records for plants added to your collections? "Some of them" Is Selected
Q8 How does your garden choose which plants to accession?

Q9 Does your garden track information (location, condition, etc.) about plants in your collections?
- ○ Yes, for all plants (3)
- ○ Yes, for some plants (4)
- ○ No, not for any plants (6)

Answer If Does your garden track information (location, condition, etc.) about plants in your collections? "For some plants" Is Selected
Q10 How does your garden choose which plants to track?

Answer If Does your garden track information (location, condition, etc.) about plants in your collections?" Yes, for all plants" Is Selected Or Does your garden track information (location, condition, etc.) about plants in your collections? "For some plants" Is Selected
Q11 When does your garden update changes to the plant records (accessions, location changes, deaths, etc)?
- ○ Immediately upon the change (1)
- ○ At least 4 times a year at regularly scheduled intervals (2)
- ○ All at once in the winter (3)
- ○ Whenever we can find the time (not regularly scheduled) (4)
- ○ Other (5) _____

Q12 Currently, what data management system does your garden use most frequently for plant records?
- ○ Handwritten/paper (1)
- ○ Microsoft Excel (2)
- ○ Microsoft Access (3)
- ○ FileMaker Pro (4)
- ○ BG-BASE (5)
- ○ IrisBG (6)
- ○ ArcGIS for Parks and Gardens (7)
- ○ None (8)
- ○ Other (9) _____

Q13 How satisfied is your garden with their current plant records system?
○ Very Satisfied (1)
○ Satisfied (2)
○ Neutral (3)
○ Dissatisfied (4)
○ Very Dissatisfied (5)

III. Current Practices: Mapping

Q14 Does your garden map plant collections?
○ Yes (1)
○ No (2)

Q15 Currently, what mapping system does your garden most frequently use?
○ Hand drawn on paper (1)
○ Hand drawn digitally in a program like Microsoft Word, AutoCAD, Adobe Illustrator, etc (2)
○ BG-Map (3)
○ We map through IrisBG (4)
○ ArcGIS (5)
○ ArcGIS specifically for Parks and Gardens (6)
○ QGIS (7)
○ Other (8) _____

Q16 How satisfied is your garden with their current mapping system?
○ Very Satisfied (1)
○ Satisfied (2)
○ Neutral (3)
○ Dissatisfied (4)
○ Very Dissatisfied (5)

IV. Users and Sharing

Q17 The primary users of your plant records are: (1 being most frequent users, 5 the least frequent users)   *Please use the mouse to click and drag your responses into the correct order*
_____ Internal (staff, board, volunteers) (1)
_____ Visiting public (2)
_____ Other professional in the public garden/green industry fields (3)
_____ Researchers (4)
_____ Other (5)

Q18 Does your garden share plant records data externally?
○ Yes (1)
○ No (2)

Q19 External data sharing from your plant records occurs most commonly through: (1 being the most common and 4 being the least common)   *Please use the mouse to click and drag your responses into the correct order*

_____ Our website (1)

_____ On an individual request basis (2)

_____ Exporting to a meta-database like BGCI PlantSearch (3)

_____ Other (4)

V. Staff Structure

Q20 Does your garden have positions with the following terms in their titles? (Choose all that apply)
- ❑ Curator (1)
- ❑ Plant Records Manager (2)
- ❑ Curatorial intern, fellow, or apprentice (3)

Q21 Who is responsible for most of the plant records tasks? (Choose all that apply)
- ❑ Curator (1)
- ❑ Plant Records Manager (2)
- ❑ Full time Horticulturist(s) (3)
- ❑ Part time Horticulturist(s) (4)
- ❑ Volunteer(s) (5)
- ❑ Intern(s), fellow(s), or apprentice(s) (6)
- ❑ Other (7) _____

VI. Transition from Private to Public

Q22 When your garden transitioned from private to public, was an inventory taken of the living plant collections?
- ❍ Yes (1)
- ❍ No (2)
- ❍ A partial inventory was taken (3)

Q23 When your garden transitioned from private to public, who was consulted about the historic plant records? (Choose all that apply)
- ❑ Property owner(s) with previous experience on the site (1)
- ❑ Property manager(s) with previous experience on the site (3)
- ❑ Designer(s) or landscape architect(s) with previous experience on the site (2)
- ❑ None of the above (4)
- ❑ Other (5) _____

Q24 In what format did most plant records (data and/or maps) exist at the time of transition?
- ❍ Paper: handwritten/drawn, invoices, or printed from a no longer extant database (1)
- ❍ Electronic: in a spreadsheet, database, or another software program (2)
- ❍ They didn't exist (3)
- ❍ Other (4) _____

Q25 How satisfied are you with the accuracy of the historic plant records?
- ❍ Very Satisfied (1)
- ❍ Satisfied (2)
- ❍ Neutral (3)
- ❍ Dissatisfied (4)
- ❍ Very Dissatisfied (5)

Q26 How were those historic plant records transitioned to your current format?
- ❍ We're still using same format (1)
- ❍ Data was input manually from paper to digital format (2)
- ❍ Existing digital data was migrated into a database software program (3)
- ❍ Other (4) _____

Q27 In regards to plant records, what worked particularly well for your garden during the transition from private to public?

Q28 What didn't work well during the transition, or what do you wish your garden had done differently in regards to plant records?

VII. Challenges

Q29 Please rate your garden's challenges in documenting your collections. (0 being not challenging at all, 10 being extremely challenging)
_____ Financial resources (1)
_____ Staff time (2)
_____ Board support (4)
_____ Selecting documentation system/ products (5)
_____ Finding resources on documentation techniques & practices (6)
_____ Technology obsolescence or fragility (corruption of files) (7)
_____ Documentation is not a mission-based priority (3)
_____ Other (8)

Q30 Please rate the following documentation tasks on how challenging they are to manage.(0 being not a challenge at all, 10 being extremely challenging)

_____ Initial accession input (1)
_____ Database maintenance (2)
_____ Mapping (3)
_____ Label maintenance (4)
_____ Inventories (5)
_____ Verification (6)
_____ Recording descriptions/special characteristics (7)
_____ Other (8)

VIII. Priorities

Q31 Please rank the following priorities at your garden (1 being the highest priority, 8 being the lowest priority) *Please use the mouse to click and drag your responses into the correct order*

_____ Horticulture & Landscape Maintenance (1)
_____ Programming & Events (2)
_____ Plant records (3)
_____ Interpretation & Education (4)
_____ Research (5)
_____ Conservation (6)
_____ Expanding our audience (7)
_____ Other (8)

Q32 The general staff attitude toward plant records is
○ Plant records are high priority (1)
○ Neutral (3)
○ Plant records are low priority (2)

Q33 The general board attitude toward plant records is
○ Plant records are high priority (1)
○ Neutral (3)
○ Plant records are low priority (2)
○ We don't have a board (4)

Q34 In order to fulfill your garden's mission, plant records are
○ Important (1)
○ Neutral (3)
○ Not important (2)

IX. Final Thoughts

Q35 Do you have any recommendations regarding plant records to share with gardens transitioning from private landscapes to public gardens?

APPENDIX D

Support from Participants for Recommendation 1: Starting Simple and Staying Current
Identifying information has been omitted to maintain anonymity of preservation garden respondents; curatorial professionals interviewed separately are identified by name and affiliation

Survey responses to the question "Do you have any recommendation regarding plant records to share with gardens transitioning from private landscapes to public gardens?"

"Do not wait to start some kind of record keeping."
"Make a start - even with paper and pencil."
"It is never too late to start cataloguing plant records, even in spreadsheet form."
"Get organized as early as possible and stick with it."
"No matter what your garden's budget or staffing situation, it is important to at least maintain basic plant records to be able to answer questions that future staff and visitors will ask."

Interview responses to the question "What advice would you give to gardens just beginning or struggling with the process of documenting their collections?"

From preservation gardens:
"It is paramount that they're done right then and there. If a plant dies, something comes in, never, ever, ever fall behind. Period. They have to be kept up to date... It seems no big deal [to wait] , and I've done it, and it's what precipitated my grand demise: 'Oh there's only 5 things, I'll do it next week, then next week it's 10 things, and I don't really have time to do 10 things,' and then…"

"In the beginning, no matter where you are, whether you're just starting or have started and stopped, it just seems so daunting. But once you get into it there's a flow to it, and it becomes much simpler."

"Start with what you are able to do.... Even just try to find 5 minutes in your day to do it, and if not, gather all your plant tags in a pile and get an intern or a volunteer to do it. Try to do it on a regular basis. You have to start somewhere, and that's a start."

"Just to start immediately keeping track of what you're planting as you plant it, and as much information about that plant as you can get...if the records don't exist, start working backwards getting as much information as you can, because the longer you put it off the more difficult it gets."

"So much information gets lost because gardens think they're not in a position to have a plant records system. Because when you look out there, most of the systems are fairly costly, and I think they give the impression to a lot gardens starting out that you have to have a lot more resources dedicated to it to start. And so I think what happens is you get to a point where it becomes overwhelming, and then they don't start...Recording information, keeping it from disappearing, is always a good thing. Even if what you think you're doing isn't very impressive, it will be very valuable as time goes on. Saying, I'll get to that when we're ready, means you'll never get to it… If all you're doing is keeping a very simple spreadsheet or list of what it is and where it came from, and where you have it, in some way you can make sense of, that's more than you'll be able to create 5 years down the road when you're trying to remember it. So I would say, just start."

From other professionals:
"Just start. Find a program that you're comfortable with, that you can maintain, that you have support for long-term. You don't want anything "fly by night" that the tech guy leaves and you're stuck with a program nobody knows. And just start small. Just do either a bed at a time, or a taxon at a time - if you

have great Rhodies, just do your Rhodies then, start there - but start. Just get started, get it going. I would do the mapping and the database together. As soon as I got a section of a garden, I would map it immediately."

<div align="right">-- Nancy Kartes, Garden Manager, Bellevue Botanical Garden</div>

"I think smaller gardens could learn a lesson from E.F Schumacher's book *Small is Beautiful* and they could move forward with whatever technology is available to you. I mean, if you're just using index cards systems and tableaus, so what? If it's a small garden, maybe that's fully functional. I think there needs to be a realistic view of what their needs are and what will really accomplish those needs, instead of what happens to be in vogue in terms of technologies that other institutions are using."

<div align="right">-- Timothy Hohn, author of *Curatorial Practices for Botanical Gardens*</div>

"I would like to one day work at or learn about a botanic garden that actually first started to document when they first started to plant their plants... that will address a lot of the issues that my staff and I spend a lot of time trying to resolve now."

<div align="right">-- Boyce Tankersley, Director, Living Plant Documentation, Chicago Botanic Garden</div>

Support from Participants for Recommendation 2: Developing a Plant Records Plan
Identifying information has been omitted to maintain anonymity of preservation garden respondents; curatorial professionals interviewed separately are identified by name and affiliation

Survey responses to the question "Do you have any recommendation regarding plant records to share with gardens transitioning from private landscapes to public gardens?"

"A high priority for the present day Landscape was obtaining an Historic Landscape Report (2014) which we now have in hand. Although it was a huge expense for our organization it serves, together with the original Design Management Guide (1984), as our reference for plantings."

"Have a Landscape plan completed, to document the history of the gardens, changes and additions from the beginning to the present."

"Gather information from as many as possible who have intimate knowledge of what is planted, if knowing the correct ID is of primary value."

"Collect as much documentation and information as possible during the transition period: photographs (preferably dated and with labels); personal recollections of owners; invoices, catalogs, and other evidence of plant selections. Tour the property with knowledgeable persons: owners, gardeners, friends, relatives, local nursery personnel."

"If at all possible, take more time versus less to do as much research as possible before initiating changes. Dig, dig, dig! Find the information, whether by interviews with people who knew the garden "back in the day" or archive repositories with a possible wealth of knowledge. You never know where a lead may take you, or what you may end up learning along the way."

"Oral interviews of former gardeners helped with some documentation."

"Since this garden had to be reconstructed from scratch, without the aid of a historic planting plan, much of this garden is a representation of what a mid-nineteenth century rural Victorian garden would have looked like. The planting plan for the gardens around the house are drawn from Andrew Jackson Downing's illustrations for rural mid-nineteenth century gardens...Plants come from hand-written lists written in the margins of those books."

"Try to have good documentation of the plants from the previous owner and where they came from."

"if you can, put a clause in the property acquisition agreement that all plant invoices, maps, lists, and other records will be transferred with the land."

"Choose the plant records system and process very carefully since it is very hard to change. Plan for the future."

"Fully research plant record databases - some are much easier to use than others. Make sure when transitioning to a new computer the database can move with the computer."

"Have a plan in place early on."

"Draft the collections and acquisitions policies as soon as possible."

"Choose the best database you can possibly afford. We are currently looking to upgrade....While Mac OS are the easiest to use, many database systems are not Mac friendly. Make sure your records hardware and software are physically secured and password protected. Our plant maintenance file was corrupted early in our transition, and we have not fully recovered from that."

"Get a good inventory started first and then have a step by step plan for getting the plant information recorded including where it is planted, where it came from, etc"

"Create priorities, protocols and deadlines for a proto-type (or beta). Than review and adjust. If using interns create a protocol for oversight."

"Consider all of the potential needs and uses for the database AND consider how the public can access, utilize and add input (positive only). Don't just think of the staff needs, consider other users beyond the garden walls."

"For us, maintaining the gardens in the spirit of the original owners is important now but was not at the time of the transition. Decide now what your focus will be and stick with it."

"Take a long hard look at your current collection and definitely think long-term about how the collection will be managed and what is important and in keeping with the mission of the garden and formulate an accession policy before starting the process."

"Even if using a very simple Excel spreadsheet or even paper records, decide on data entry criteria and stick to it. Migration to a new system will be so much simpler. Our records clean-up process before migration to IRIS is very daunting because of this issue. For example probably 20% of (many thousand) records have comments in the scientific name field. All of that must be moved to a comments field. That is the first step of the records irregularity we are correcting. Think about the kinds of reports you might want to generate and how that process is done."

"Make sure mapping and databasing are factored into budget from the get-go so not constantly in a state of catching up."

"Look forward to ways that the plant records can serve the needs of the institution and the public in the the future, and design the system accordingly."

"Try to reserve some money for a professional plant ID inventory and assessment to be done in cooperation with the people that work most closely with the plants, and for a plant records system, staff, and the system's yearly maintenance for at least the first couple of years!"

"Match the collections management system to the resources and mission of the institution."

"Photographs, measurements, and any notes are incredibly important to document, in the right system."

"If you don't know where to begin, there are many plant records professionals that are willing to help. Join APGA and the Plant Collections professional section and ask for help."

"Contact other historic gardens, preservation groups, etc. The world of historic gardens is relatively small but wide-reaching. Join organizations like the Southern Garden History Society."

"If possible, enlist the services of a collections management professional in designing both the policies and the system, and if the property is large enough, build in support for GIS mapping."

"Interpretation is key to the visitor experience. Use plant records as a basis for educating the public."

Interview responses to the question "What advice would you give to gardens just beginning or struggling with the process of documenting their collections?"

From preservation gardens:
"For us...there have been previous gardeners who never left any records whatsoever. We're painfully aware of that missing piece, and so we want to leave a record going forward for other future gardeners. That's really what's motivating me to leave a good, decent record...to have something written down for somebody if they ever want to go and look."

"You have the plant collections practices on one hand, but then you have the "what are the plant collections actually supposed to do?" and for us that's the most important part. I would say for people at emerging gardens, if you don't have something like that, then you need to. Even more important that strategic and master plan - what is design intent for these spaces and how do landscapes and plants within them contribute to that? So we had this thing sort of out of sequence. If had to start all over again, would start with that. One of biggest parts of heritage landscape plan is that oral history is being recorded: long time gardeners, staff members, family, board, landscape designers, and then a review of all archival material."

From other professionals:
"The real hardcore case to make, and the one that's hard to toe the line to, would be that the collection needs to be scaled to the documentation effort. But that means a really honest approach to what you're capable of, what you're doing, the quality of what you've been doing. No one's going to want to scale back on their living collection simply because their documentation isn't keeping up with it, but the case could be made that maybe they should."

"For public garden people...it would be great if they could go to the AAM function too and sort of get together with people that work in herbaria and other sort of taxonomic venues, things that could touch on plant collections. What are they doing with documentation, where are they getting their support? What ways have they found to maintain that good balance so that you don't get subsumed in the living collection and its horticultural requirements and its preservation and the documentation slides to the point where it's forever inaccurate, and you're constantly having to do these sort of retrospective inventories…if you're a curator dealing with an historic collection, it's networking yourself with other kinds of historical collections, because you never know where the innovation is going to come from."
-- Timothy Hohn, author of *Curatorial Practices for Botanical Gardens*

"Some of the ways that we can leverage our collections now because they are documented is that we can either share our collections out with other institutions that also document their collections well, or bring in other collections. Some examples of this is that we have been giving some duplications of our collections - especially of our cactus and succulent collections - out to some other gardens that also have strong cactus and succulent collections, and they've also been sending material to us as well, so that if for some reason or another one of our specimens dies we can always go back to someone else for germplasm. That's really been helpful for us, and good peace of mind. I think there are many ways that we can look -

especially with partnerships with NAPCC and APGA - to share with other gardens so that we can help others build their collections while we can also safeguard ours."

"We've been able to [share data] in a couple of different ways: we've been doing it with the research and greater botanic gardens community through the BGCI PlantSearch. For us, that's really been valuable for being able to share material with researchers from around the world. We've had students come in and do their Masters or PhD work by being able to collect specimens from our gardens. We've also just been able to share tissue samples with researchers or seeds back to other gardens that have been looking for specific things."

"Being a part of the BGCI PlantSearch has allowed us a second level of verifying our collections and seeing if they are truly a part of our living inventory. As people request specific plant material, we've been able to look back in our collections, say 'oh that's actually not there anymore' and get them updated so that the next time somebody requests that we have a better updated inventory list."

"Another example for us of a way that we share our collections is we do it with the greater public through our Gardens Navigator website that is run through BG-Maps Web-VQF module. And through doing that we've, I think, in part allowed people to look at our collections more easily, find what they're looking for, in addition to really alleviating the stress on staff members for having to provide lists of plants like we did in the past."

> -- Cindy Newlander, Associate Director of Horticulture (Plant Records), Denver Botanic Gardens

"Would like to see our collections used more extensively for climate change studies...We have plants from all over the world. perfect microcosm, great lab tool, would like to see it used more for that. We do a great job of integrating garden into education classes, and that's wonderful. In a soft way we educate a lot of gardeners about the best plants for their region, can see in the garden what's really thriving. It's a challenge to look down the road and see the future. We're collecting data to address questions being put to us know. It' a challenge to collected data for questions that haven't even been asked yet. That's one of the challenges with plants records - how much is too much, how much is enough. I wish I knew that answer."

> -- Boyce Tankersley, Director, Living Plant Documentation, Chicago Botanic Garden

"Just start out with a plan on paper...we had the old policy from when they worked on collections before and were able to look over - do we want to start fresh, edit, change vision? Spent the winter looking for a new database. We sat down and talked about it a lot - what do we want in a database, what do we want plant collections to look like? We drew out an outline and still have it on a white board, still refer to it to make sure we're staying true to that, or need to adjust. You have to have the vision first to know what you're going to do. Once you have that, you know how to tackle - what software you're going to get, what resources you'll need."

"Another thing I would recommend, connect with other gardens. We were overwhelmed by how much they were willing to share about their process, very encouraging to me that they were willing to help us out, and in the future, we were willing to help other gardens out."

> -- Daniel Murphy, Native Plant Horticulture Technician, Idaho Botanical Garden

"If it calls for it, contracting a professional service who would go through your collection and really come up with a strategic plan for you and the gardens, and cater it to your staff and to your time and money. Or figure it out with the resources that you have to come up with a manual or a plan yourself…"

> -- Nick Courtens, Senior Horticulturist, Betty Ford Alpine Gardens

Support from Participants for Recommendation 3: Making it a Priority: Create a Culture of Plant Records
Identifying information has been omitted to maintain anonymity of preservation garden respondents; curatorial professionals interviewed separately are identified by name and affiliation

Survey responses to the question "Do you have any recommendation regarding plant records to share with gardens transitioning from private landscapes to public gardens?"

"The X Gardens...have been entirely maintained for the past 37 years by a group of volunteers...without any support, financially or manually....The gardens look great, but are basically not documented."

"If you have the budget, make the position of curator of the collection a priority."

"Make the establishment of collections management and acquisition policies an important goal."

"It takes more dedicated to this task than was initially allowed and now we are trying to catch up."

"Put the people doing the Plant Records in with the people doing the ordering and planting so they can keep current with collection changes. Once a plant is in and the label removed, if it hasn't been documented it is so hard to go back in time and try to collect all the pertinent information (e.g., cultivar, source, etc.) It is easy for the hort staff to just worry about getting the plants in and forget to give Plant Records the info if that person isn't always visible."

"This process can be difficult without staffing and historical data."

"Try to get staff time devoted to record-keeping, or find a university student/intern who can work alongside staff. Plant records are of utmost importance!"

"Make sure mapping and databasing are factored into budget from the get-go so not constantly in a state of catching up."

"Try to reserve some money for a professional plant ID inventory and assessment to be done in cooperation with the people that work most closely with the plants, and for a plant records system, staff, and the system's yearly maintenance for at least the first couple of years!"

Interview responses to the question "What advice would you give to gardens just beginning or struggling with the process of documenting their collections?"

From preservation gardens:

"There's a disconnect with board members: board members cycle on and off, by the time they get it they move on. Everyone understands the revenue from sales, but not everyone understands the value of plant records."

"I think the problem with boards...unless they're really passionate plant people, they don't get the importance. If you have a beautiful garden, it's bringing in people, there are plenty of activities and it's contributing to the community, that's all they care about. It's hard to educate the board members so that

they understand the power of having great collections information and having great maps...and it takes educating on my part, too, to be able to explain to them how important that is in a way they understand."

"Our board grown from 10 to 25; would have been good early on to give a primer on plant collection, plant collections policies, and challenges that we're going through. Now they're very much all on board, but it's been real learning process for the importance of those, even to a non-collections oriented place, and what their responsibility is in helping to advocate for those things."

"I'm kind of doing it as part of my job, which is hard to do, because I need to be doing the data full time, but I need to be out in the field, too, and so I try to do the recording collections in some glob of time. It's really not the most efficient way to do it at all, but it's hard to describe or to create a job when one person's been doing it...It's a pretty hard sell, to create yet another position that's just kind of like a back office position. How do you sell the value of that, because it's just adding to the cost? Because the value making this garden important to the world is the value of its plant collection. It's only as valuable as the data that's behind it. So that needs to be accurately maintained."

"I think making it a higher priority [during transition to public] would have been better. For gardens transitioning, I wouldn't want that record to be lost."

From other professionals:

"If at all possible, have somebody who really is solely or at least very much dedicated to the plant records process, and creating those procedures, and doing the actual documentation. If it becomes just a very small part of one person's job I think it becomes more challenging to make sure that it actually happens on a daily and weekly and monthly basis. Some gardens have to push their documentation work to the winter months, and that can allow for some things to slip through the cracks over time."

"It's really important for gardens to realize that this is an important priority for so many reasons: it's the history of your institution and collections, it's germplasm, and some of it - especially if you are building collections for conservation use - you need to know where it's from, when it was collected, who collected it, and be able to track it back to those individual plants at all times."

"Be able to have the people at the very top of your organization - your directors, your board - also really on board with this, and have them realize that there is a lot of strength in having this information documented digitally. Being able to share it out to researchers, being able to use this information in leverage for, like, having your collections become part of perhaps an PCN collection, can really help gardens as you are fundraising, and so many things that you're doing on a day to day level that lets your members and funders know you're doing right by your collections."
>   -- Cindy Newlander, Associate Director of Horticulture (Plant Records), Denver Botanic Gardens

"Talk to people in zoos, and talk to people in other museums and see if they've got some really catchy perspective on documentation that has resonated with the boards of governance, with the leadership of the institution, and then from there out to all the big stakeholders and so on. But it really has to start internally to make sure everybody in the curatorial program is well grounded in the essential nature of the documentation. In order for them to do that, they have to feel really competent in its workings - is it doing what it's supposed to do? If they're feeling there's a loss of value in it, it may be because it's not being effectively applied."

"Part of it starts with having a really clear idea internally of what the value of it is. And sometimes I questioned whether there was a clear understanding of that amongst the staff of the institution. It's recognizing what the resource and product value of the documentation is...To me, if it's working hard then the inherent value of it grows and it's easier to make a compelling case for it too, because then you can turn back and say 'this is what it's done.' Products and resources. That requires a lot of attention to the interface between the documentation and the collection. And it takes work. All of it takes being engaged with both the living collection and the documentation equally. Is that interface broad, and deep, is it constantly being trialed so that we're seeing both of those things working together... and bringing it out in various programmatic ways."

"I'd always thought...documentation seemed like the stepchild of curatorial programs… Value is nested in the living organisms and what they bring to the living museum, but the conceptual part of the collection, which is part of the documentation, is equally as important in terms of providing for the research and educational value of the institution, to really serve its mission and programs. It's not sexy. It's not attractive. The public isn't going to place a lot of value on that unless there's somehow some direct pipeline there, some thread drawn between what they learn when they're at the garden and where that information comes from, where it's stored...It's hard to muster the necessary internal and external attention to that program. It's always a struggle, especially now and in recent times when gardens are concerned with programs that will pull in a larger number of visitors, and build memberships. Some of that … having to do with attractive displays, and unusual features like miniature trains… is useful because it gets people in, but it's hard to maintain all of that and the necessary documentation to retain the contextual value of the collection. What gives it context is all that documentation."

"You need a flag bearer in the curatorial department. It's easy to come up with curators who are flag bearers for different taxa, but it's hard to find someone who's also the flagbearer for the documentation program."

<div align="right">-- Timothy Hohn, author of Curatorial Practices for Botanical Gardens</div>

"When you're first building a garden and you're looking at scarce resources, do you really need to commit the resources to document the collection? What you're building is a legacy that goes well beyond your lifespan, your children's lifespan, your grandchildren's lifespan. That little bit of extra effort is really critical early on in the system, and what you create is an institution of excellence. You start with the first day that you plant the first plant. Then that philosophy and management plan has a strong foundation, and you go forward."

"We enrich our knowledge of plants and how they're performing and surviving and where they grown and don't grow. Our mission is not only to provide beautiful garden for people to come and enjoy, but also to advance plant science and knowledge of the natural world. That's in our mission statement. We live on relatively small planet. What happens in one part has an impact on other places. If we can share our successes and failures with other institutions around the world, then that saves resources. They don't have to repeat our errors...it enriches us, because communication is always a two-way street… Being part of that sharing community provides hope for the future. In a vacuum, we can only see what's in our little backyard. That's important in our backyard, but that has a global context, [for which] others can use our data."

<div align="right">-- Boyce Tankersley, Director, Living Plant Documentation, Chicago Botanic Garden</div>

"I do the curatorial work accompanied by, or assisted by, a group of highly trained volunteers, especially if we're researching the attributes and entering them in the database, they actually do that work as well. They do all the photography, and they're attaching the photographs to the correct plants. And the grounds

staff assist in keeping the records up to date. So if something dies or moves, we communicate very closely to keep those things up to date as well...If they make a correction and they put that on my desk, it goes to the top of my priority list, because I promised them if they were good about communicating with me, then I wouldn't be a block to getting that information into the system, because as I'm entering information - whatever it is, accessioning, deaccessioning, moves - that's live, real time. The thing the visitor gets on their phone, they get that the minute I make that change. It's got to be current, and careful, and accurate."

<div align="right">-- Nancy Kartes, Garden Manager, Bellevue Botanical Garden</div>

"Find something central to your mission and use as starting point for selling idea of plant records. There are very few organizations that do everything they want to do with plant records. Always have to prioritize - one way is to just find what's most central to your mission and start with that; by doing that can convince people of the importance of it."

"It does add value, although we probably haven't done as good of a job [of tracking] as we could. We keep track of all what we call "Scientific Use:" any samples that are sent for research, we track all of that. Then we've publicized some of that, in annual report or other places, but I think we need to do a better job or internal communication...to tell people it's more than a pretty garden, there really is scientific use and basis to the gardens. We could do more of that, but whenever we get the opportunity, we try to promote that. I think maybe even the board is not as aware of that value as they could be. One of my goals is to make them more aware of the kinds of research that happens here."

<div align="right">-- Anthony Aiello, Director of Horticulture and Curator,
Morris Arboretum of the University of Pennsylvania</div>

"We've been incredibly fortunate with our staff being 100% a part of the plant records process. I think that's a product of our history. Mrs. Copeland, our founder, was very well versed in best practices at public gardens... and I think that that has traditionally carried out throughout our staff, through our first director Dr. Lighty, through Rick Lewandowski...and through our current director (Jeff Downing). I think it trickles down through the staff. They know they're a part of something bigger, a part of this living museum, and that's one of the things you do. It makes your collection so much more valuable when you document them, and I think that's why they're in public gardens, it to make their work meaningful to the greater community."

"[New staff] are oriented to their position what they'll do, then they spend time with plant recorder, and they get the talk of this is what plant records is, this is how we do it, this is how you fit into it. Also we do a lot of routinizing of the routine. We make it something that's the exact same every single time. Everybody knows that on the 10th of the month your plant change log is due. It's a log, it's something they fill out. Not something they are having to make up everytime, having to construct an email every time; it's a part of their day and their month to give us this information. Part of the annual calendar as well because we have very specific periods in the year when we'll be doing inventory and mapping with them."

"It's not "this person comes into my life and upsets my schedule and demands answers to all these questions," it's "this is a part of my job, I know when to expect them. And conversely, the information they're capturing is useful to me." So as a horticulturist, there are things you want to know about your gardens and collections too, and we really try to make that information useful and timely for them so they can see the benefit of putting that time and energy into capturing data for us."

(On talking to the board about records): "I try to do this every time I speak with my board, put it in a greater context. You run the risk of sounding a little grandiose, you know, like, we're a public garden,

we're going to save the world, but really you almost have to give them the context for the resources that they're putting into a project. It's not just me, not just us, it's all that we can accomplish together as a community."

"[Plant records are] not sexy. It's not 'oh, we saved this endangered species from extinction, or we planted this brand new garden in three days,' or anything like that. So it can be a little tricky when securing resources for plant records, and I think that's why you have to continuously take the conversation to that higher level, where you're not just talking about the data that you're capturing or the information or the structure or the policy. You really have to talk about the more existential questions: why are we here? What are we hoping to accomplish with this? What's our mission? How does every aspect of what we do feed back into that mission? How can we compound goals within our organization in a way where one tree is accomplishing several things, and one dataset can feed into more projects?"

<div align="right">-- Amy Highland, Curator, Mt. Cuba Center</div>

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