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**FACTORS ASSOCIATED WITH THE DEVELOPMENT AND  
IMPLEMENTATION OF MASTER PLANS FOR  
BOTANICAL GARDENS**

**By**

**Laura Elizabeth Mielcarek**

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**A Thesis Submitted to the Faculty of the  
COLLEGE OF ARCHITECTURE, PLANNING,  
AND LANDSCAPE ARCHITECTURE**

**In Partial Fulfillment of the Requirements  
For the Degree of**

**MASTER OF LANDSCAPE ARCHITECTURE**

**In the Graduate College**

**THE UNIVERSITY OF ARIZONA**

**2000**

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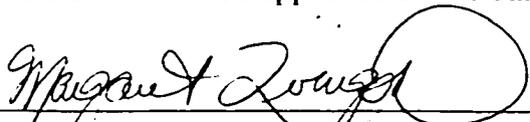
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## ACKNOWLEDGEMENTS

Completing a thesis is a difficult, time-consuming task for anyone who assumes such an assignment. I somewhat feel overwhelmed when I look back to the beginning of my thesis and dreamed about its completion. It is now completed and I am very relieved to look ahead into the future. As Eleanor Roosevelt said, “The future belongs to those who believe in the beauty of their dreams.”

Fulfilling my dream was possible through not only lots of discipline, but through the help of several individuals. First of all, I would like to acknowledge Dr. Margaret Livingston, my thesis Director, for her constant availability, dedication, and efforts relating to my thesis. I am very proud of my thesis and feel that it is possible because of Margaret’s dedication. I would also like to acknowledge my two thesis committee members, Ms. Marty Eberhardt, Executive Director of the Tucson Botanical Gardens, and Professor William Havens, Professor Emeritus in Landscape Architecture. They were a tremendous support in the organization and editing of my thesis. Equally important, I would like to acknowledge Eric Scharf, my employer, who also took on the difficult task of editing my thesis. Lastly, I would also like to acknowledge Dr. Steven Smith. He helped in the statistics used for my thesis, not only running the program, but making the process interesting and enjoyable.

I would like to thank the fifty Directors of botanical gardens and arboreta that completed my survey, but also provided me with insight and professional expertise on the development and implementation of garden master plans.

**Lastly, and most important, I would like to thank my family and husband, Jeff.  
Their constant encouragement provided me with perseverance.**

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### ABSTRACT

The role of master plans at botanical gardens was studied for the purpose of identifying particular characteristics in successful master plan implementation. Twenty existing master plans were analyzed to provide background information about typical content, format, and professionals involved with development of master plans. In addition, fifty surveys were conducted with Directors of botanical gardens and arboreta. Twenty questions were posed to the Directors to define the extent of master plan implementation (i.e. use) at the garden and to identify the factors that affect implementation. Log-likelihood ratio tests (G tests) were performed to evaluate the data. Eighty-eight percent of the institutions surveyed reported that they implement a master plan at the garden. Significant relationships were observed between use of the master plan and the following factors: hiring a landscape architecture firm; involvement of staff, Boards of Directors, and the community; and inclusion of key sections, graphics, and the institution's mission statement. Based on these results, guidelines for master plan development and implementation are presented.

## CHAPTER ONE

### INTRODUCTION

From physic gardens in the sixteenth century to present-day destinations for a family excursion, the significance and evolution of botanical gardens has profoundly changed throughout the centuries. Botanical gardens, past and present, have historically and continue to make three major contributions to society. First, the modern sciences of taxonomic and experimental botany were developed at botanical gardens as a result of the comparative study of collected plant materials and herbarium collections. Second, the applied science of economic botany, such as the study of plants that have potential economic value (e.g. rubber, coffee, sugar, cotton, and hemp) was developed in botanical gardens. Third, they have provided horticultural services such as selection, hybridization, and distribution of new and improved varieties of plant materials (Hyams, 1969).

Today's botanical garden is defined as an established, public institution with a professionally managed plant collection that supports recreation, education, and science programs (Hubbuck, 1998). An arboretum is simply a botanical garden that specializes in woody plant materials. Typically, botanical gardens are governed by a mission statement, a plan for development, and a collection policy that guides future direction (Hubbuck, 1998). Despite this definition, the term "botanical garden" is used very loosely today. True botanical gardens focus on two major recurring functions: research and education.

Research and educational functions distinguish botanical gardens from parks and other pleasure gardens. Another distinguishing, though minor function is the encouragement of interest and appreciation of plants for the general public. Education at botanical gardens takes on a variety of forms, such as interpretative signage, brochures, walking tours, lectures, volunteer programs, activities for local schools, collaboration with local universities, professional training, and publications.

Due to certain changes that face botanical gardens, such as the lack of funding and evolving public expectations, adequate planning and organization is required to ensure continued success. Many botanical gardens are currently reevaluating their master plans, specific garden goals, and mission statements; redeveloping their site; and also undergoing rigorous planning processes that reflect the necessary adjustments that gardens must face in today's rapidly changing world.

### Research Objectives

This thesis focuses on the role of master plans for botanical gardens and factors that contribute to their successful implementation. The purpose of the master plan is to guide garden administrators in setting future priorities with regard to the form and layout of the garden.

The intent of this study is to discover what characteristics contribute to successful implementation of botanical garden master plans and how the master plan is involved in

the planning process. These characteristics include: who was involved with the development of the master plan, what the master plan consists of, when is it implemented, and how it is used. The ultimate goal of this thesis will be to produce guidelines that individuals, particularly directors of botanical gardens, academia, landscape architects, and other professionals connected to the development of new and existing botanical gardens, may utilize in creating a successful and effective master plan.

Using a two-part research methodology, master plan analysis and surveys, the following hypotheses will be tested and analyzed. Conclusions related to the hypotheses will aid in answering the thesis research question.

1. Involvement of an outside landscape architect improves the quality of the master plan.  
Involvement with a professional is associated with a successful master plan.
2. Inclusion of staff and Board members, with a variety of skills and abilities, in the development of the master plan increases its effectiveness and its development.  
There is a sense of ownership of the master plan, and it also becomes a more holistic document.
3. The use of the master plan increases when the document contains key sections and strong, concise graphics.
4. If a mission statement exists and is present in the master plan, the master plan will be more successful.

This thesis is divided into four chapters. Chapter One consists of the Introduction and Literature Review, which provides general background information about botanical

gardens. Chapter Two describes the two research methodologies: a master plan analysis, and surveys with Directors of botanical gardens. Chapter Three outlines and interprets the methodology with respect to the fulfillment of the research objectives of this thesis. Chapter Three also includes guidelines for successful master plan implementation. Lastly, conclusions are presented in Chapter Four, including research goals and objectives, specific limitations and successes, and research conclusions.

## LITERATURE REVIEW

### EARLY EUROPEAN BOTANICAL GARDENS

#### Predecessors to Contemporary Botanical Gardens

Prior to the first contemporary botanical garden, the act of collecting and growing plants in a garden setting was an ancient concept that existed in different corners of the world. Not including traditional agriculture, these gardens were established for a variety of reasons such as aesthetics, economics, and medicinal uses. For example, a record of Egyptian and Chinese gardens and plant exploration date back 30 centuries. Early collections included gardens of medicinal plants created by Chinese emperor Shen Ming around 2800 BC and Pharaoh Thutmose III in Egypt (Spongberg, 1995). Aristotle also established a botanical garden in Athens around 350 BC that was passed on to Theophrastus, who is known as the “Father of Botany”. The idea of scientific collections of plants may well have been suggested to Europeans by the remarkable “gardens of plants” which so astonished the Conquistadors in Aztec Mexico (Hyams, 1969).

Plant exchanges also occurred between Western Europe and the Turkish Empire. Professor William Stearn discussed these exchanges in a Masters Memorial Lecture in 1965 at Cambridge. “Never before or since has there been such an astonishing influx of colourful strange plants into European gardens, as when in the second half of the sixteenth century, importation of unpromising onion-like bulbs and knobby tubers from Constantinople brought forth tulips, crown imperials, irises, hyacinths, anemones, turban ranunculi, narcissi, and lilies” (Hobhouse, 1997, 96).

As the contemporary botanical garden evolved, the foci changed based on a number of influences including religion, art, and other human needs. The following sections describe some of the major foci in the evolution of botanical gardens.

### The Garden of Eden

Early Christian theory surrounding the development of botanical gardens centers on recreation of the Garden of Eden. For example, throughout the Middle Ages, the Garden of Eden was believed to have survived the Flood. Navigators and explorers were in search of Eden during the expeditions of the fifteenth century to places such as Africa, the West Indies, and South America. Columbus believed he discovered the location of the earthly paradise in the new continents. After the discovery of America, each newly discovered family of plants was thought to represent a specific act of creation. Gathering up the pieces of creation, as in the first Garden of Eden, potentially recreated a new Garden of Eden.

This idea of searching “the Indies for their Balm and Spice” in order to “Rifle the treasure of old Paradise”, as it seems, the ultimate motivation behind the creation of botanical gardens in the fifteenth and sixteenth centuries (Prest, 1981, 42). Scholars of this time believed people got closer to God by creating places like botanical gardens. The idea behind these gardens was the recovery of knowledge and power over nature.

Prior to the beginning of the Renaissance, fifteenth century Vatican herb and medicinal gardens were established. They were similar to contemporary botanical gardens, but only considered the forerunners to later Italian botanical gardens that emerged during the Renaissance. In 1447, Pope Nicholas V set aside a part of the Vatican grounds for a garden of medicinal plants. His intentions were to forward the teaching of botany, not as a pure science, but in relation to medicine. This papal garden was the only one of its kind in Europe until the founding of the Paduan and Pisan Botanical Gardens, the first contemporary botanical gardens, nearly a century later.

#### The Sixteenth Century: The Renaissance Period

The Renaissance began in Italy about fifty years earlier than the rest of Europe. Italian merchants and bankers became wealthy, independent from the church, and politically influential. It was through the wealthy that Italy became the leading country in Europe in science, education, and culture. Specifically, science and education played important roles in the creation of the first botanical gardens. These two factors are still recognized today as the foci of botanical gardens distinguishing them from other pleasure gardens, collections, horticultural displays, and parks.

The Renaissance reawakened human interest in the natural world. Scholars, botanists, physicians, and gardeners gathered to communicate not only about plants, but also about the new plant introductions into Renaissance Europe. A new scholarly approach to the study of plants emerged, including the study, classification, and determination of the

usefulness of “nature”. The thought was that all natural products were created for the use of man; consequently, a plant’s “usefulness” was a component for classification purposes.

Renaissance botanical gardens began at medical schools in Italy and were often referred to as ‘physic’ gardens, medicinal plant gardens, or sometimes ‘gardens of simples’. Plants were believed to contain healing powers and were grown for demonstration and study. The professors of these medical schools maintained gardens for teaching purposes. Medical schools based their studies on the human body as well as the observation and dissection of the plant bodies. Thus, the development of botany was linked to the development of medical science.

The first botanical gardens began in Italy between 1545 and 1550, inspired by two men, Luca Ghini and Francesco Bonafede (Hyams, 1969). Bonafede’s aim, along with the botanist Ghini from the University of Bologna, was to teach students about the medicinal uses of plants and the environment from which they originated. Their research centered on the desire to develop cures for diseases. Ghini and Bonafede created the first two contemporary botanical gardens, Pisa and Padua Botanical Gardens, both located in Italy. There is debate regarding which of these botanical garden was created first. Both gardens contributed greatly to the acclimatization and introduction of new plants in Europe and botanical science in general. These two botanical gardens, in addition to the

Leiden University Garden in the Netherlands, are excellent examples of sixteenth-century Renaissance botanical gardens. They are discussed in the following sections.

*Padua Botanic Garden, Italy*

Many references claim that Padua is commonly distinguished as the oldest botanical garden (Hyams, 1969; Minelli, 1995). It was founded in May 1545, by a decree of the Venetian Senate followed by an announcement on July 7, that an area equal to about 20,000 square meters was ceded to the Republic and the University for the planting of a botanical garden (Hyams, 1969). Padua's primary and original function was to educate students on the medicinal purposes of plants. Research, education, art, and architecture were all merged into the new Renaissance worldview at Padua (Minelli, 1995).

Researchers at the garden approached the study of the world by compartmentalizing each plant collected into a separate plot. The plots were not randomly arranged but organized according to a deeper order derived from Christian religious beliefs about the Garden of Eden.

Much elegance and refinement was incorporated into the layout of the garden. The plan of the garden was formal, consisting of a ring of trees with a square inside. This square is divided into four smaller squares by two paths and thus forming eight triangular beds. Each square is then sub-divided into twelve large beds, or parterres, in intricate patterns. Every bed represented a single plant species. This pattern was used repeatedly in public and private gardens during the next two centuries.

*Pisa Botanical Garden, Italy*

Some accounts have dated the origin of Pisa to 1543, thus classified as the oldest botanical garden (Hyams, 1969). A letter written by Lucca Ghini dated July 4, 1545, addressed to Piero Francesco Ricci (majordomo of Cosimo I de Medici) implies that the Pisan garden was already in existence before the decrees of the Venetian Senate founded the Paduan garden. Regardless, Pisa, like Padua, contributed to the introduction and acclimatization of new plants into Europe. In addition, many acclaimed prefects studied and taught at Pisa, also contributing to the expanding study of botany at the time.

*The Leiden University Garden, The Netherlands*

The Leiden University Garden was established in 1587 as the first botanical garden in the Netherlands. It was the first botanical garden to have a greenhouse, which opened in 1599. The Leiden University Garden was relatively small for a botanical garden. In 1594, the total area was only 130' by 100', whereas today it covers over five acres.

Initially, the professors of medicine were placed in charge of the garden, yet they did not plant anything until twelve years after its establishment. Evidently, they were not interested in botany outside of their books. Fortunately, the first non-academic director at Leiden, Carolus Clusius, was very ambitious. Within a year after he started, Leiden had over one thousand plant species. He was especially interested in collecting, studying, and describing plants that he collected in Spain, Portugal, and India.

The design of Leiden emphasized the academic philosophy that botanical gardens are encyclopedias, a place to study plants (Hyams, 1969). The garden was structured in parterres that were further divided into long, narrow beds each known as a “pulvillus”, which in Latin means ‘small cushion’. In general, each pulvillus contained a particular family of plants. They were further divided into sections for different members of a family. Each plant can be touched and smelled from the gravel pathways located between the pulvilli.

Leiden was redesigned in the early nineteenth century. It was replanted as an English landscape garden to conform to the style that dominated Europe. Eventually, experimental botany practices were eliminated. Today, this five-acre botanical oasis is still located in the modern city of Leiden, in the heart of the university.

### The Seventeenth Century: The Colonization Period

In the sixteenth century, botanical gardens were spiritual connections to gardening and the study of plant materials for medical purposes. The decline of physic, or medicinal, gardens occurred concurrently with the colonial expansion of the late sixteenth and seventeenth centuries. The focus of botanical gardens in the seventeenth century was redirected towards the collection of plant materials from around the world and the study of plants for other human uses and for climate appropriateness to a region. During this time, England, Spain, and Portugal were all conducting explorations to the New World concurrently with developing new botanical gardens.

Charles Darwin, Joseph Hooker, Robert Brown, and Sir Joseph Banks were among those individuals who conducted many of Britain's early explorations in the seventeenth century through the support of institutions such as the Royal Botanic Gardens of Kew (Davenport, 1995). Plants were primarily obtained for food, medicine, timber, and dyes. Many came to be widely used such as tea, chocolate, citrus, palm products, stimulants, tranquilizers, oils, and a variety of fibers. These discoveries were linked to the growing interest in gathering plants for economic gain in commerce and trade.

Plants were not only collected during this time for economic gain, but also to continue the study for usefulness to humans in terms of food and medicine. Emphasis on botanical connections to medicines through herbal extracts of herbs reinforced the existing strong link between medicine, healing, and botany. For instance, apart from the Chelsea Physic Garden at Oxford University, which was founded by the Worshipful Society of Apothecaries, botanical gardens established in Great Britain during the seventeenth century were adjuncts of universities and provided living material for the study of botany relevant to the training of physicians (Ballard, 1983).

The design layout of botanical gardens during the seventeenth century was greatly influenced by exploration and colonization. Before the discovery of America, gardens were divided into four quarters representing the four corners of the world. However, immense growth of botanical gardens followed the discovery of the New World, which

had an effect on the layout of the gardens. The gardens were still divided into four sections, yet they now represented the four regions: Asia, North America, Africa, and Europe (Prest, 1981).

During the seventeenth century, botanists began classifying the many new plant introductions on a systematic basis. Carl Linnaeus introduced a plant classification system based upon individual plant characteristics such as stamens and pistil (Davenport, 1995). This system was first written in *Genera Plantarum* in 1737, and continues to be used throughout the world today. The classification and study of plants in botanical gardens was significantly extended when plants were brought into cultivation from different parts of the world by travelers, explorers, botanists, and the colonies of European powers (Heywood, 1990). Botanical gardens also began to exchange plant materials among themselves, providing even more variety in plant materials at individual botanical gardens. Two excellent examples of how botanical gardens classified and exhibited new plant materials can be seen at the Oxford Physic Garden and the Jardin du Roi in France. These gardens are discussed in the following sections.

#### *Oxford Physic Garden, Oxford, England*

Hortus Botanicus of Oxford University, eventually named the Oxford Physic Garden, was founded in 1621, and became the first botanical garden in Great Britain. The Earl of Danby founded this garden to promote learning about medicine, and as a living museum

for plants from every continent, especially plant species from Europe and the United States. The initial focus of the garden was on plants with medicinal value.

A stone wall surrounds the site that remains today on the eastern side of High Street in Oxford, England, near the Magdalena Bridge. It currently encompasses seven acres. The garden is arranged as a square with a central water feature, further divided into four quarters, representing a formal pattern called a 'char-bagh' pattern. The result is four individual gardens that contain plant representatives from Europe, Asia, Africa, and North America.

#### *Jardin du Roi, France*

Jardin du Roi, also known as Jardin Royal des Plantes Medicinales, was founded in 1626, in Paris, France. It was laid out with two main parterre areas. One was flat with simple rectangular beds; adjacent parterres were traversed by tree-lined allees. A small walled enclosure was the *jardin a tulipes* in which precious bulbs were protected from robbers. The first director was the king's physician. Its total area was eighteen acres and was based on a more scientific collection theory than most other botanical gardens of that time. Plants were placed into habitats, "Grooves and hills, meadow ground, and flat marshie" as described by John Evelyn in his *Elysium Britannicum* (Prest, 1981).

### The Eighteenth and Nineteenth Centuries: Global Expansion and Colonization

Global expansion and colonization of the eighteenth and nineteenth centuries had a profound effect on the development of botanical gardens. More plant material was continually discovered, resulting in more and bigger botanical gardens. In particular, the regions of the world affected by colonization during this period were tropical regions. Botanical gardens in tropical regions such as the Caribbean and the Island of Mauritius were established to grow plants that would eventually be sent back to Europe. Acclimatization gardens were also established in intermediate climates with the misguided intention of adapting tropical plants to the conditions in Europe (Heywood, 1990). Eventually, tropical botanical gardens were established for the introduction, assessment, propagation, and culture of plants that were potentially economically important to the colonial powers. The first botanical garden to be founded in the tropics is the *Jardin des Pamplemousses* (Garden of Grapefruits) in Mauritius, a French island in the Indian Ocean. It was founded in 1735, to provide fresh fruit and vegetables for the settlement and for ships that came to port (Heywood, 1990).

Colonization and expansion from Great Britain occurred later than the rest of Europe; thus, it was during the eighteenth century when botanical gardens in Great Britain had the most growth. This trend continued into the nineteenth century, with a host of plant introductions flooding into Britain from the far corners of the globe. John Claudius Loudon estimated that, by the end of the eighteenth century only 1,400 were native species of the 13,140 cultivated plants in Britain (Ballard, 1983). These gardens were not

associated with universities, but were founded by private botanical and horticultural societies with amateur botanists and horticulturists. These societies were self-financing, occasionally receiving grants from university or national funds. Their aims were to promote the study of botany and the practice of horticulture among middle-class citizens. An example of this type of garden is the most famous garden in England, the Royal Garden at Kew.

*The Royal Garden at Kew, England*

The Royal Garden at Kew is located in Surrey, which is near London, on the Thames River. Princess Augusta founded Kew in 1759, during the reign of George II. After the death of Prince Frederick, she set aside nine acres of the large estate for exotic plant collections and plant explorations, thus facilitating the founding of this famous botanical garden.

Much of Kew's success over the years has been attributed to ambitious individuals that were instrumental in Kew's two, key developmental phases: the earlier desire for scientific collections and, eventually, the desire to attract visitors with a visually pleasing design (Evans, 1999). One of the first landscape gardeners and designers at Kew was Charles Bridgeman, hired by Queen Caroline, wife of George II. Bridgeman is known for his work at the Chiswick House and Gardens of Stowe. He and William Kent developed the "ha-ha", or sunken ditch, which became a very significant design element in English landscapes. His style was integrating curving paths and pockets of cultivated

fields into a very pastoral, natural landscape (Davenport, 1995). Following Bridgeman's work, Lancelot "Capability" Brown was hired by George III to be the Royal Gardener at Kew in 1760.

The subsequent work of three directors at Kew, Sir Joseph Banks (1743-1820, informal director), William Jackson Hooker (1785-1865, formal director), and Joseph Dalton Hooker (1817-1911), cannot be underestimated. These directors encouraged plant introductions into Britain from the far reaches of the expanding British Empire. Thousands of species came under cultivation, as the world's floras became the scientific focal point in the herbarium and library at Kew (Spongberg, 1995).

Sir Joseph Banks transformed Kew into a center for the global transfer of plants through its collectors and links to colonial botanical gardens. In order to establish Kew's superiority over other gardens in Great Britain and abroad, Banks insisted that "as many new plants as possible should make their first appearance at the Royal Gardens" (Desmond, 1995). It was during his time at Kew that seven thousand new plant species were added to the garden's collections. He was also credited with organizing and documenting the plants and contents of the garden. Banks participated in plant collections around the globe; for example, he was a part of the famous voyage *Endeavour* in which Australia and the area known as Botany Bay was discovered.

Today, Kew has the world's largest collection of living plants: 83,000 accessions of approximately 38,000 species, from habitats as diverse as the Amazonian rainforest, mountaintops in Kenya and the tropical waters around coral reefs. In addition to the 6 million preserved specimens of seed-producing plants, Kew houses the world's most comprehensive plant collection (Angel, 1993). Kew currently occupies more than 330 hectares (800 acres) and includes more than 2 hectares of protected glasshouse area. Kew's annual target for additions or replacement of wild-origin plants to the Gardens is 4,000, plus additions of 1,500 accessions of live seed to the World Seed Bank at Wakehurst Place in Sussex. As the collections increase, it is likely that more plants with beneficial properties to humans will be discovered.

## DEVELOPMENT OF BOTANICAL GARDENS IN THE UNITED STATES

Early botanical garden development in the United States paralleled contemporary European gardens, typically acclimatizing and displaying plants brought in by colonists and from other regions of North America. However, North American botanical gardens played minor roles in the history of introduction of plants into the global economy compared to their European counterparts. North America has been relatively poor in agricultural plant genetic resources, but their industrious ability to introduce plant species from other continents for agriculture has been impressive (Heywood, 1990). The development and predominant role of botanical gardens in the United States can be organized into four distinct periods: the Eighteenth Century, the Nineteenth Century, 1900 to World War II, and World War II to the present.

### The Eighteenth Century: The Origin of Botanical Gardens

The development of botanical gardens during the eighteenth century was slow and minimal. Fewer than ten were built and managed by private, wealthy individuals of commerce or medicine. These first botanical gardens were created to serve colonial interests and then abandoned during the War of Independence (Heywood, 1990). It is believed that approximately seven additional gardens were established before the war, however most pre-Revolutionary gardens did not persist after the war.

John Bartram (1699-1777) founded the first botanical garden in North America in 1732 (Lockwood, 1931). It was one of the earliest botanical gardens in the United States to be

established for the purpose of cultivating various natives. It was located on the west bank of the Schuylkill River in then suburban Philadelphia in 1728. Remnants of the garden still exist today. Bartram traveled extensively throughout eastern North America, studying and collecting plants not only for his botanical garden but also for consortiums of plant enthusiasts from England to whom he sent seeds.

*Longwood Gardens, Kennett Square, Pennsylvania*

One of the greatest botanical gardens of the eighteenth century was Longwood Gardens in Kennett Square, Pennsylvania. Still in existence, Longwood is one of the most extensive and well-known gardens in the United States. In the year 1700, William Penn granted land to George Peirce. Peirce's son, Joshua, built a house on the land in 1730, and Joshua's twin grandsons, Joshua and Samuel, started an arboretum on the land which would become Longwood Gardens.

The success of Longwood Gardens is attributed to Pierre du Pont who purchased the arboretum in 1906, saving it from the pressures of timbering at the time. It was du Pont, an industrialist, conservationist, and philanthropist who developed the family chemical business into the famed corporate empire known today. Du Pont's extensive world travels formulated ideas for the gardens, specifically in landscape and architectural design, in addition to the elaborate fountains displayed on the grounds. Today, Longwood Gardens encompasses 1,050 acres, with 20 outdoor gardens and 20 indoor gardens enclosed in over four acres of greenhouse space.

### The Nineteenth Century: Continuous Growth

The nineteenth century was characterized by the slow but steady development of botanical gardens by private individuals in the mid-Atlantic and northeastern states and universities. Botanical gardens, originally established for the cultivation of flowers, trees, and plants, became places of retreat due to the elegance of the layout and floral attractions. On average, during this century, a botanical garden was established every four years.

The nineteenth century saw an emphasis on plant introductions, particularly after independence from England. This practice was promoted by the so-called “botanist kings”, which included Benjamin Franklin, George Washington and Thomas Jefferson. Jefferson is remembered for his often-quoted saying, “The greatest service which can be rendered to any country is to add a useful plant to its culture” (Heywood, 1990, 26). The Federal government requested that the Navy and other official departments send back any plants that they came across in their travels that may be of value for agriculture in the United States. Plants were shipped to government greenhouses and also a botanical garden in Washington DC, founded in 1842, for propagation and distribution of new plant introductions. This institution, referred to as the United States Botanic Garden Conservatory, still exists today.

The wave of horticultural enthusiasm that crossed America in the nineteenth century was noticeably strong in the state of Massachusetts. The “Massachusetts Society for

Promoting Agriculture” was a very active organization, containing many zealous members. Through the efforts of this society, the Harvard Botanic Garden was founded, as was the Emery Arboretum in Cincinnati, Ohio. The Emery Arboretum was purchased and given to the city by Mrs. Thomas Emery as a sanctuary for birds and for an arboretum. The University of Cincinnati still uses it today for environmental study.

Two other notable botanical gardens established during the nineteenth century include the Missouri Botanical Garden in St. Louis, Missouri, and the Arnold Arboretum in Boston, Massachusetts.

*Missouri Botanical Garden, St. Louis, Missouri*

Mr. Henry Shaw's Garden in St. Louis, Missouri, the predecessor of today's Missouri Botanical Garden, was founded in 1859. The garden was the dream of philanthropist Henry Shaw, who wanted to turn his considerable property into a botanical garden. In the 1850's, while visiting the gardens at Chatsworth in England, Shaw was inspired to put his wealth to public purpose. Shaw planned the first public botanical garden in the United States on his country estate. He was inspired by the St. Louis physician and botanist George Engelmann to make his garden not only a display but a scientific institution as well (Hyams, 1969).

Today, the Missouri Botanical Garden boasts one of the largest memberships in the world. The Climatron, a futuristic-looking, geodesic dome structure, has become a

symbol of the garden. The research at the Garden focuses on plant taxonomy, the describing, naming, and classification of plants, and systematics, the scientific discipline that formalizes this study (Bry, 1990). The Garden's scientists are also involved with two major types of botanical work: monographic surveys that involve the study of one particular plant group, and floristic inventories where plants from a specific region are catalogued (Bry, 1990). An extensive herbarium, library, computer resources, laboratories, and graduate training attract thousands of scientists and other researchers annually.

*The Arnold Arboretum, Jamaica Plain, Massachusetts*

In 1872, Harvard College, using funds from the James Arnold Trust and donated farmland from Benjamin Bussey, established the Arnold Arboretum in Jamaica Plain, Massachusetts, just outside of Boston proper. After negotiations with Harvard College and the City of Boston, the city took over ownership of the Arnold Arboretum in 1882, then leased it back to the University for a dollar a year. Shortly after, Frederick Law Olmsted, America's first landscape architect, with the assistance of James Sprague Sargent, the Arboretum's first director, began the landscape design for the arboretum. The Arnold Arboretum remains one of the best-preserved Olmsted landscapes today (Sutton, 1971).

The 265-acre Arnold Arboretum, a National Historic Landmark, displays a wide spectrum of hardy trees, shrubs, and vines from around the world. The plant collections

are grouped together according to plant family for easy comparison along the roads and pathways throughout the grounds. The Arnold Arboretum, with its associated Herbarium, Library and Laboratories, is an outstanding international center for scientific research and education.

### 1900 to World War II

The rate of establishment of botanical gardens during the first half of the twentieth century increased immensely compared to the last two centuries. This was influenced by a variety of political, social, and economic forces (Lighty, 1996). Wealthy donors played a big role in the funding of botanical gardens during this time. This was largely due to tax relief provided to those who contributed to the common good. This philanthropic practice, unique to North America, largely facilitated the increase of botanical gardens (Lighty, 1996). Privately funded public gardens constituted the single largest class of public gardens, although many school and municipal-owned gardens were also the result of philanthropic acts. Nonetheless, ownership of gardens was relatively equal among governments, universities, and individuals.

Another factor that influenced the increase of botanical gardens during the first half of the twentieth century was the development of botanical gardens and conservatories at universities and colleges. These functioned as adjuncts to Botany Departments. Conservatories soon became symbols of cultural maturity and economic competence for American universities and cities.

Most gardens during this period emphasized aesthetics rather than education. This was due to the fact that most were established with funding from private individuals as not-for-profit institutions under tax laws. These individuals were more interested in an aesthetic showcase displaying their wealth rather than incorporating educational components. However, school and government-owned gardens were still designed with an emphasis on teaching and research purposes such as special collections of particular genera.

A few of the many outstanding botanical gardens established during this period are the Huntington Botanical Garden located in San Marino, California, established in 1903, the Brooklyn Botanic Garden located in Brooklyn, New York, established in 1910, and the Fairchild Tropical Garden located in Miami, Florida, established in 1935.

#### World War II to the Present

The growth of botanical gardens increased steadily during the second half of the twentieth century. After World War II, the number of new public gardens increased by five or six per year compared to one or two in the first half of the century. Several factors occurred after World War II that affected the establishment of botanical gardens in the United States. First, the founding of many new colleges increased urbanization, resulting in the loss of open space and biodiversity. Also, Botany Departments at universities moved away from research and maintaining living collections to studying plants out in the field or in the laboratory. This resulted in many universities and land-grant colleges

giving up their botanical gardens and conservatories by mid-century. Thus, the establishment of botanical gardens was generally steady during the majority of this time period although there was a slight increase in the number of government-owned gardens (Lighty, 1996) (see Table 1). Many of the new government-run gardens focused on horticultural and educational programs and not so much on scientific programs. Two well-known gardens that were established during the second half of the twentieth century is the Denver Botanic Garden, established in 1959, and the San Antonio Botanical Gardens, established in 1980.

One factor that affected the establishment of botanical gardens in the United States after World War II was the founding of The American Association of Botanical Gardens and Arboreta (AABGA) in 1940. The Association, first organized as an affiliate to the American Institute of Park Executives, became an independent organization in 1950. The Association's current mission is "to support North American botanical gardens and arboreta in fulfilling their missions to study, display, and conserve living plant collections for public benefit" (AABGA's website). There are currently 430 institutional members involved with AABGA.

Beyond the steady growth rate during this post World War II period, the establishment of botanical gardens greatly increased during the 1990's. In the last decade, an average of eight new gardens is established annually (Lighty, 1996). The southeast and inter-mountain region experienced the most growth due to the increase in population in these

regions. The number of zoological gardens and museum-owned gardens have risen, whereas the number of school-owned, government-owned and privately-owned gardens remained constant (Lighty, 1996).

## BOTANICAL GARDENS TODAY

Changes in politics, commerce, social structure, and the environment significantly influenced the development of botanical gardens over time. For example, during the colonization period of the sixteenth century, collecting plants from around the world for display purposes was the prime focus. More recently, population explosions and environmental degradation have caused a reassessment of these past objectives and shifted the focus towards other developments such as conservation, research, education, and recreational. The following sections discuss the main objectives of today's botanical gardens.

### Plant Conservation

The important role of botanical gardens in plant conservation of threatened species and preservation of biodiversity has been evident for decades. However, it was not until recently that botanical gardens have placed conservation, and in some cases reintroduction of wild plant species, as primary goals. Currently, twenty-nine percent of U.S. native plant species is at risk of extinction (Teese, 1999), a relatively high percentage compared to other nations. In addition, more than ninety percent of the 4,669 endangered U.S. plants are endemic. These species could be lost forever without government intervention (Teese, 1999). According to the International Union for Conservation of Nature and Natural Resources (IUCN), there are about 1,400 botanical gardens and arboreta in the world, visited by over 100 million people annually. Botanical gardens in the United States and throughout the world must continue to play a key role in

the conservation of the threatened plant species because they are ideal locations for plant conservation awareness.

Plant conservation at botanical gardens is accomplished in two primary ways: *in situ* and *ex situ* conservation. *In situ* conservation is performed in the wild through protection of habitats and reserves. Protected areas are an important aspect of plant conservation, allowing natural processes and populations to continue. *Ex situ* conservation is performed outside of natural habitats at botanical gardens. This is similar to being a custodian of a threatened plant. These threatened plants are propagated for possible future reintroduction to the wild. It is becoming critical to reestablish species populations and restore degraded lands in order to maintain diverse landscapes.

*Ex situ* conservation presents troubling conservation issues for botanical gardens. For example, it is important to ensure that accumulating the required genetic diversity for an *ex situ* collection does not further threaten natural populations and diversity (Watson, 1993). A thorough risk assessment is required to determine the long-term effects of reintroduction and collection from the wild. *Ex situ* approaches have other serious implementations such as limited gene pools, potential hybridization among genera, altered growth habits, theft, and expense (Watson, 1993). On the other hand, the benefits of *ex situ* conservation are cultivar-requirement research, propagation, and public education.

## Collections

Historically, botanical gardens constantly expanded their plant collections. Newly-discovered plants were a seemingly endless resource. This was the result of ambitious plant collectors and the drive for new information on plant material in addition to the lack of limits or laws on plant collecting. These collections were composed of a wide variety of individual representatives of different species, but this approach was narrowly taxonomic in nature in relation to the current role of collections at botanical gardens. Lack of accessible land area and funding seldom allow botanical gardens to take such an ambitious plant-collecting approach. Today's collectors have many limitations, such as obtaining special permits, exporting regulations, and limits on the amounts of plant material that can be taken from a population.

Many current plant collections at botanical gardens are more ecosystem and biotic community-based collections. Botanical gardens present the vision of a complex whole ecosystem and how all the pieces fit together. For example, some collections emphasize all plant species that will tolerate the local climatic conditions, whereas others focus on regional collections.

The living collections at a botanical garden are well suited for research in plant anatomy, phytochemistry, embryology, physiology, and plant pathology. Preserved collections and seeds are located in herbaria and seed banks. Seed banks also play an important role in plant conservation. It is important that seed banks make plants available without

damaging natural populations, prevent hybridization when the seeds are in storage, and are not considered a substitute for habitat conservation (Watson, 1993). Furthermore, preservation of a wide variety of genetic diversity in seed banks generally costs less and takes less space than living collections.

### *Display of Collections*

Earlier displays of plant collections at botanical gardens were systemic, demonstrating taxonomic, phylogenetic, economic, and physic purposes (Scheid, 1987). One can still see the organization of these categories in the geometric layout of historic botanical gardens such as Padua and Leiden. Today, displays often demonstrate: 1) principles in ecology (alpine, desert, and aquatic), 2) evolutionary parallelism (succulents), 3) economic uses (education purposes), 4) ethnobotany, 5) taxonomy, 6) economic value of ornamental plants (nursery industry), 7) uses and landscape applications (herbal), 8) historical themes (bible and Shakespeare), and 9) the evolution of a certain plant species. An example of an exciting taxonomic collection is the palm collection at the Fairchild Tropical Garden in Florida. Characteristics of the extensive collection, such as size, trunk characteristics, frond size and shape, fruit, and color, are interpreted for the visitor.

Many botanical gardens have permanent collections and seasonal displays. Some gardens also incorporate their collections as displays for study, evaluation, conservation, and beauty. Display is not an anomaly to collections, but a necessary and basic part of every collection (Scheid, 1987). Botanical gardens constantly make decisions about

which collections should be put on display. Sometimes research collections are kept separate from public displays due to the threatened or endangered status of the plant species. These plants may also be used in educational public displays. In addition, undeveloped areas in botanical gardens were considered off-limits to visitors in the past and slated for future theme gardens when funding became available. Today, many gardens recognize the value of these natural areas as collections, which present interpretive opportunities for nature trails and contextual displays.

### Research and Plant Exploration

The origins of botanical gardens revolved around research into the medicinal value of plant materials. In the early 1980's, the focus of botanical gardens had evolved to the point where only ten percent of 145 gardens surveyed could report that research was primary to their mission (Sacchi, 1991). This decision is not based on the garden's objection for research, but the financial reality of many institutions that seek public funding. This statistic is changing, and research is expected to increase in the future and reflect the increased interest in environmental and urban issues (Watson, 1993).

Currently, there are several forms of research occurring at botanical gardens. These include plant exploration, plant breeding and selection, and urban-related plant research. For example, research may involve plant exploration expeditions searching for plants for the urban landscape, medicines, or other human uses; or woody plant explorations for selection of cultivars with unusual characteristics. For many years, the Orient was a

favorite location for plant explorations because of its similar climate to North America and the high ornamental value of the plants located there. In contrast, where the flora is largely untapped in the tropics. Other current research foci at botanical gardens are ecology, conservation, morphology, propagation, cultural practices and horticultural therapy. In addition, botanical gardens are logical sources of plant material to be used by botanists for the study of plant anatomy and morphology, reproductive biology, physiology, taxonomy, and ecology (Sacchi, 1991).

With the disappearance or merger of many botany departments at universities, botanical gardens may become some of the last institutions with a specialization and knowledge of plants. Botanical gardens may assume responsibility for conducting research, conveying results to the public in the form of displays and newsletters, and for providing inspiration about plants and botany to the public. “A botanical garden with no research at all is little more than a kind of park; with research, such a garden develops a more profound significance to society” (Sacchi, 1991, 35). For instance, the Missouri Botanical Garden takes a very active role in plant research and exploration. It has become one of the world’s leading centers for tropical botanical research (Gibbons, 1990). The Garden has thirty-nine botanists spread throughout the tropics that work with local governments to preserve tracts of rainforest land, search for unique plant life, and send back plant specimens for identification and further study. In addition, the Garden is one of three institutions collecting tropical plants for the National Cancer Institute with hopes of finding new drugs for treatment.

### Education and Outreach

Education and outreach programs at botanical gardens play major roles in meeting the needs of the public, which is essential for continued public support. A botanical garden's educational program typically has three major objectives: 1) to provide information and educational services for interested clientele who seek them out, 2) to reach persons not yet especially concerned about plants or conservation, and 3) to train professionals (Watson, 1993). Educational programs focus on everything from plant conservation, botany, natural history, ethnobotany, to environmental awareness.

Educational programming at botanical gardens can take the form of interpretative signage, walking tours, lectures, volunteer programs, gardening classes, and professional training. Classes offered typically include preschool and school-age, credit and non-credit adult classes, in-service classes for teachers, research lectures, and training programs for landscape professionals and garden staffs. Other forms of educational programs include tours of the grounds and self-paced tours by pamphlet, audio, or reading labels. Labels are very important for fulfillment of the educational goals and can effectively interpret the garden's mission statement. Garden publications, libraries, and research herbariums also contribute to the goals of education for a botanical garden.

### *Children's Gardens*

One form of educational programming at botanical gardens is the development of children's gardens. Children are considered the future caretakers of ecosystems and their

understanding of horticulture and related disciplines is critical not only for their development as adults, but for the overall future of the environmental field. Many botanical gardens are responding to this philosophy and redesigning portions of their grounds as children's gardens that serve as educational centers. Children's gardens are places where children can play, perform science experiments, interact with technology, and discover nature. They contain hands-on displays, interactive exhibits, and special programs in the summer to fit their needs and lifestyle. Geoffrey Rausch, ASLA, a partner in Environmental Planning and Design in Pittsburgh describes the importance of children's gardens. "For years and years gardens were set up for little old ladies in tennis shoes, but it is very important to have diversity. The importance of having children come is that you are building tomorrow's audience" (Mays, 1997).

### *Outreach*

Outreach, sometimes referred to as public service, has become an important function of botanical gardens in the last half of this century. Botanical gardens have become involved with community services such as visiting schools and supporting garden clubs and professional societies. Gardens advocate urban plant aesthetics and care and plant information for homeowners as a form of outreach, in addition to their publications, library, and herbarium. Other enriching forms of community outreach include tree planting programs, community gardening technical assistance, and greenhouse advice.

### Recreation

Botanical gardens provide a variety of recreational opportunities such as pleasure walks, cross-country skiing, picnicking, and family outings. According to one visitor survey taken at the Olbrich Gardens in Madison, Wisconsin, recreation is the number one reason people visit the garden (Proctor, 1996). Botanical gardens are attempting to integrate more with the existing public recreational greenspace, therefore increasing recreational opportunities at the gardens. In addition, botanical gardens also sponsor cultural events, such as concerts and folk fairs that provide much needed publicity for the gardens.

## FUTURE OUTLOOK FOR BOTANICAL GARDENS

Botanical gardens are considered, in general, vital institutions for addressing the issue of increased urbanization, providing a rewarding experience with the natural environment. Many botanical gardens are attempting to offer a more comprehensive view of the local and global significance of biodiversity in the natural world. Botanical gardens and arboreta across the country are actively designing new collections, updating master plans and mission statements, and expanding facilities to better address contemporary issues and serve contemporary audiences (Mays, 1997). In addition, they are developing fewer chemically-dependant, monoculture, taxonomic collections and placing greater emphasis on sustainable and biologically sound collections consistent with local habitat, which emphasizes the need to focus on local biodiversity (Mays, 1997).

Recently, there has been a shift in funding for botanical gardens from public to private sources (Theis, 1996). As a result, attendance and broad appeal are even more crucial for successful operations due to increased costs and reduced financial support. In response, botanical gardens are upgrading facilities to provide better access to public transportation and improved accommodations for the elderly, disabled, and children. Directors of botanical gardens throughout the country are realizing the importance of diversifying the use of their facilities and thereby attracting additional visitors and sources of income in order to survive the changing times. For example, the Directors of two dozen midsize botanical gardens gathered in Orlando, Florida, in January 1999 to discuss strategies for finding new and innovative sources of income for survival. One alternative they

discussed is to promote facilities as interesting places that photographers and other artists could use as sources or backgrounds for their work. Rental of facilities for functions such as weddings, private and public events, and even memorial services provides another source of income (Morin, 1999).

The following pages describe changes that botanical gardens are currently undergoing, and that will most likely continue into the future. These changes include trends in tourism, theme and adventure park development, and the concept of regionalism. These changes are new strategies that create more funding and diversity for botanical gardens, and also higher appeal for a contemporary audience.

### Tourism

The rate in which people are recreating and spending money on vacations could be at an all time high. Therefore, it is important for botanical gardens to build connections with the tourism market, which can result in increased revenue. Botanical gardens want to attract tourists not only from the local community, but also on a statewide or even national level. Some tourism connections could be involvement with state and local tourism councils, convention and visitor bureaus, publicity such as news releases, advertising, posters, travel guides, new resident's packets, and newsletters, and involvement with travel organizations such the American Automobile Association and tour companies.

Collaboration between botanical gardens and other regional attractions such as zoos, museums, nature centers, and historic estates for publicity opportunities may also increase visitation. For example, these institutions can work together at the local and regional level and combine limited funds, thereby increasing the overall tourist market. Creation of a theme, which unifies the participants, often provides a broader, more appealing regional identity. Advertising through area convention and visitor bureaus and working with state highway departments on road sign programs may also encourage visitation at the gardens.

#### Theme & adventure parks

At the present time, we are living in an age of information and technology explosion. Recent trends show that people are becoming more and more attracted to technological and entertainment-based experience (Theis, 1996). The public's appetite for fast, convenient recreation, such as amusement parks and arcades, is growing in contrast to passive recreation experiences such as strolling in the park. Pine and Gilmore (1998, 97) describe this trend as the emerging 'experience economy'. Consumers desire experiences; therefore, more and more businesses are responding by explicitly designing and promoting them. Experience has always been at the heart of the entertainment business (e.g. Disneyland). Botanical gardens have the potential to participate in this experience economy.

According to Theis (1996, 7), there needs to be both passive and active foci at botanical gardens. With a passive recreation focus, the garden experience is ineffable, personal, and inward. With an active focus, the garden experience is user-friendly, entertaining, and outward: focusing upon attracting and entertaining large crowds. The passive recreation focus is difficult to assess in terms of increased attendance and revenues compared to entertainment. This does not necessarily suggest amusement rides and games, but simply giving the public a more interactive and inspiring experience.

Multi-purpose parks, such as Moody Gardens in Galveston, Texas, offer a variety of interactive and inspiring attractions for the public, including jogging trails, animal exhibits, artificial lagoons, a performing-arts theater, a wetlands preserve, a botanical garden, and a visitor's complex. It also offers special facilities for the mentally and physically disabled. The Moody Foundation, a philanthropic organization that founded The Moody Gardens, created a public recreational area adjacent to Galveston's municipal airport that benefits the city, increases tourism on the island, and provides a therapeutic setting for the handicapped.

### Regionalism

Another phenomenon occurring at botanical gardens is the interest in regionalism. The Random House College Dictionary defines regionalism as "devotion to the interests of one's own region". Geographic research has confirmed the validity of 'region' as a unifying theme or identity to which local inhabitants relate. To develop regional pride, it

is necessary to have an appreciation and understanding of that place (Schwetz, 1996). Botanical gardens are celebrating and reappraising our native floras and rediscovering their value to local communities. Regional horticulture can promote a new way of interacting and understanding the processes and materials of the local landscape. By emphasizing an area's unique, natural features, and the importance of being responsive to the region, botanical gardens can enhance a community's relationship with the local environment, therefore becoming a crucial resource of an area. Regional plant collections may also offer important insights into how to manage and treat local landscapes such as scenic recreation areas, neglected urban areas, and designed open space.

An excellent example of regionalism orchestrated at a botanical garden can be seen at The Crosby Arboretum, in Picayune, Mississippi. It promotes the uniqueness of the flora and ecological processes of the region through designed zones of local ecosystems. Landscape Architect Edward Blake, one of the planners of the Arboretum, strives to enhance the public's perception of its own environment. He writes, "We live in a garden called Mississippi. We're preserving, in a scientific and artistic way, the best examples of this garden for future generations. Too many people just take all this for granted" (Johnson, 1991). When visitors get out of their cars and walk toward the Arboretum's center, they view a fire-controlled, pine landscape running parallel to the boundary of the site. It exhibits a fine example of the relationship between human impacts and the natural environment of Mississippi.

The Red Butte Garden and Arboretum in Salt Lake City, Utah, is another example of a botanical garden that focuses on the concept of regionalism. It emphasizes the local region through guided walks, natural history programs and environmental education classes, using the site and natural areas for *in situ* interpretation.

### Historical Interpretation

Many botanical gardens possess historic landscapes of local, if not national, significance. Increased awareness of the cultural value of public gardens has led to new approaches in historic interpretation. Historic interpretation can define changes in landscape aesthetics, scientific research, or public service that occurred over the years at a particular botanical garden. If a botanical garden wants to acknowledge the cultural and landscape history of the site, it must seek the resources needed for historical documentation, combine the historical aspect into the larger mission, and plan accordingly to balance historical interpretation and the ever-changing current displays. Richard Schulhof, Assistant Director, Education and Public Affairs at the Arnold Arboretum of Harvard University says that the greatest challenge in developing interpretive strategies is to effectively convey the cultural significance with the often many-layered history of the botanical garden landscape (Schulhof, 1996). Several gardens are currently exploring new historical interpretation approaches for their grounds. For example, Longwood Gardens opened their “Longwood Heritage Exhibit” that includes photographs, film clips, and a computer reconstruction that follows the evolution of the gardens and historic du Pont house.

### Horticultural Therapy

Many botanical gardens are getting involved with horticultural therapy as either an outreach or on-site program. Horticultural therapy has many benefits for its participants, such as physical exercise, greater awareness of the natural world, opportunities for socializing, and nurturing living things. In the form of outreach, botanical gardens have used horticultural therapy at prisons, places for the mentally ill, hospices and homes for troubled children.

As gardens are validated as true healing institutions, a treasure chest of funding opportunities becomes available. For instance, the Olbrich Gardens in Madison, Wisconsin received funds from several HMO's and medical supply houses to incorporate horticultural therapy programs. At the very least, the ability of gardens to meet the needs of people with disabilities and sensory impairments for quality, passive recreation provides compelling impetus for funding from a variety of health-care related sources (Proctor, 1996).

### Living Museums/Zoological Gardens

Botanical gardens and zoos are experiencing a trend of integrating botanical and zoological displays. For example, botanical gardens are beginning to depict an emphasis on animal interactions in their plant displays, and zoos are now including a horticultural component in their animal displays (Telewski, 1997). These institutions are sometimes referred to as living museums or zoological gardens. They contain recreational,

educational, and aesthetic facilities with both zoological and botanical exhibits that display the relationships among different living things, thereby teaching the public about issues of biodiversity.

One example of a living museum is at the Arizona-Sonoran Desert Museum in Tucson, Arizona. The exhibit called "Hummingbirds of the Sonoran Desert Region" is enclosed by fencing, enabling the visitor to observe closely the natural interactions between plants and birds. Other examples of living museums are the Butterfly Pavilion and Insect Center in Westminster, Colorado, and ZooMontana in Billings, Montana. The Butterfly Pavilion and Insect Center is a 7,200 square foot, tropical conservatory, filled with over 1,200 live exotic butterflies. The plant collection in the conservatory was completely designed with the butterflies and visitors in mind. ZooMontana specializes in plant and animal species from northern latitudes or temperate zones. Animal exhibits emphasize geographical and ecological relationships, and each provides botanical display areas for plant species native to the particular areas in which the animals evolved.

## PLANNING AT BOTANICAL GARDENS

In the last few years, the rate of botanical garden and arboreta establishment has increased, and continued growth is anticipated in the near future (AABGA, 1999). Therefore, effective planning and organizational efforts are necessary to ensure the permanence of these new institutions. Planning of new, as well as existing, botanical gardens is a complex, multi-faceted process. The most common planning challenge for botanical gardens is balancing visitation increases with few resources. Three planning methods commonly utilized by botanical gardens are strategic planning, interpretive planning, and master planning. Other forms of planning include the acquisition and acclimatization of plant materials and the addition of temporary/permanent greenhouses. The following sections describe the three most-common planning methods mentioned above, in addition to sections about the function of mission statements and the importance of planning teams for botanical gardens.

### Strategic Planning

Strategic planning is a process with a relatively short history (Worssam, 1997). Post World War II American corporations coined the phrase strategic planning to describe corporate planning (LeFevre, 1999). Strategic planning evaluates past and present activities, establishes the future mission, develops goals and programs, forms a management and financial strategy, and produces the overriding framework for the master plan. It involves dealing with issues of timing and organizational framework, funding sources and fund-raising tactics. For botanical gardens, strategic planning can

set meaningful goals and objectives for many aspects such as collections and displays, the education program, the research program, revenues, and administrative processes.

Traditionally, strategic planning is performed prior to master planning because it determines the goals and objectives of the garden first and then determines what is financially feasible. Garden initiatives are defined during strategic planning; so misallocated funds or wrong initiatives will not misdirect the master planning process. The master plan has importance equal to the strategic plan, yet it is a more effective document when the strategic plan serves as its foundation (Worssam, 1997).

### Interpretive Planning

Interpretive planning embraces the total institution from an educational viewpoint, including the mission, educational goals, and an assessment of current and target audiences (Parman, 1999). The end result is a document that conceptualizes a set of effectual, memorable exhibits and desirable public spaces that motivate and reward visitors of all ages and backgrounds (Parman, 1999). Interpretive planning involves compiling the information exchange between garden and visitor, determining future interpretive goals, and inventorying the collections to foresee future potential for interpretive opportunities.

### Master Planning

Master planning is the process in which a garden, with a group of consultants, develops a master plan. A master plan is an agreed-upon vision of what a particular botanical garden will physically be, based upon their goals and objectives (Scarfone, 1999). The purpose of the master plan is to guide garden administrators in setting future priorities with regard to the form and layout of the garden. The master plan is forward-looking, comprehensive, and sets the course for the garden's development into the future. Most importantly, the master plan ensures that the botanical garden fulfills its mission statement through its exhibits, programs, and services.

A master plan can be developed not only to create a new botanical garden, but also for renovating existing sites (Polakowski, 1987). It summarizes the strategic and interpretive planning processes into a very effective document, which becomes a crucial planning tool for all botanical gardens. It also develops a spatial arrangement concept that interprets the results of the strategic planning effort (Polakowski, 1987). Master plans can be used for preparation of future programs and budgets, for orientation of new staff and trustees, to substantiate fund-raising requests of potential donors, and to educate the public and government officials about the mission statement and objectives.

The master plan interprets the physical elements of the botanical garden such as infrastructure, plants, pathways, circulation, and special design elements and programming options. It typically includes an illustrative site plan (see Fig. 10) and a

written project manual. The manual contains phasing strategies, project descriptions, design guidelines, preliminary cost estimates, process diagrams, and lists of key recommendations. It also describes current site characteristics such as the natural, cultural, political, environmental, and infrastructure of the site; the thematic organization of the garden; the support facilities and service system; circulation; and visitor facilities and requirements for the plant collections. It contains many maps, tables, illustrations, and plans for design clarity while presenting the botanical garden with a clear vision for the layout of the grounds.

#### Mission Statements

The mission statement for botanical gardens has several functions: it acts as a planning tool, a guide for the management philosophy, a framework for a garden's long-range plan, and assists in formulating exhibit themes. As a planning tool, it is cross-referenced with the planning goals and objectives established in the strategic plan. Mission statements should be developed during the strategic planning phase, and then be incorporated into the master plan.

The mission statement also acts as a management guide for botanical gardens by stating the primary goals and philosophies of the institution. The mission statement establishes an understanding among staff and the Board of Directors as to the direction in which the institution is headed (Polawski, 1987). It presents the garden's philosophy to stakeholders, insuring they are in agreement on direction and presents the organization to

potential funding sources. Agreement on the philosophy is crucial from the beginning before any effort is expended on developing strategies for achieving the goals of the garden.

Lastly, the mission statement guides the development of exhibit themes. The interpretation of the botanical garden's mission statement shapes the physical form of the garden (Polakowski, 1987). The mission statement should drive the interpretive messages of a particular botanical garden. The mission statement may focus on certain messages such as education, conservation, research, and recreation.

### Planning Teams

Planning at botanical gardens should be a participatory process, including the garden Director, individuals from the various departments, the Board of Directors, necessary outside consultants, as well as a variety of community members. Outside consultants are typically Landscape Architects, Architects, Structural, Civil, and Mechanical Engineers, and specialists in interpretation, graphics, and exhibit design. LeFevre (1999, 38) noted that resulting plans become one-dimensional if the planning process is entirely delegated to a single consultant.

Landscape Architects are one of the most common consultants for development of a botanical garden master plan. Scott Mehaffrey, ASLA, staff landscape architect for the Morton Arboretum in Lisle, Illinois, argues that because most Landscape Architects are

generalists, they are uniquely qualified to meet the challenges associated with developing new public gardens and adapting older ones (Mays, 1997). They can visualize the “big picture,” provide overall design, and coordinate specialty consultants if they are needed. Landscape Architects understand the need for a variety of professionals, such as horticulturists, pathologists, administrators, and maintenance personnel, for project planning and the creation of an effective master plan.

## CHAPTER 2

### METHODOLOGY

The primary research goal was to identify factors that contribute to the effective implementation of a botanical garden master plan. Two research methods were applied to identify these factors: (1) a master plan analysis, and (2) surveys with Directors of botanical gardens. Research was conducted prior to the methodology, which included observing master plans for other land uses, reading literature pertaining to master plans, and personal communication that occurred at a botanical garden conference.

The master plan analysis was done prior to conducting the surveys. From the master plan analysis, certain trends were observed which helped in formulating survey questions and drawing conclusions about the successful implementation of a botanical garden master plan. This information was invaluable to obtain before the surveys were conducted.

#### Master Plan Analysis

The master plan analysis was a descriptive analysis of twenty existing master plans. A descriptive analysis is a type of non-experimental quantitative research, which looks at a certain phenomena at one point in time and formulates conclusions in a numerical format. The phenomenon was the master plan currently implemented at the garden, and the numerical conclusions were in the form of tabulated percentages. Through tabulated percentages, similarities and differences were discovered among the twenty master plans.

Twenty master plans from both botanical gardens and arboreta were obtained through the Resource Center of the American Association of Botanical Gardens and Arboreta (AABGA) and by contacting individual gardens for a copy of their master plan. It was important to analyze a variety of master plans. This provided adequate preparation and background information on master plans prior to conducting the surveys of garden directors. Each garden was then contacted to verify that the master plan was indeed their current master plan document, and also was currently implemented at the garden. For the analysis, each master plan was subjected to a series of seventeen questions. Factual information was also collected about each institution such as size, location, governing authority, and type of garden. The information was arranged in a table format (see Appendix A), and a descriptive analysis was performed on the results, which in turn unveiled trends among all the master plans. Results and discussion from the analysis are presented in Chapter Three.

### Surveys

The second part of the research methodology was surveys with Directors of botanical gardens/arboreta. The survey questions focused on how their master plan was currently implemented and utilized at the garden. It was important to include Directors from diverse botanical gardens in regard to location, size, and governing authority, in order to identify similar trends across institutions.

Prior to the survey, a letter or e-mail was sent out to eighty directors of botanical gardens or arboreta to inform them of the research, nature of the survey, and time allotted for the survey. If the institution currently had a master plan, they were subjected to a set of fourteen questions (see Appendix B). If the institution did not have a master plan, they were subjected to a different set of eleven questions (see Appendix C). Fifty Directors were available to participate in the survey. Twenty-eight Directors completed the phone survey, and twenty-two Directors completed the e-mail survey. Sixteen of these institutions did not have a master plan, while thirty-four of these institutions did. The surveys provided information on the development and specific functions of their master plans and also offered an opportunity to tap into the Director's knowledge and expertise about the implementation of master plans.

After the surveys were completed, responses were placed in numerical format (see Appendix D). Contingency tables were constructed with these responses to evaluate any differences among particular institution characteristics. This also allowed trends and relationships to be examined relating to master plan implementation. Characteristics and response categories were assembled so that the number of cells within any contingency table with less than five responses was as small as possible. Data within contingency tables were analyzed using log-likelihood ratio tests (G tests) and the procedure FREQ in SAS (SAS Institute, 1989). Statistical significance was assigned at  $P \leq .01$ . The results and discussion from the surveys are presented in Chapter Three. On the following page

is a summary that summarizes the institutions for which master plan analyses was conducted and/or surveyed.

Sources Contacted Summary			Mode of Contact		
#	Botanical Garden/ Arboretum	Location	Master Plan Analysis	Survey by Phone	Survey by E-mail
1	Adkins Arboretum, The	Ridgely, Maryland			X
2	Alaska Botanical Garden	Anchorage, Alaska	X		
3	Anderson Gardens	Rockford, Illinois			X
4	Arboretum, The; University of Central Florida	Orlando, Florida			X
5	Arboretum at Flagstaff, The	Flagstaff, Arizona		X	
6	Berkshire Botanical Garden	Stockbridge, Massachusetts		X	
7	Betty Ford Alpine Gardens	Vail, Colorado	X	X	
8	Bickelhaupt Arboretum	Clinton, Iowa		X	
9	Botanical Gardens at Asheville, The	Asheville, North Carolina		X	
10	Brooklyn Botanic Garden	Brooklyn, New York		X	
11	Brookside Gardens	Wheaton, Maryland		X	
12	Cedar Valley Arboretum & Botanic Gardens	Waterloo, Iowa		X	
13	Chatham College Arboretum	Pittsburgh, Pennsylvania			X
14	Cheyenne Botanic Garden	Cheyenne, Wyoming		X	
15	Coastal Maine Botanical Garden	Boothbay, Maine			X
16	Crosby Arboretum, The; Mississippi State University	Picayne, Mississippi	X		X
17	Daniel Stowe Botanical Garden	Belmont, North Carolina			X
18	Dawes Arboretum, The	Newark, Ohio			X
19	Descanso Gardens	La Canada Flintridge, CA		X	
20	Desert Botanical Garden	Phoenix, Arizona	X		X
21	Dothan Area Botanical Garden	Dothan, Alabama		X	
22	Dyck Arboretum of the Plains	Hesston, Kansas	X		
23	Fairchild Tropical Gardens	Miami, Florida		X	
24	Florida Botanical Gardens	Largo, Florida			
25	Fort Worth Botanic Garden	Fort Worth, Texas	X	X	
26	Friends of San Luis Obispo Botanic Garden	San Luis Obispo, California			X
27	Fullerton Arboretum, The	Fullerton, California		X	
28	Garven Woodland Gardens	Hot Springs, Arkansas			X
29	Harry P. Leu Gardens	Orlando, Florida		X	
30	Hawaii Tropical Botanical Garden	Papaikou, Hawaii			X
31	Hershey Gardens	Hershey, Pennsylvania	X	X	
32	Holden Arboretum	Kirtland, Ohio	X		X
33	Huntington Botanical Garden	San Marino, California	X		
34	Iowa Arboretum	Madrid, Iowa		X	
35	Kalmia Gardens of Coker College	Hartsville, South Carolina			X

Sources Contact Summary			Mode of Contact		
#	Botanical Garden/ Arboretum	Location	Master Plan Analysis	Survey by Phone	Survey by E-mail
36	Klehm Arboretum & Botanic Garden	Rockford, Illinois			X
37	Lady Bird Johnson Wildflower Center	Austin, Texas		X	
38	Leach Botanical Garden	Portland, Oregon	X		
39	Leila Arboretum	Battle Creek, Michigan	X		
40	McKee Botanical Garden	Vero Beach, Florida		X	
41	Minnesota Landscape Arboretum	Chanhassen, Minnesota	X		
42	Morton Arboretum, The	Lisle, Illinois			X
43	Mount Pisgah Arboretum	Eugene, Oregon	X		
44	Mounts Botanical Garden	West Palm Beach, Florida			X
45	Norfolk Botanical Garden	Norfolk, Virginia		X	
46	North Carolina Botanical Garden	Chapel Hill, North Carolina	X		
47	Olbrich Botanical Garden	Madison, Wisconsin		X	
48	Orland E. White Arboretum	Boyce, Virginia			X
49	Queens Botanical Garden Society, Inc.	Flushing, New York		X	
50	Reeves-Reed Arboretum	Summit, New Jersey			X
51	Rio Grande Botanic Garden	Albuquerque, New Mexico			X
52	Santa Fe Botanical Garden	Santa Fe, New Mexico			X
53	Strybing Arboretum & Botanical Garden	San Francisco, California	X		
54	Tohono Chul Park	Tucson, Arizona	X	X	
55	Tucson Botanical Garden	Tucson, Arizona	X	X	
56	University of California Santa Cruz Arboretum	Santa Cruz, California		X	
57	University of Idaho Arboretum & Botanical Garden	Moscow, Idaho	X		
58	University of Wisconsin Arboretum	Madison, Wisconsin	X	X	
59	Utah Botanical Center	Logan, Utah		X	
60	Van Dusen Botanical Garden	Vancouver, British Columbia			X
61	Western Colorado Botanical Society	Grand Junction, Colorado		X	
62	Wilbur D. May Arboretum	Reno, Nevada	X		

### CHAPTER THREE

This chapter is organized into three major sections. The first section presents the descriptive analysis from the master plan analysis. The second section presents the results and discussion from surveys of fifty Directors from botanical gardens and arboreta. Lastly, the third section in this chapter presents guidelines on successful master plan development and implementation. These guidelines were developed from the results of the master plan analysis, surveys, and personal communication with garden Directors. These guidelines identify recommendations for certain groups and individuals undertaking the development and implementation of a botanical garden master plan.

#### Master Plan Analysis

The master plan analysis was performed on a variety of master plans. The size of the gardens/arboreta ranged from one acre to 3,175 acres. Their year of establishment ranged from 1922 to 1992. The governing authority also varied: Private Nonprofit, College/University, Municipal, and County/Regional. Annual visitation rates varied from 9,710 annually to 700,000. The number of staff varied from one to 310. Some gardens supplied their strategic plans or business plans because they did not have a traditional master plan. Some of the master plans were quite lengthy, with very few graphics; others were short, with almost all graphics. Interestingly, even with such a variety of master plans and institutions, there are certain similarities that appeared among them all. These similarities were enlightening not only for the development of survey questions, but also in the development of guidelines for successful master plan implementation.

*Responses from Master Plan Analysis*

The first question asked for the title of the master plan. There was not much variety in master plan titles. Titles were straightforward, such as “Master Plan Study”. It was unnecessary to study this issue further.

The second question asked when the master plan was developed. The oldest master plan was dated from 1980, while the most recent was dated 1999. Thirty percent of the master plans were developed in the 1980’s, forty percent were developed between 1990 and 1995, and twenty-five percent between 1996 and the present. This result reflects the fact that master plans developed more recently are not necessarily implemented more often at botanical gardens. A survey question was developed to study these issues further.

The third question investigated the length of the master plan. There was a variety in master plan lengths: from six to 111 pages. Thirty percent of the master plans have less than twenty-five pages, thirty percent have less than fifty pages, and forty percent have over fifty pages. The length of the master plan did not correlate with the size of the garden. It was unnecessary to study this issue further.

The fourth question asked about staff involvement in the development of the master plan. Thirty-five percent mentioned staff involvement. However, this may not be representative, as the garden may have involved the staff, but did not mention this in the

master plan. It was necessary to investigate the true representation of this issue.

Therefore, a survey question was developed to help verify this percentage.

The next question examined involvement of the Board of Directors in the development of the master plan. Forty-five percent mentioned Board involvement in the development of the master plan. Once again, this may not be representative, as the garden may have involved the Board, but did not mention this in the master plan. It was necessary to investigate the true representation of this issue. Therefore a survey question was developed to help verify this percentage. It needs to be noted that not all gardens have a Board.

The master plan analysis also examined other individuals or groups involved in the development of the master plan. Other people mentioned were consultants, volunteers, garden groups, Park Bureau, planning committees, and the community at large. A survey question was developed to find out the variety of individuals involved with master plan development. Comparison studies were performed to assess if this had an impact on successful implementation.

The seventh question asked if the institution hired local, or out-of-state, consultants to develop the master plan. Forty-five percent of the institutions hired local consultants, while twenty-five percent hired out-of-state or national consultant firms to assist in developing their master plan. Fifteen percent hired both local and out-of-state firms.

Fifteen did not report on this issue in the master plan. These results are difficult to analyze due to specific conditions at each institution. For example, if a garden were located in a major city, they would be able to local firm to develop their master plan. Many of the firms located in large cities are considered to be national consultant firms. On the other hand, an arboretum located in a rural setting probably would have to hire an out-of-state firm. Also, small gardens probably do not have the financial resources to hire a national firm. A survey question was developed to study this issue further.

There were two questions relating to the institution's mission statement. The first question asked if the mission statement was included in the master plan. Fifty-five percent of the master plans included the mission statement. This percentage was low, since most institutions have a mission statement. A survey question was created to research this issue further. The second question relating to the mission statement investigated if the mission statement was located in the beginning of the document. For the master plans that contain a mission statement, eighty-three percent placed the mission statement in the beginning of the document. This is a high percentage, which was expected; therefore it was unnecessary to study this issue further.

The next two questions asked about the inclusion and description of the institution's interpretive goals and objectives in the master plan. Sixty percent discuss the interpretive goals and objectives of the garden. As a result of this question, different sections of a master plan were researched and analyzed in regard to their function and value. A survey

question was developed to evaluate the inclusion and importance of particular sections in the master plan. Several interpretive strategies were discussed, such as interpretive signage guidelines, landscape interpretive stations, and inclusion of a botany or education chapter in the master plan. It was unnecessary to study this issue further.

The next question investigated the inclusion of design guidelines in the master plan. Seventy percent included design guidelines. As a result of this question, different sections of a master plan were researched and analyzed in regard to their function and value. A survey question was developed to evaluate the importance of particular sections of the master plan.

There were two questions relating to the type of graphics included in the master plan. There is a wide variety of graphics found in master plans, such as sections, maps, perspectives, thumbnail sketches, photos, plans, and details. Twenty percent did not include any graphics. A survey question was developed inquiring about the importance of graphics in the master plan. Another graphic question asked if an illustrative site plan was included in the master plan. Seventy-five percent of the master plans included an illustrative site plan. A survey question was developed inquiring about the importance of graphics and an illustrative site plan in the master plan.

Two questions in the master plan analysis involved researching the inclusion of particular sections within the master plan document. These sections are the mission statement, master plan objectives, site analysis, proposed layout, timeline, and cost estimate. After

review of the literature, it can be concluded that these sections need to be included in the master plan. However, forty-five percent of the master plans did not include the mission statement. Twenty-five percent of the master plans did not include a site analysis. Sixty percent of the master plans did not include a timeline. Forty percent of the master plans did not include a cost estimate. Twenty percent did not include a proposed layout (site plan). Yet, none of the master plans lacked the master plan objectives. A survey question was developed inquiring about the use and importance of these key sections in the master plan. Additional sections were included in the master plan beyond the six key sections mentioned in the last question. Other sections included Land Use Issues, Structural Features, Special Garden Projects, Visitation, Citizen Role, and Plant Sales Management. These sections are solely dependent on the garden's special needs and goals.

The final question in the master plan analysis asked if historical planning efforts were included in the master plan. Forty percent of the master plans describe historical planning efforts at the garden. Even though it is an important section to include in the master plan, this issue was not studied further.

It is important to note the trends that appeared in the above analysis, primarily because all twenty master plans are currently implemented at the respective institutions. These trends could reflect successful characteristics to master plan implementation. For example, seventy percent of the master plans included design guidelines, indicating that it

is an important element in the master plan. These trends aided in the development, first of the following survey questions, and second in the development of guidelines to successful implementation of a botanical garden master plan. These guidelines are presented and discussed later in Chapter Three.

## Surveys

The intent of the surveys was to discover, through comparisons, what characteristics contribute to successful implementation of a botanical garden master plan, and what role the master plan assumes in the planning process. For the purposes of this research, successful master plan implementation is defined as: current use of the master plan; if the institution actually reflects goals stated in the master plan; how often the master plan is updated and reviewed; recognition of the master plan as the institution's most effective planning tool; and the Director's evaluation of the success of their master plan.

Fifty Directors, from diverse institutions, completed the survey for this thesis (see tables in Appendix C and E). Forty-four percent completed the e-mail survey and fifty-six percent performed the survey over the phone. Thirty-four percent of the Directors represented arboretums and sixty-six percent represented botanical gardens. Forty-six percent of the Directors were from institutions located from the eastern United States (east of the Mississippi River) and fifty-four percent were from the western United States. The size of the institutions ranged from one acre to 3,175 acres. The institutions were grouped according to size: one to fifty acres represent a small institution, and over fifty-one acres represents a large institution. Fifty-four percent were obtained from large institutions, fifty-one acres and larger, and forty-six percent were from small institutions. The year of establishment for the institution ranged from 1910 to an anticipated opening of 2003. The governing authority also varied, including Private Nonprofit, College/University, Municipal, and County/Regional. Sixty-six percent were non-profit

institutions. Sixteen percent of the institutions were both a college/university and municipal institution, whereas, only four percent were a county/regional institution. Annual visitation rates varied from 823 to 700,000. Institution visitation was grouped as small (under 25,000 annually), medium (25,001 to 200,000 annually), and large (over 200,000 annually). Forty-two percent had a small visitation rate; thirty-eight percent had a mid-size visitation rate; and twenty percent had a large visitation rate. The number of staff varied from one to 165.

Thirty-four of the fifty institutions surveyed possessed a master plan. Responses varied as to why sixteen institutions did not have a master plan, such as the previous master plan was out-dated, lack of time and money, and the institution was recently established and had not yet prepared a master plan. Comparisons of institution characteristics were performed to see if there were relationships between demographic information and presence or absence of a master plan using log-likelihood ratio tests. However, no relationships were evident. In order to investigate possible relationships between institution responses and successful master plan implementation, the thirty-four Directors with master plans were the prime subjects for discussion of these results.

### Characteristics of Successful Implementation

#### *Master Plan Use*

One of the survey questions that focused on determining successful master plan implementation asked the Directors if they currently use their master plan. Eighty-eight

percent of the institutions that have a master plan use their master plan. Comparisons were performed to investigate if relationships occurred between master plan use and certain demographic information, such as garden size, visitation rate, year of establishment, number of staff, type of institution, location of the institution, and if the survey was performed via e-mail or by phone. There were no significant relationships between master plan use and demographic information except for visitation rate (see Table 1). Generally speaking, master plans are used more if the institution has a large visitation rate. Seventy-four percent responded that they use the master plan predominantly for marketing purposes. Eighty-six percent responded that they use the master plan predominantly for implementation of new gardens.

Table 1. Relationships between master plan use and three factors: annual visitation rate, use of a timeline section, and graphics inclusion (N=34).

Factor	Use of the Master Plan (%)	
	Yes	No
<b>Visitation Rate</b>		
Small	12	0
Medium	35	6
Large	41	6
<b>Timeline Section</b>		
Yes	12	9
No	76	3
<b>Graphic Inclusion</b>		
Yes	71	3
No	18	9

Log-likelihood ration test (G test) indicates a lack of independence between factors compared in Table 1.

*Reflecting Goals stated in the Master Plan*

One of the survey questions asked the director if the institution reflects the goals stated in the master plan. Ninety percent of the Directors stated the layout of the garden reflects their master plan. Comparisons were performed to investigate if relationships occurred between gardens reflecting their master plan and certain demographic information.

There were no relationships between gardens reflecting their master plans and demographic information except for location of the gardens (see Table 2). Generally speaking, it is more likely for an institution in the western United States to have their gardens reflect the master plan than an institution in the eastern United States. It is interesting to note that there was no relationship between the garden reflecting its master plan and the size of the garden or number of staff. One would speculate that if there were more employees and more acreage at the institution, more support would be available to implement the master plan. However, it appears that the reflection of the master plan on the garden layout has no relationship with demographics, and solely depends on the individual institution.

Table 2. Relationships between reflection of garden master plan and two factors: region and involvement of landscape architecture firm in master plan development (N=34).

Factor	Reflection of Garden Master Plan (%)	
	Yes	No
Region*		
East	38	8
West	52	2
Landscape Architecture Firm		
Yes	82	8
No	6	4

Log-likelihood ration test (G test) indicates a lack of independence between factors compared in Table 2.

\*East=East of Mississippi River; West=West of Mississippi River

### *Updating the Master Plan*

One of the survey questions asked the Directors how often they update their master plan; in other words, how often they revise the document. Eighty-three percent of the institutions update their master plan less often than annually and seventeen percent responded by saying they update their master plan on an annual basis.

There were no significant relationships between updating the master plan and demographic information except for source and location of the institution (see Table 3). Interestingly, more Directors surveyed by phone stated that they update their master plans more frequently than Directors that responded to the e-mail survey. Also, institutions in the western United States have a greater tendency to update their master plans annually

than institutions in the eastern United States. Surprisingly, there were no relationships between updating the master plan and size of the institution or number of staff.

Table 3. Relationships between frequency of master plan updates and two factors: region and presence of mission statement in master plan (N=34).

Factor	Frequency of Master Plan Updates (%)	
	Annually	Less Often
Region*		
East	3	52
West	14	31
Mission Statement		
Yes	17	59
No	0	24

Log-likelihood ration test (G test) indicates a lack of independence between factors compared in Table 3.  
\*East=East of Mississippi River; West=West of Mississippi River

### *Reviewing the Master Plan*

One of the survey questions asked the Directors how often they review their master plan; in other words, how often they refer to it. Sixty-six percent of the institutions that have a master plan responded by saying they review the master plan regularly, that is on a weekly to monthly basis.

There were no relationships between reviewing the master plan and demographic information except for source and size of institution (see Table 4). More Directors stated

over the phone that they review their master plans more often than the Directors that responded to the e-mail survey. It was interesting to discover that smaller gardens review their master plan more often than larger ones.

There were relationships between reviewing the master plan on a regular basis and hiring a landscape architecture firm and involving the Board of Directors in master plan development (see Table 4). The master plan may be taken more seriously if the institution hired a landscape architecture firm and involved the Board of Directors in master plan development; therefore, the master plan is reviewed more often.

**Table 4. Relationships between frequency of master plan reviews and four factors: survey source, institution size, involvement of a landscape architecture firm, and Board of Directors involvement in master plan development (N=34).**

Factor	Frequency of Master Plan Reviews (%)	
	Regular*	Less Often
Survey Source		
Phone	52	15
E-Mail	15	19
Institution Size		
Large	22	26
Small	44	7
Landscape Architecture Firm		
Yes	48	33
No	19	0
Board of Directors		
Yes	56	33
No	11	0

Log-likelihood ration test (G test) indicates a lack of independence between factors compared in Table 4.

\*Regular Review = weekly or monthly.

#### *Master Plan as the Most Effective Planning Tool*

One of the survey questions asked the Directors if they felt the master plan was their most effective planning tool. Forty-eight percent replied that the master plan is their most effective planning tool. Fifty-two percent replied that the strategic plan is their most effective planning tool. These percentages are based on all fifty Directors surveyed, including institutions without master plans. Seventy-one percent of institutions with master plans responded that the master plan was their most effective planning tool. There

were no relationships between the perception of the master plan as the most effective planning tool and demographic information.

There were relationships between the master plan perceived as the institution's most effective planning tool with community involvement in the development of the master plan and including a site analysis section, an illustrative site plan, graphics, and a mission statement in the master plan (see Table 5). If the community is involved and the master plan contains certain key sections, the master plan is perceived as a more effective planning tool; therefore, potentially used more often.

Table 5. Relationships between the master plan perception as most effective planning tool and five factors: community involvement, and inclusion of site analysis section, illustrative site plan, graphics, and mission statement in master plan (N=34).

Factor	Master Plan Perception As Most Effective Planning Tool (%)	
	Yes	No
<b>Community Involvement</b>		
Yes	54	12
No	14	20
<b>Site Analysis</b>		
Yes	38	10
No	30	22
<b>Illustrative Site Plan</b>		
Yes	66	18
No	4	14
<b>Graphics</b>		
Yes	62	20
No	6	12
<b>Mission Statement</b>		
Yes	64	20
No	4	12

Log-likelihood ration test (G test) indicates a lack of independence between factors compared in Table 5.

### *Personal Reflection of Success*

Another survey question asked the Directors if they feel their master plan is successful. Ninety-six percent of the institutions that have a master plan responded by saying their master plan is successful. However, relationships were difficult to investigate because

only two of thirty-four institutions with a master plan felt their master plan was unsuccessful.

**Table 6. Relationships between perception of a successful master plan and three factors: Community involvement, and inclusion of graphics and mission statement in the master plan (N=34).**

Factor	Perception of a Successful Master Plan (%)	
	Yes	No
<b>Community Involvement</b>		
Yes	66	0
No	30	4
<b>Graphics Inclusion</b>		
Yes	82	0
No	14	4
<b>Mission Statement Inclusion</b>		
Yes	84	0
No	12	4

Log-likelihood ration test (G test) indicates a lack of independence between factors compared in Table 6.

### Institution Characteristics and their Relationship to the Research

After performing certain comparisons on the hypothesized factors of successful master plan implementation, comparisons were also performed between success factors and the following hypotheses to determine if certain relationships emerged.

#### *Landscape Architects*

**Involvement of an outside landscape architect improves the quality of the master plan; therefore, increasing its use.**

One of the survey questions asked the Directors if they hired a landscape architecture firm to develop their master plan. Eighty-eight percent hired landscape architecture firms to develop their master plan. Sixty-eight were nationally renowned firms. There was no relationship between use of the master plan and hiring a landscape architecture firm to develop the master plan. There was a significant relationship between hiring a landscape architecture firm and how often the institution reviews the master plan (see Table 4).

Generally speaking, institutions that hired a landscape architecture firm to develop their master plan reviewed their master plan more often on a regular basis. There was also a relationship between hiring a landscape architecture firm and the layout of the institutions grounds reflecting the master plan (see Table 2). Directors of institutions that hired a landscape architecture firm stated that their grounds reflected their master plan.

Another survey question asked the Directors if the landscape architecture firm was a nationally renowned firm, or was located within the community. There was no relationship between with this question and factors of successful master plan implementation.

### *Staff, Board, and Community Involvement*

**Including staff, Board members, and the community, with a variety of skills and abilities, in the development of the master plan increases its effectiveness and its development.**

Three of the survey questions asked the Directors if they involved the staff, Board of Directors, and community in the development of their master plan. Eighty-eight percent involved staff in the development of their master plan; ninety-two percent involved the Board of Directors; and sixty-six percent involved the community. There was not a relationship between involvement of the three groups and use of the master plan.

However, there was a relationship between involvement of the Board of Directors and how often the master plan is reviewed (see Table 4). If the Board of Directors was involved in the development of the master plan, the institution reviews the master plan more regularly. There was also a relationship between community involvement and the institution stating the master plan is their most effective planning tool and reflection of master plan success (see Table 5 and Table 6). If the community was involved, the institution felt their master plan was their most effective planning tool. The Directors

also felt their master plan was successful if the community was involved in the development of the master plan.

### *Key Sections and Graphics*

**The use of the master plan increases when the project manual contains key sections and strong, concise graphics.**

Several of the survey questions asked the Directors what sections they refer to the most in the master plan (site analysis section, timeline section, cost estimation section, and an illustrative site plan), and also their perception on graphic inclusion in the master plan. Forty-eight percent of the institutions predominantly use the timeline section; thirty-two percent predominantly use the cost estimation section, forty-eight percent predominantly use the site analysis section, and eighty-four percent predominantly use the illustrative site plan. Eighty-two percent felt graphics are important to include in the master plan.

There was a relationship between the timeline section and use of the master plan (see Table 1). If the master plan is used at the institution, the timeline section was generally not an important section to include. There were also relationships between the Director stating that the master plan is the most effective planning tool and the inclusion of a site analysis section and illustrative plan in the master plan (see Table 5). If the Director stated that the master plan is the most effective planning tool, the site analysis and illustrative site plan were important to include in the master plan.

There were several survey questions that focused on the sections of the master plan relating to specific uses, such as marketing, implementation of future gardens, and program development (see Tables 7 through Table 10). Generally speaking, it was found that it is important to include a site analysis section and a timeline section if the master plan was used for marketing and implementation of future gardens, but not for program development. In addition, an illustrative site plan is important if the master plan is used for marketing and implementation of future gardens. Lastly, it is important to include a cost estimate section if the master plan is used for marketing and program development.

Table 7. Relationships between inclusion of site analysis section in master plan and three uses: marketing, implementation of future gardens, and program development (N=34).

Use	Inclusion of Site Analysis Section (%)	
	Yes	No
<b>Marketing</b>		
Yes	46	28
No	2	24
<b>Implementation of Future Gardens</b>		
Yes	46	40
No	2	12
<b>Program Development</b>		
Yes	38	20
No	10	42

Log-likelihood ration test (G test) indicates a lack of independence between factors compared in Table 7.

**Table 8. Relationships between inclusion of timeline section in master plan and three uses: marketing, implementation of future gardens, and program development (N=34).**

Use	Inclusion of Timeline Section (%)	
	Yes	No
<b>Marketing</b>		
Yes	42	32
No	4	22
<b>Implementation of Future Gardens</b>		
Yes	44	42
No	2	12
<b>Program Development</b>		
Yes	40	8
No	6	46

Log-likelihood ration test (G test) indicates a lack of independence between factors compared in Table 8.

**Table 9. Relationships between inclusion of illustrative site plan in master plan and two uses: Marketing and implementation of future gardens (N=34).**

Use	Inclusion of Illustrative Site Plan (%)	
	Yes	No
<b>Marketing</b>		
Yes	72	2
No	12	14
<b>Implementation of Future Gardens</b>		
Yes	76	10
No	8	6

Log-likelihood ration test (G test) indicates a lack of independence between factors compared in Table 9.

Table 10. Relationships between inclusion of cost estimate in master plan and two uses: marketing and implementation of future gardens (N=34).

Use	Inclusion of Cost Estimate (%)	
	Yes	No
Marketing		
Yes	58	2
No	10	14
Implementation of Future Gardens		
Yes	16	8
No	16	24

Log-likelihood ratio test (G test) indicates a lack of independence between factors compared in Table 10.

### *Mission Statements*

**If a mission statement exists and is present in the master plan, the master plan will be more successful.**

Two of the survey questions asked the Directors if they included the mission statement in the master plan and if they felt this impacted the quality of the master plan. One hundred percent of the institutions surveyed have a mission statement. Eighty-two percent included the mission statement in the master plan. Seventy-seven percent of the Directors felt that including the mission statement in the master plan was very important, and impacted its quality. There were relationships among mission statement inclusion and certain factors of successful master plan implementation. If the master plan included

the mission statement, the master plan was updated less often than annually (see Table 3). If the Directors stated that the master plan was their most effective planning tool, the mission statement was included in the master plan (see Table 5). And also, if the Directors felt their master plan was successful, the mission statement was included in the master plan (see Table 6). In addition, seventy-seven percent of the Directors that stated it was very important to include the mission statement in the master plan felt their master plan was successful and was their most important planning tool.

### Guidelines for the Development and Implementation of a Botanical Garden Master Plan

These guidelines present recommendations for certain groups and individuals undertaking the development and implementation of a botanical garden master plan. These guidelines are supported by research on the topic, the master plan analysis, conversation with Directors of botanical gardens and arboreta, and results from specific research comparisons. Evidence is shown that certain demographic characteristics, such as institution size, number of staff, location, annual visitation rate, and year of establishment, do not impact the development and implementation of a botanical garden master plan. In short, every institution appeared to have the capacity to create a successful master plan.

#### *Updating and Reviewing the Master Plan*

Generally speaking, institutions that have a master plan, review it on a by-weekly or monthly basis. Master plans that are reviewed more frequently are perceived by Directors to be more successful. Reviewing the master plan can be done in a variety of ways such as reviewing it at staff and Board meetings. Results indicated that the master plan should not be updated too often, perhaps every five to ten years. A master plan should also not be too rigid, leading to difficult implementation, thus becoming obsolete within a few years. The master plan should be sufficiently flexible so that the garden can respond as needed in the future.

### *Hiring a Landscape Architecture Firm*

It is advisable to hire a landscape architecture firm to develop the master plan rather than develop it internally. Results indicated that institutions that have and use their master plan hired a landscape architecture firm than one that did not hire a firm. If an institution hires a landscape architecture firm, there is a greater tendency that the institution will review the master plan more often and that the layout of the garden reflected the goals stated in the master plan. It was also indicated that the landscape architect helps in master plan implementation and also guiding the institution in following the master plan goals.

It is important to have an outside facilitator in master plan development, allowing staff, Directors, and the community to participate equally. Landscape architecture firms that specialize in master planning will usually cost more than preparing it in-house; however, it appears effective, from the results, to budget money for professionals which can lead to better fund-raising results and garden credibility.

It appears that the landscape architecture firm does not need to be a nationally renowned firm. However, it is advisable to hire a landscape architecture firm that best suits the garden's situation. Institution often will hire a national firm that specializes in master planning and a local firm that understands local conditions. Nonetheless, institutions should be cautious of out-of-state master planners that can create a master plan that has nothing unique to a specific garden situation.

### *Involvement of the Staff, Board of Directors, and Community*

It is important to involve staff, Board of Directors, and community in master plan development. A successful master plan will include perspectives from various individuals. Most institutions that have and use their master plan, included three groups in master plan development. Evidence shows that when an institution includes the Board of Directors in master plan development, the master plan is reviewed more often and is therefore, more successful. It is shown that an institution perceives their master plan as their most effective planning tool and also successful when they include the community in master plan development.

Results implied that staff from all departments, not only department heads, should be involved in master plan development. They should be recognized in the document, preferably in the beginning, if they were involved. This creates stated collaboration for the master plan. Also, the Board of Directors and community needs to be involved for the same reasons as stated above. This formally stated collaboration is especially important for the Board of Directors, since they are involved in contributing to and identifying other funding sources for the institution.

### *Inclusion of Key Sections and Graphics in the Master Plan*

Results indicated that there are certain sections that should be included in the master plan. These are an illustrative site plan, cost estimate, timeline section, site analysis section, and a variety of graphics. An illustrative site plan, with clear, concise graphics, is

important to include if the master plan is to be used for marketing and implementation of future gardens. The site analysis section is also important when the master plan is used for marketing and implementation of future gardens. It helps reflect what the garden used to be and what it will be in the future. Inclusion of graphics such as plans, sections, elevations, and photos are beneficial for the master plan and also important if the master plan is used for marketing. It is difficult to illustrate the garden's goals and objectives without graphics. Generally speaking, institution Directors feel their master plan is a very effective planning tool if an illustrative site plan, site analysis section, and graphics included in the document. The cost estimate and timeline sections are not as critical to include, if used for marketing, as the illustrative site plan; however, the cost estimate helps to maintain the garden budget and the timeline or phasing strategies is important for prioritizing projects.

Master plans should also integrate guidelines on interpretive and educational if the master plan is used for program development. In addition, master plans should include circulation plans, potential for future expansion, utilities, infrastructure, parking, and themes. Design guidelines are also essential for a master plan. They ensure that the botanical garden fulfills its mission through its exhibits, programs, and services through the proposed site layout.

### *Mission Statements*

Almost all institutions have a mission statement and most include it in the master plan.

Results indicated that it is important to include the mission statement in the beginning of the document, especially if the master plan is to be used for marketing purposes.

Therefore, the mission and related goals of the institution are clearly evident to potential donors. Mission statements also help the institution stay focused on their particular goals and objectives. For example, it is shown that institutions do not need to update their master plan as often if the mission statement is included in the master plan.

Institutions also perceive their master plan as successful and an effective planning tool, if the mission statement is included.

### Other Master Plan Considerations

The following master plan considerations were developed through both informal conversations with Directors during the phone survey and also through detailed information from the e-mail responses:

#### *Need for an Industry Standard*

There are a wide variety of master plans, from master plans that are quite lengthy with many graphics to master plans that are very short with no graphics. Possibly, there needs to be an industry standard. However, having standardized master plans may give the garden less control of the function of its master plan. Different master plan strategies work for different botanical gardens.

### *Budget*

Make sure the master plan is in correspondence with how much money will be available for implementation. Budget does buy more consultants but it does not buy ideas, purpose, or commitment. A particular institution may not need a lot of money, but it needs the motivation to develop the garden.

### *Potential Constraints on Master Plan Development*

There are many potential constraints on master plan development: time, budget, site, politics, historical issues, topography, and zoning ordinances are only a few. In addition, the institution should know what they want before the Request for Proposal goes out. In that way, a consultant cannot dictate the needs of the institution. Also, master plan development can be difficult when there are separate governing authorities. For example, when the County government manages a garden, but the programs are developed by a non-profit organization. Another constraint may emerge when there are changes in Trustees or Director. The institution may be forced to go back and review what had been done to date, and in some case, start over. Small staff numbers can also make master plan development difficult due to limited resources. Lastly, one Director suggested visiting other institutions to share and compare master plan experiences in order to minimize potential constraints on master plan development and implementation.

### *Director's Interpretation of Master Plan Success*

Most Directors feel their master plan is successful. One Director stated that the master plan helped in the recruitment of their Development Director. Another Director described how the master plan effectively guided fund raising and development at the institution. Particular master plans were described as visionary, but attainable, practical, suitable, usable, generators of ideas, and guidance for future development. Lastly, one Director described the master plans as an effective communication device; it assisted in communicating the mission to constituents outside of the institution.

### *Other Potential Uses for the Master Plan*

Most institutions that have a master plan, will indeed use it. Dominant uses include: marketing, implementation of future gardens, and program development. However, some Directors stated that they use their master plan for more than the functions described in this study. Other uses included: membership development, explanation of vision to the Board of Directors and Staff, presentation of design guidelines for the institution, and as a tool at their fall retreat.

## CHAPTER FOUR

### CONCLUSIONS

The two research methodologies used for this thesis successfully addressed the research goals and objectives by focusing on certain factors of successful master plan implementation and the four hypotheses that helped define certain characteristics of successful implementation.

It was shown through the master plan analysis and surveys, that involvement of a landscape architecture firm increases the amount of master plan review and promotes an accurate reflection of the master plan in the garden. This leads to increased master plan use. It was also shown that including the Board of Directors in the development of the master plan increases the amount of master plan review, therefore increasing its use. Results indicated that if the community was involved in the development of the master plan, the Director's had a perspective that their master plan was successful and also that it was the institution's most effective planning tool. This can potentially increase master plan implementation. Results also showed that master plan implementation increases when it contains key sections and graphics, and that these key sections impact specific functions of the master plan. It was also indicated that if a mission statement is present in the master plan, the Director had a perspective that their master plan was successful and would be the institution's most effective planning tool.

There are many interesting results from the comparisons that aided in the development of factors of successful master plan implementation. However, the comparisons performed with the demographic information, such as size of the institution, year of establishment, number of staff, and annual visitation rate, did not show any significant relationships with master plan implementation. Therefore, one can speculate that successful master plan implementation depends solely on the individual institution.

Interestingly, seen through the results of this thesis that if an institution has a master plan, their annual visitation rate, number of staff, and program development increases. It was also shown that institutions without a master plan are experiencing increases in visitation, staff, and programs. However, the growth of botanical gardens in the United States in the last decade is certainly increasing; therefore, experiencing increases in visitation, staff, and programs will occur with or without a master plan.

### Research Limitations

Research limitations and successes are manifested for every thesis. As mentioned above, several research goals and objectives were successfully achieved. However, there were several research limitations. First of all, budget information was not available for several botanical gardens and arboreta and therefore could not be included in the research. The budget would have been a good factor to analyze in relation to master plan implementation. For example, if a particular garden has a very high budget for the development of their master plan, implementation of the master plan may have been more

successful. Another limitation was the lack of written information on master plans, specifically for botanical gardens and arboreta. Research material was gathered from a few articles on the subject, the use of existing master plans, and through the expertise of directors that were interviewed. Information on the history of master plan use was unavailable. That deficiency made the research very challenging; however, it also validated the need for this kind of research.

Another limitation was the need to survey more Directors. More than half of the Directors surveyed did have a master plan. Lacking a larger percentage of Directors without a master plan made it difficult to isolate the characteristics that affect the use of the master plan. The information obtained from Directors without a master plan was helpful in the overall descriptive analysis of institutions. Their survey responses could not be used in most comparisons. Lastly, defining “use” of master plans was difficult. The gathered survey responses from Directors of botanical gardens and arboreta could be opinionated, based upon individual perception of what “use” is.

#### Potential Future Research

There are several possibilities for further research on this topic. First of all, one research possibility can focus on the actual process of implementing and developing the master plan at the institution. The process can be analyzed how to involve the staff, Board, and community in master plan development; raising funds to implement individual gardens; and use of the master plan for different functions. Another potential research topic is to

survey landscape architects to analyze how they develop master plans and work with the institution in the development of the master plan. Lastly, potential research can look at the institution mission statement and its role in the master plan. However, despite the possibilities for further research, one of the greatest sources of information for individual institutions is other institutions. Collaboration is needed among institutions to share experiences of master plan development and implementation. Collaboration could occur in the form of regional workshops, seminars, and visits to other institutions.

Creating successful master plans is not only the result of particular characteristics discussed in this thesis. It is also contingent on having a key person with a driving force, committed Board members and staff, use of clever approaches for fund-raising, persistence, choosing effective professional consultation, and the ambition to create a useful and creative master plan.

**APPENDIX A  
MASTER PLAN ANALYSIS**

**Master Plan Analysis/  
Descriptive Analysis of 20  
Master Plans**

		Alaska Botanical Garden	Betty Ford Alpine Garden	Pinecote at The Crosby Arboretum, Mississippi State University	Desert Botanical Garden
<b>General Questions</b>					
1	Where is the garden located/region?	Anchorage, Alaska, Pacific Region	Vail, Colorado, Interior West	Picayune, Mississippi, Southeast	Phoenix, Arizona, Interior West
2	What is the size of the garden (acres)?	110	1	64	145
3	Annual Visitation	50,000	105,000	9,710	230,944
4	Governing Authority	Private Nonprofit	Private Nonprofit	College/University	Private Nonprofit
5	# of Staff	3	4	5	74
6	Botanical Garden or Arboretum	Botanical garden	Botanical garden	Arboretum	Botanical garden
7	Open to the Public	1992	1987	1990	1939
8	What kind of garden is it? What are the common design/exhibit themes?	Leisure, research	Display theme gardens with alpine and subalpine plant species	Interpretive center for The Crosby Arboretum depicting the Piney Woods of the Deep South	Sonoran desert and and-land emphasis
<b>Master Plan Analysis</b>					
1	What is the title of the master plan?	Master Plan Study	1999-2000 Business Plan and Budget with Attached Strategic Vision	Pinecote Master Plan, A Guide For Long Range Development	Master Plan for Facilities
2	When was the master plan developed (printing date)?	November 1990	1999	1994	1998
3	What is the length of the master plan?	27 pages	20 pages	34 pages	14 pages, plus appendices
4	Was staff mentioned as being involved in the development of the master plan?	No	No	Yes	No
5	Was the Board mentioned as being involved in the development of the master plan?	No	Yes	Yes	Yes
6	Who else was involved in the development of the master plan?	Consultants, Alaska Botanical Garden Study committee	Volunteers	Consultants	Consultants
7	Were local consultants hired to develop the master plan?	Yes	No	Yes, No	Yes
8	Is there a mission statement included in the master plan?	No	Yes	No	Yes
9	Is the mission statement located in the beginning of the master plan?	No mission statement	Yes	No mission statement	Yes
10	Are the garden's interpretive goals and objectives discussed or illustrated in the master plan?	Yes	Yes	Yes	Yes
11	How are the interpretive goals and objectives described in the master plan?	Interpretive Signage guidelines	It prioritizes programs that support educational mission.	Describes landscape interpretive stations	Descriptions of future interpretive goals
12	Are design guidelines included in the master plan?	Yes	No	No	No, they are programmatic needs
13	What kinds of graphics are included in the master plan?	Maps, sections, perspectives, thumb-nails	No graphics	Plans, photos, perspectives	Plans, sketches, sections
14	Is there an illustrative site plan?	Yes	No	Yes	Yes
15	What are the missing sections of the master plan, according to specific sections discussed in the lit. review (Mission statement, master plan objectives, site analysis, proposed layout, timeline, and cost estimates/budget)?	Mission Statement	Site Analysis, Proposed layout	Mission statement, site analysis, timeline, cost estimate	None
16	What are the additional sections of the master plan, according to specific sections discussed in the lit. review (Mission statement, garden concept/program/master plan guidelines, site analysis, proposed layout, timeline, and cost estimates/budget)?	Land Use Issues	3-5 Year Strategic Vision	Structural Features	Special Garden Projects; Items for Future Study; Site Amenities; Future Exhibits; Master Plan Resources
17	Is there mention of historical planning efforts?	No	No	No	No

**Master Plan Analysis/  
Descriptive Analysis of 20  
Master Plans**

		Dyck Arboretum of the Plains	Fort Worth Botanic Garden	Hershey Gardens	Hobden Arboretum
<b>General Questions</b>					
1	Where is the garden located/region?	Hesston, Kansas, Midwest	Fort Worth, Texas, Southeast	Hershey, Pennsylvania, Mid-Atlantic	Kirtland, Ohio, Midwest
2	What is the size of the garden (acres)?	30	109	23	3,175
3	Annual Visitation	14,200	700,000	45,000	89,000
4	Governing Authority	College/University	Municipal	Private Nonprofit	Private Nonprofit
5	# of Staff	3.5	45	6	57
6	Botanical Garden or Arboretum	Arboretum	Botanical garden	Botanical garden	Arboretum
7	Open to the Public	1981	1934	1937	1950
8	What kind of garden is it? What are the common design/exhibit themes?	Plains and grasslands	Theme gardens, natural wooded areas, expansive vistas	Display garden of seasonal color, rose garden, and butterfly house	Largest arboretum in U.S., plant collections, research, education
<b>Master Plan Analysis</b>					
1	What is the title of the master plan?	Dyck Arboretum of the Plains Master Plan	Fort Worth Botanic Garden: A View of the Future	Hershey Gardens Strategic Plan	Master Plan 2000
2	When was the master plan developed (printing date)?	1983	late 1980's	1999	November 1989
3	What is the length of the master plan?	40 pages	11 pages	6 pages	54 pages
4	Was staff mentioned as being involved in the development of the master plan?	No	No	Yes	Yes
5	Was the Board mentioned as being involved in the development of the master plan?	Yes	No	No	No
6	Who else was involved in the development of the master plan?	Consultants	Consultants	Volunteers	Planning Committee, consultants
7	Were local consultants hired to develop the master plan?	N/A	N/A	No	No
8	Is there a mission statement included in the master plan?	No	Yes	Yes	Yes
9	Is the mission statement located in the beginning of the master plan?	No mission statement	No	Yes	Yes
10	Are the garden's interpretive goals and objectives discussed or illustrated in the master plan?	No	Yes	Yes	Yes
11	How are the interpretive goals and objectives described in the master plan?	N/A	Contains information on Research Institute	Briefly outlined in Strategic Objectives	Education Chapter included
12	Are design guidelines included in the master plan?	No, they are programmatic needs.	Yes	No	Yes
13	What kinds of graphics are included in the master plan?	Sketches, plans, photos, sections	Plans, sections, photos, perspectives	None	Plans, photos
14	Is there an illustrative site plan?	No	Yes	No	Yes
15	What are the missing sections of the master plan, according to specific sections discussed in the lit. review (Mission statement, master plan objectives, site analysis, proposed layout, timeline, and cost estimates/budget)?	Mission statement, timeline, cost estimates	Timeline, cost estimate	Site Analysis, proposed layout, timeline	Cost Estimate
16	What are the additional sections of the master plan, according to specific sections discussed in the lit. review (Mission statement, garden concept/program/master plan guidelines, site analysis, proposed layout, timeline, and cost estimates/budget)?	Statement of Purpose; Concept Development; Policies	Description of existing gardens; description of master plan process	Principles of Hershey Gardens; Strategic Objectives	Visitation; Land Use Plan
17	Is there mention of historical planning efforts?	No	Yes	Yes	No

**Master Plan Analysis/  
Descriptive Analysis of 20  
Master Plans**

		Huntington Botanical Garden	Leach Botanical Garden	Lella Arboretum	Minnesota Landscape Arboretum
<b>General Questions</b>					
1	Where is the garden located/region?	San Marino, California; Pacific	Portland, Oregon; Pacific	Battle Creek, Michigan; Midwest	Chanhassen, Minnesota; Midwest
2	What is the size of the garden (acres)?	207	9	72	930
3	Annual Visitation	460,000	No gates	46,960	222,355
4	Governing Authority	Private Nonprofit	Municipal	Private Nonprofit	College/University
5	# of Staff	310	3	8	110
6	Botanical Garden or Arboretum	Botanical garden	Botanical garden	Arboretum	Arboretum
7	Open to the Public	1928	1963	1922	1958
8	What kind of garden is it? What are the common design/exhibit themes?	Large exotic plant collections and manicured gardens	Small, public botanical park specializing in native plants and maintenance of historical collections	Arboretum with trails and theme planting areas	Display & Demonstration gardens, research, trails
<b>Master Plan Analysis</b>					
1	What is the title of the master plan?	A Clear Vision for the Huntington Botanical Gardens from 1995 to 2020 (There's been updates since this was published.)	Master Plan Goal and Study Scope	Lella Arboretum Concept Master Plan Report	A Plan for the Minnesota Landscape Arboretum
2	When was the master plan developed (printing date)?	1994	No answer	1994	1987
3	What is the length of the master plan?	85 pages	60 pages	26 pages, plus appendices & Update Attachment	84 pages
4	Was staff mentioned as being involved in the development of the master plan?	Yes	No	No	No
5	Was the Board mentioned as being involved in the development of the master plan?	No	No	Yes	No
6	Who else was involved in the development of the master plan?	Overseer Committee	Citizen Advisory Committee, Park Bureau, Consultants	Community, Consultants	N/A
7	Were local consultants hired to develop the master plan?	Yes	Yes	Yes, No	Yes, No
8	Is there a mission statement included in the master plan?	Yes	No	No	No
9	Is the mission statement located in the beginning of the master plan?	Yes	No mission statement	No mission statement	No mission statement
10	Are the garden's interpretive goals and objectives discussed or illustrated in the master plan?	No	No	Yes	No
11	How are the interpretive goals and objectives described in the master plan?	N/A	N/A	Implementation of the site into an education center for botany	N/A
12	Are design guidelines included in the master plan?	Yes	Yes	Yes	Yes
13	What kinds of graphics are included in the master plan?	No graphics	Plans, sketches, photos	Plans	Plans, perspectives, sketches
14	Is there an illustrative site plan?	No	No	Yes	Yes
15	What are the missing sections of the master plan, according to specific sections discussed in the lit. review (Mission statement, master plan objectives, site analysis, proposed layout, timeline, and cost estimates/budget)?	Proposed layout, timeline	Mission statement, cost estimates	Mission Statement, Timeline	Mission statement, timeline, cost estimates
16	What are the additional sections of the master plan according to specific sections discussed in the lit. review (Mission statement, garden concept/program/master plan guidelines, site analysis, proposed layout, timeline, and cost estimates/budget)?	Overall Effects of the Plan, Program Development Plan for The Huntington Botanical Gardens, Organizational Resources, Policies & Procedures, Plant Sales Management	Citizen Role, Building Use Concepts, Botanical Collections, Transit and Parking, Implementation, Land Acquisition, relationship to existing trail system, Management Framework	Concept Master Plan Update	The Relationship between the Collection Policy and the Design of the Arboretum, Interpretation & Signage, Strategies for Coping with Peak Visitor Capacity, Visitor Survey
17	Is there mention of historical planning efforts?	Yes	Yes	No	No

**Master Plan Analysis/  
Descriptive Analysis of 20  
Master Plans**

		<i>The Mount Pisgah Arboretum</i>	<i>North Carolina Botanical Garden</i>	<i>Strybing Arboretum &amp; Botanical Garden</i>	<i>Tohono Chul Park</i>
	<b>General Questions</b>				
1	Where is the garden located/region?	Eugene, Oregon; Pacific	Chapel Hill, North Carolina; Southeast	San Francisco, California, Pacific	Tucson, Arizona; Interior West
2	What is the size of the garden (acres)?	208	600	55	49
3	Annual Visitation	95,000	95,000	500,000	170,000
4	Governing Authority	Private Nonprofit	College/University	Private Nonprofit	Private Nonprofit
5	# of Staff	3.5	25	37	12
6	Botanical Garden or Arboretum	Arboretum	Botanical garden	Botanical garden, Arboretum	Botanical garden
7	Open to the Public	1978	1968	1940	1985
8	What kind of garden is it? What are the common design/exhibit themes?	Arboretum that displays world ecological zones	Natural habitat displays	Urban oasis in Golden Gate Park	Urban desert preserve w/mature trails, demo gardens, and cultural exhibits
	<b>Master Plan Analysis</b>				
1	What is the title of the master plan?	The Mount Pisgah Arboretum Master Plan	North Carolina Botanical Garden Master Plan	A Garden for the 21st Century	Tohono Chul Park Master Plan
2	When was the master plan developed (printing date)?	1993	1992	1995	1998
3	What is the length of the master plan?	79 pages	38 pages	111 pages	14 pages
4	Was staff mentioned as being involved in the development of the master plan?	No	Yes	No	No
5	Was the Board mentioned as being involved in the development of the master plan?	No	Yes	No	No
6	Who else was involved in the development of the master plan?	Friends of Mount Pisgah Arboretum, consultants, Master Planning Committee Members	Consultants	San Francisco Recreation & Parks Commission, Master Plan Steering Committee, Consultants	Master Planning Committee, Master Plan Resources
7	Were local consultants hired to develop the master plan?	Yes	No	Yes	Yes
8	Is there a mission statement included in the master plan?	Yes	Yes	Yes	Yes
9	Is the mission statement located in the beginning of the master plan?	Yes	Yes	Yes	Yes
10	Are the garden's interpretive goals and objectives discussed or illustrated in the master plan?	No and its mentioned in its mission.	Yes	Yes	No, in separate document
11	How are the interpretive goals and objectives described in the master plan?	N/A	Design guidelines for interpretation techniques & signage	Promoting Public Awareness of Plants & the Environment Through Education chapter	N/A
12	Are design guidelines included in the master plan?	Yes	Yes	Yes	Yes
13	What kinds of graphics are included in the master plan?	Plans, sections, photos	Plans, sketches, photos, sections	Photos, plans, sections, details, perspectives	Plans, sections, perspectives
14	Is there an illustrative site plan?	Yes	Yes	Yes	Yes
15	What are the missing sections of the master plan, according to specific sections discussed in the lit. review (Mission statement, master plan objectives, site analysis, proposed layout, timeline, and cost estimates/budget)?	Timeline	Timeline, cost estimates	Timeline	Site Analysis, Timeline
16	What are the additional sections of the master plan, according to specific sections discussed in the lit. review (Mission statement, garden concept/program/master plan guidelines, site analysis, proposed layout, timeline, and cost estimates/budget)?	Arboretum Theme, A Narrative Arrival Sequence	History, The Major Buildings, Nature Trail Exhibits, Infrastructure	Major Architectural, Landscape, and Garden-Wide Design Proposals (Each a separate chapter)	None
17	Is there mention of historical planning efforts?	No	Yes	Yes	No

**Master Plan Analysis/  
Descriptive Analysis of 20  
Master Plans**

		Tucson Botanical Garden	University of Idaho Arboretum & Botanical Garden	University of Wisconsin - Madison Arboretum	Wilbur D. May Arboretum
<b>General Questions</b>					
1	Where is the garden located/region?	Tucson, Arizona; Interior West	Moscow, Idaho; Interior West	Madison, Wisconsin; Midwest	Reno, Nevada; Interior West
2	What is the size of the garden (acres)?	6	63	2991	10
3	Annual Visitation	94,931	No gates	No gates	No gates
4	Governing Authority	Private Nonprofit	College/University	College/University	County/Regional
5	# of Staff	25	2	25	1
6	Botanical Garden or Arboretum	Botanical garden	Botanical garden, Arboretum	Arboretum	Arboretum
7	Open to the Public	1968	1982	1934	1985
8	What kind of garden is it? What are the common design/exhibit themes?	Urban botanical garden with emphasis on education and desert plant life	University arboretum	Emphasis on restoration-related research and education	Emphasis on native plants of the Sierra Nevada/Great Basin region
<b>Master Plan Analysis</b>					
1	What is the title of the master plan?	Strategic Plan Tucson Botanical Garden (No master plan)	Shattuck Arboretum and Botanical Garden	Physical Development Master Plan	Wilbur D. May Arboretum Master Plan 1984
2	When was the master plan developed (printing date)?	1998	1980	1994	1984
3	What is the length of the master plan?	17 pages	86 pages	51 pages, plus appendices	32 pages
4	Was staff mentioned as being involved in the development of the master plan?	Yes	Yes	No	No
5	Was the Board mentioned as being involved in the development of the master plan?	Yes	Yes	No	Yes
6	Who else was involved in the development of the master plan?	N/A	Consultants	Master Plan committee, Consultants	Washoe County Parks Dept., Consultants, Community
7	Were local consultants hired to develop the master plan?	N/A	Yes	No	Yes
8	Is there a mission statement included in the master plan?	Yes	No	No	No
9	Is the mission statement located in the beginning of the master plan?	Yes	No mission statement	No mission statement	No
10	Are the garden's interpretive goals and objectives discussed or illustrated in the master plan?	Yes	Yes	No	No
11	How are the interpretive goals and objectives described in the master plan?	Educational goals are described in the Program Goals chapter.	Included in the Program Planning and Design Directives is the Emphasis on Teaching, Research and Extension section	N/A	N/A
12	Are design guidelines included in the master plan?	No	Yes	Yes	Yes
13	What kinds of graphics are included in the master plan?	None	Plans, sections, perspectives, photos	Plans, photos, details	Plans, sketches,
14	Is there an illustrative site plan?	Yes	Yes	Not the whole site	Yes
15	What are the missing sections of the master plan, according to specific sections discussed in the lit. review (Mission statement, master plan objectives, site analysis, proposed layout, timeline, and cost estimates/budget)?	Site analysis, proposed layout, cost estimate (more like budget goals)	Mission statement	Mission statement, timeline	Mission statement
16	What are the additional sections of the master plan, according to specific sections discussed in the lit. review (Mission statement, garden concept/program/master plan guidelines, site analysis, proposed layout, timeline, and cost estimates/budget)?	Program Goals, Facilities Committee Goals, Finance Committee Goals, Development Goals, Earned Income Gift Shop Goals, Board Members Committee Goals, Staffing Plan Goals, Communication Committee Goals	Certain additional information in appendices: discussion on the planning process	None	Public Input- Questionnaire Results
17	Is there mention of historical planning efforts?	No	Yes	No	Yes

## APPENDIX B

### Interview Questions for Directors with a Master Plan

1. Do you currently use your master plan? What is the dominant use for your master plan: (A) marketing and fund-raising, (B) Implementing future gardens, (C) Program development or (D) other-Please specify.
2. Does the garden reflect your current or previous master plan?
3. Did you hire a landscape architecture firm to prepare your master plan? Were they local or out-of-state? Do you feel this impacted the quality of your master plan?
4. Was staff involved in the development of the master plan? Which staff? How were they involved?
5. Who else was involved in the development of your master plan?
6. What sections in the master plan do you refer to the most? Site analysis? Timeline? Cost estimate? Layout plan?
7. Do you feel the quality of the graphics in your master plan impacts the use of your master plan?
8. How often is the master plan evaluated and/or up-dated? How often is it referred to? Do you have scheduled reviews?
9. Does the garden have a mission statement? Is your mission statement included in your master plan?
10. How important do you feel the mission statement is in the master plan? Why?
11. Do you feel budget influences the quality of the master plan?
12. What is your most effective planning tool? Why?
13. How would you improve your existing master plan?
14. Is your institution growing? How? Visitation? Programs? How many staff work there?

**APPENDIX C**  
**SURVEY RESPONSES:**  
**INSTITUTIONS WITH A MASTER PLAN**

2) yes (1) no (0) numerical value ( ) no answer

<b>Director Interviews with Master Plans</b>		1	2	3	4	5
		What city/state is the garden located in?	What region is the garden located in? (1) Pacific, (2) Interior West, (3) Midwest, (4) Northeast, (5) Mid-Atlantic, (6) Southeast	Arboretum (1) or Botanical Garden (2)	What is the size of the garden (acres)?	Annual Visitation
1	Adkins Arboretum, The	Ridgely, Maryland	5	1	425	6,500
2	Arboretum, The, University of Central Florida	Orlando, Florida	6	1	80	12,000
3	Berkshire Botanical Garden	Stockbridge, MA	4	2	15	11,416
4	Betty Ford Alpine Garden	Vail, Colorado	2	2	1	105,000
5	Cedar Valley Arboretum & Botanic Gardens	Waterloo, Iowa	3	1,2	74	2,000
6	Cheyenne Botanic Garden	Cheyenne, Wyoming	2	2	8	25,000
7	Coastal Maine Botanical Gardens	Boothbay, Maine	4	2	130	
8	Crosby Arboretum, Mississippi State University	Picayune, Mississippi	6	1	1,000	8,630
9	Daniel Stowe Botanical Garden	Belmont, North Carolina	6	2	125	100,000
10	The Dawes Arboretum	Newark, Ohio	5	1	1,149	235,781
11	Desert Botanical Garden	Phoenix, Arizona	2	2	145	230,944
12	Dothan Area Botanical Garden	Dothan, AL	6	2	50	10,000
13	Farrchild Tropical Garden	Miami, Florida	6	2	83	123,497
14	Friends of San Luis Obispo Botanical Garden	San Luis Obispo, CA	1	2	150	3,000
15	Fort Worth Botanic Garden	Fort Worth, Texas	6	2	109	700,000
16	Fullerton Arboretum	Fullerton, California	1	1	26	55,792
17	Garven Woodland Gardens	Hot Springs, AR	6	2	209	823
18	Harry P. Leu Gardens	Orlando, Florida	6	2	50	115,000
19	Hershey Gardens	Hershey, PA	5	2	23	45,000
20	Kleinm Arboretum & Botanic Gardens	Rockford, IL	5	1,2	155	24,924
21	Lady Bird Johnson Wildflower Center	Austin, TX	2	2	43	100,000
22	McKee Botanical Garden (under restoration)	Vero Beach, Florida	6	2	20	
23	Morton Arboretum	Lisle, IL	5	1	1,700	314,217
24	Mounts Botanical Garden	West Palm Beach, Florida	6	2	13	40,000
25	Norfolk Botanical Garden	Norfolk, VA	6	2	155	155,794
26	Olinch Botanical Gardens	Madison, Wisconsin	5	2	37	203,000
27	Orland E. White Arboretum	Boyce, VA	5	1	170	60,500
28	Reeves-Reed Arboretum	Summit, New Jersey	5	1	13	25,000
29	Rio Grande Botanic Garden	Albuquerque, New Mexico	2	2	78	490,528
30	Tohono Chul Park	Tucson, Arizona	2	2	60	200,000
31	Tucson Botanical Garden	Tucson, Arizona	2	2	6	94,931
32	University of Wisconsin Arboretum	Madison, Wisconsin	5	1	2991	(no gates)
33	Utah Botanical Center	Logan, Utah	2	2	100	

2) yes (1) no (0) numerical value (1) no answer

	6	7	8	9	10
<b>Director Interviews with Master Plans</b>	<b>Governing Authority: (4) Nonprofit, (3) College/University, (2) Municipal, (1) County/Regional</b>	<b># of Staff (full and part time)</b>	<b>Demographics (2) Urban: +250,000, (1) Suburban: 250,000-50,000, (0) Rural: -50,000</b>	<b>Open to the Public</b>	<b>Do you currently use your master plan?</b>
Adkins Arboretum, The	4	6	0	1984	2
Arboretum, The, University of Central Florida	3	5	2	1983	2
Berkshire Botanical Garden	4	9	0	1934	2
Betty Ford Alpine Garden	4	4	0	1987	2
Cedar Valley Arboretum & Botanic Gardens	4	3	1	1995	2
Cheyenne Botanic Garden	2	4	1	1997	2
Coastal Maine Botanical Gardens	4	1	0	1995	2
Crosby Arboretum, Mississippi State University	3	5	1	1989	2
Daniel Stowe Botanical Garden	4	24	0	1991	2
The Dawes Arboretum	4	37	1	1929	1
Desert Botanical Garden	4	74	2	1939	2
Dothan Area Botanical Garden	4	3	1	1997	2
Fairchild Tropical Garden	4	70	2	1938	2
Friends of San Luis Obispo Botanical Garden	4	1	2	1996	2
Fort Worth Botanic Garden	2	45	2	1934	1
Fullerton Arboretum	2	15	2	1976	2
Garven Woodland Gardens	3	16	1	1990	2
Harry P. Leu Gardens	2	30	2	1962	2
Hershey Gardens	4	6	1	1937	1
Kiehm Arboretum & Botanic Gardens	4	12	1	1997	2
Lady Bird Johnson Wildflower Center	4	40	1	1982	2
McKee Botanical Garden (under restoration)	4	5	1	1932	2
Morton Arboretum	4	165	1	1922	2
Mounds Botanical Garden	1	7	1	1976	2
Norfolk Botanical Garden	4	42	2	1937	1
Olinch Botanical Gardens	2,4	36	1	1952	2
Orland E. White Arboretum	2	19	0	1982	2
Reeves-Reed Arboretum	4	10	0	1974	2
Rio Grande Botanic Garden	2	14	2	1996	2
Tohono Chul Park	4	12	2	1985	2
Tucson Botanical Garden	4	25	2	1968	2
University of Wisconsin Arboretum	3	25	1	1934	2
Utah Botanical Center	3	12	1	2003	2

2. Yes (1) No (0) Numerical value (1) no answer

		11	12	13	14	15
<b>Director Interviews with Master Plans</b>		What is the dominant use for your master plan: marketing and fundraising?	Implementing future gardens?	Program development?	Other...Please specify.	Does the garden reflect your current or previous master plan?
1	Adams Arboretum, The	2	1	2		2
2	Arboretum, The: University of Central Florida	2	2	1		1
3	Berkshire Botanical Garden	1	2	1		2
4	Betty Ford Alpine Garden	1	1	1		2
5	Cedar Valley Arboretum & Botanic Gardens	2	2	1		2
6	Cheyenne Botanic Garden	2	2	1		2
7	Coastal Maine Botanical Gardens	2	2	2		
8	Crosby Arboretum, Mississippi State University	1	2	1		2
9	Daniel Stowe Botanical Garden	2	2	1		2
10	The Dawes Arboretum					1
11	Desert Botanical Garden	2	1	2		2
12	Dothan Area Botanical Garden	2	2	2		2
13	Fairchild Tropical Garden	1	2	1		2
14	Friends of San Luis Obispo Botanical Garden	2	2	1		2
15	Fort Worth Botanic Garden	1	2	1		1
16	Fullerton Arboretum	1	2	1		2
17	Garven Woodland Gardens	2	1	1		1
18	Harry P. Lou Gardens	2	2	1		
19	Hershey Gardens	1	2	2		1
20	Kiehm Arboretum & Botanic Gardens	2	2	1		2
21	Lady Bird Johnson Wildflower Center	1	1	2		2
22	McKee Botanical Garden (under restoration)	2	1	1		2
23	Morton Arboretum	1	2	1		2
24	Mounts Botanical Garden	2	2	1		2
25	Norfolk Botanical Garden	1	2	1		2
26	Olinch Botanical Gardens	2	2	1		2
27	Orland E. White Arboretum	2	2	1		2
28	Reeves-Reed Arboretum	1	2	1		2
29	Rio Grande Botanic Garden	1	2	2		2
30	Tohono Chul Park	2	2	1		2
31	Tucson Botanical Garden	1	1	1		2
32	University of Wisconsin Arboretum	2	2	1		2
33	Utah Botanical Center	2	2	1		2

(2) yes (1) no (0) numerical value (1) no answer

<b>Director Interviews with Master Plans</b>		16	17	18	19	20
		Did you hire a landscape architecture firm to prepare your master plan?	Was the firm local (1) or national (2)?	Do you feel this decision impacted the quality of your master plan?	Was the staff involved in the development of your master plan?	Was the community involved in the development of your master plan?
1	Adams Arboretum, The	2			2	2
2	Arboretum, The, University of Central Florida	1	1	2	2	1
3	Berkshire Botanical Garden	2	2	2	2	2
4	Betty Ford Alpine Garden	1			2	1
5	Cedar Valley Arboretum & Botanic Gardens	2	2	1	No staff at the time	2
6	Cheyenne Botanic Garden	2	1	2	2	2
7	Coastal Maine Botanical Gardens	2	1,2	2		
8	Crosby Arboretum, Mississippi State University	2	1, 2	2	2	
9	Daniel Stowe Botanical Garden	2	2		2	1
10	The Dawes Arboretum	2	2	2	1	1
11	Desert Botanical Garden	2	1	2	2	1
12	Dothan Area Botanical Garden	2	1	2	2	2
13	Fairchild Tropical Garden	2	1	2	2	1
14	Friends of San Luis Obispo Botanical Garden	2	2	2	Had no staff at the time	1
15	Fort Worth Botanic Garden	2	1	1	2	2
16	Fullerton Arboretum	1			2	1
17	Garven Woodland Gardens	2	2	2	2	2
18	Harry P. Leu Gardens	2	2,1	2	2	2
19	Hershey Gardens	1			2	1
20	Kleinm Arboretum & Botanic Gardens	2	1	2	1	2
21	Lady Bird Johnson Wildflower Center	1	2	2	2	1
22	McKee Botanical Garden (under restoration)	2	2	2	1	1
23	Morton Arboretum	2	2,1	2	2	2
24	Mounts Botanical Garden	2	2	1	2	1
25	Norfolk Botanical Garden	2	2	1	2	2
26	Obrich Botanical Gardens	2	1,2	2	2	1
27	Orland E. White Arboretum	2	1	2	2	1
28	Reeves-Reed Arboretum	2	2	2	2	2
29	Rio Grande Botanic Garden	2	1,2	2	2	2
30	Tohono Chul Park	2	1	2	2	2
31	Tucson Botanical Garden	2	1	1	2	1
32	University of Wisconsin Arboretum	2	1,2	2	2	1
33	Utah Botanical Center	1	2	2	2	2

(2) yes (1) no (0) numerical value (-) no answer

<b>Director Interviews with Master Plans</b>		21	22	23	24	25
		Was the Board involved in the development of your master plan?	Which section do you refer to the most in your master plan: site analysis?	Timeline/Phasing strategies?	Cost Estimate?	Layout plan?
1	Adkins Arboretum, The	2	1	1	1	2
2	Arboretum, The, University of Central Florida	1	2	1	1	2
3	Berkshire Botanical Garden	2	1	1	1	2
4	Betty Ford Alpine Garden	2	1	1	2	1
5	Cedar Valley Arboretum & Botanic Gardens	No Board at the time	1	1	2	2
6	Cheyenne Botanic Garden	2	1	1	2	2
7	Coastal Maine Botanical Gardens	2	2	2	2	2
8	Crosby Arboretum, Mississippi State University		1	1	1	2
9	Daniel Slowe Botanical Garden	2	1	1	1	2
10	The Dawes Arboretum	2				
11	Desert Botanical Garden	2	2	2	2	2
12	Dothan Area Botanical Garden	2	1	1	1	2
13	Farchild Tropical Garden	2	1	1	1	1
14	Friends of San Luis Obispo Botanical Garden	2	2	2	2	2
15	Fort Worth Botanic Garden	2	1	1	1	2
16	Fullerton Arboretum	2	1	1	1	2
17	Garven Woodland Gardens	2	1	1	2	2
18	Harry P. Leu Gardens	1	1	1	2	2
19	Hershey Gardens	2	1	2	1	1
20	Kiehm Arboretum & Botanic Gardens	2	1	1	2	2
21	Lady Bird Johnson Wildflower Center	2	1	1	2	1
22	McKee Botanical Garden (under restoration)	2	1	1	1	2
23	Morton Arboretum	2	1	1	2	2
24	Mounts Botanical Garden	2	1	1	2	2
25	Norfolk Botanical Garden	2	1	2	2	1
26	Olinch Botanical Gardens	2	1	1	1	2
27	Orland E. White Arboretum	2				
28	Reeves-Reed Arboretum	2	2	1	1	1
29	Rio Grande Botanic Garden	2	1	1	1	2
30	Tohono Chul Park	2	1	1	1	2
31	Tucson Botanical Garden	2	1	1	2	1
32	University of Wisconsin Arboretum	1	1	1	2	2
33	Utah Botanical Center	2	1	1	1	2

2= yes, 1= no, 0= numerical value, (-)= no answer

		26	27	28	29	30
<b>Director Interviews with Master Plans</b>		Do you feel the quality of the graphics in your master plan impacts the use of it?	How often is the master plan updated (2- Every 3-20 years, 1- Annually, 0- As Needed)?	How often is the master plan reviewed (2-Monthly, regularly, or Seasonally, 1- Weekly, 0-As Needed)?	Does the garden have a mission statement?	Is the mission statement included in the master plan?
1	Ackens Arboretum, The	2	1		2	2
2	Arboretum, The, University of Central Florida	2			2	2
3	Berkshire Botanical Garden	1	0	2	2	1
4	Betty Ford Alpine Garden	2	0	1	2	2
5	Cedar Valley Arboretum & Botanic Gardens	1	1	2	2	2
6	Cheyenne Botanic Garden	2		1	2	2
7	Coastal Maine Botanical Gardens	2	0	0	2	2
8	Crosby Arboretum, Mississippi State University	2	2		2	2
9	Daniel Stowe Botanical Garden	2	0	1	2	2
10	The Dawes Arboretum	1	0	0	2	1
11	Desert Botanical Garden	2	2	2	2	2
12	Dothan Area Botanical Garden	2	0	1	2	1
13	Fairchild Tropical Garden	1	0	0	2	1
14	Friends of San Luis Obispo Botanical Garden	2			2	2
15	Fort Worth Botanic Garden	2	0	0	2	2
16	Fullerton Arboretum	2	1	2	2	2
17	Garven Woodland Gardens	2	0	0	2	2
18	Harry P. Leu Gardens	2	2	1	2	2
19	Hershey Gardens	1	0	2	2	2
20	Kiehn Arboretum & Botanic Gardens	2	2		2	2
21	Lady Bird Johnson Wildflower Center	2	1	2	2	2
22	McKee Botanical Garden (under restoration)	2	2	2	2	2
23	Morton Arboretum	2	0	1	2	2
24	Mounts Botanical Garden	2	2	0	2	2
25	Norfolk Botanical Garden	1	0	0	2	1
26	Olinch Botanical Gardens	1	0	2	2	2
27	Orland E. White Arboretum	2	2		2	2
28	Reeves-Reed Arboretum	1	2	2	2	1
29	Rio Grande Botanic Garden	2	0	0	2	2
30	Tohono Chul Park	1			2	2
31	Tucson Botanical Garden		0	0	2	2
32	University of Wisconsin Arboretum	2		2	2	1
33	Utah Botanical Center	2	0	1	2	1

2: yes, 1: no, 0: numerical value, -1: no answer

**Director Interviews with Master Plans**

		31	32	33	34	35
		How important do you feel the mission statement is in the master plan? (2-very, 1-somewhat, 0-not at all)	Do you feel budget influences the master plan (2=yes, 1-somewhat, 0-not at all)?	Is the master plan your most effective planning tool?	Is the strategic plan your most effective planning tool?	Are meetings your most effective planning tool?
1	Adkins Arboretum, The	2	2	2	1	1
2	Arboretum, The, University of Central Florida	2	2	2	1	1
3	Berkshire Botanical Garden	1	0	1	1	1
4	Betty Ford Alpine Garden	1	1	1	1	1
5	Cedar Valley Arboretum & Botanic Gardens	2	1	2	1	1
6	Cheyenne Botanic Garden	2	2			
7	Coastal Maine Botanical Gardens	1	1	1	1	2
8	Crosby Arboretum, Mississippi State University	2	1	2	1	1
9	Daniel Stowe Botanical Garden	2	1	1	1	1
10	The Dawes Arboretum	0	1	1	1	2
11	Desert Botanical Garden	2	2	2	2	1
12	Dothan Area Botanical Garden	1	0	2	1	1
13	Fairchild Tropical Garden	1		1	2	1
14	Friends of San Luis Obispo Botanical Garden	2	1	1	1	1
15	Fort Worth Botanic Garden	2	2	2	1	1
16	Fullerton Arboretum			1	1	2
17	Garven Woodland Gardens	2	2	1	1	1
18	Harry P. Leu Gardens	2	2	2	1	1
19	Hershey Gardens		2	1	1	2
20	Kleinm Arboretum & Botanic Gardens	2	1	1	1	1
21	Lady Bird Johnson Wildflower Center	2	2	2	1	1
22	McKee Botanical Garden (under restoration)	2	2	2	1	1
23	Morton Arboretum	2	2	2	1	1
24	Mounds Botanical Garden	2	1			
25	Norfolk Botanical Garden	1	0	1	2	1
26	Obrich Botanical Gardens	2	1	2	1	1
27	Orland E. White Arboretum	2	2			
28	Reeves-Reed Arboretum		2	1	2	1
29	Rio Grande Botanic Garden	2				
30	Tohono Chul Park	2	2	2	2	1
31	Tucson Botanical Garden	2	1	1	2	1
32	University of Wisconsin Arboretum	2	1	1	1	1
33	Utah Botanical Center	2	0	2	1	1

2) yes (1) no (0) numerical value (1) no answer

<b>Director Interviews with Master Plans</b>		36	37	38	39
		Do you feel your master plan is successful?	Is there an increase in visitation?	Is there an increase in staff?	Is there an increase in programs?
1	Adkins Arboretum, The	2	2	2	2
2	Arboretum, The, University of Central Florida	2	2	2	1
3	Berkshire Botanical Garden	2	1	2	2
4	Betty Ford Alpine Garden	2	2	1	2
5	Cedar Valley Arboretum & Botanic Gardens	.	2	2	2
6	Cheyenne Botanic Garden	2	1	2	2
7	Coastal Maine Botanical Gardens	2	2	1	1
8	Crosby Arboretum, Mississippi State University	2	2	2	2
9	Daniel Stowe Botanical Garden	2	2	2	2
10	The Dawes Arboretum	1	2	1	2
11	Desert Botanical Garden	2	1		2
12	Dothan Area Botanical Garden	2	2	1	2
13	Farchild Tropical Garden	1	2	2	2
14	Friends of San Luis Obispo Botanical Garden	2	2		2
15	Fort Worth Botanic Garden	2	1	1	2
16	Fullerton Arboretum	.	2	2	2
17	Garven Woodland Gardens	2		2	2
18	Harry P. Leu Gardens	2			
19	Hershey Gardens		2	2	2
20	Kiehm Arboretum & Botanic Gardens	2	2	2	2
21	Lady Bird Johnson Wildflower Center		1	1	1
22	McKee Botanical Garden (under restoration)	2	2	2	2
23	Morton Arboretum	2	2	2	2
24	Mounds Botanical Garden	2	2	2	2
25	Norfolk Botanical Garden	2	2	1	2
26	Olinch Botanical Gardens	2	2	1	2
27	Orland E. White Arboretum	2	2	2	2
28	Reeves-Reed Arboretum	2	2	2	2
29	Rio Grande Botanic Garden	2	1	1	1
30	Tohono Chul Park	.	2	2	2
31	Tucson Botanical Garden	2	2	2	2
32	University of Wisconsin Arboretum	2	.	2	2
33	Utah Botanical Center	2	.	2	

## APPENDIX D

### Interview Questions for Directors without a Master Plan

1. If you had a master plan would you use it for: (A) marketing and fund-raising. (B) the implementation of future gardens. (C) program development. or (D) other. please specify.
2. What is the main reason why you do not have a master plan?
3. Who would you involve in the development of your master plan? Staff? The Board?
4. Would you hire a landscape architecture firm to develop your master plan? Out-of-state or Local?
5. What is currently your most effective planning tool?
6. Does the garden have a mission statement?
7. Would you include your mission statement is in the master plan?
8. Do you feel budget would influence the quality of the master plan?
9. What constitutes a successful master plan?
10. Do you feel master plans are a waste of time? Why?
11. Have you seen any increases or decreases in your visitation rates in the last year. 5 years. or ten years? How many staff?

**APPENDIX E  
SURVEY RESPONSES:  
INSTITUTIONS WITHOUT A MASTER PLAN**

(2) yes; (1) no; (0) numerical value; (-) no answer

<b>Director Interviews without Master Plans</b>		1	2	3	4	5
		What state is the garden located in?	What region is the garden located in? (1) Pacific, (2) Interior West, (3) Midwest, (4) Northeast, (5) Mid-Atlantic, (6) Southeast	Arboretum (1) or Botanical Garden (2)	What is the size of the garden (acres)?	Annual Visitation
1	Anderson Gardens	Rockford, IL	5	2	5	18,000
2	Arboretum at Flagstaff, The	Flagstaff, Arizona	2	1	200	10871
3	Bickelhaupt Arboretum	Clinton, IA	3	1	14	2500
4	Botanical Gardens at Asheville, The	Asheville, NC	6	2	10	70,000
5	Brooklyn Botanic Garden	Brooklyn, New York	4	2	52	555452
6	Brookside Gardens	Wheaton, MD	5	2	50	300,000
7	Chatham College Arboretum	Pittsburgh, PA	5	1	32	2,500
8	Descanso Gardens	La Canada Flintridge, California	1	2	160	210000
9	Hawaii Tropical Botanical Garden	Papaikou, Hawaii	1	2	42	55000
10	Holden Arboretum	Kirtland, OH	5	1	3175	89,000
11	Iowa Arboretum	Madrid, Iowa	3	1	378	19500
12	Kalma Gardens of Coker College	Hartsville, SC	6	2	30	15,000
13	Queens Botanical Garden Society, Inc.	Flushing, New York	4	2	39	325495
14	Santa Fe Botanical Garden	Santa Fe, NM	2	2	35	1000
15	University of California Santa Cruz Arboretum	Santa Cruz, California	1	1	150	60000
16	Van Dusen Botanical Garden	Vancouver, BC	1	2	55	170000

(2) yes (1) no (0) numerical value (-) no answer

<b>Director Interviews without Master Plans</b>		6	7	8	9	10
		Governing Authority: (4) Nonprofit, (3) College/University, (2) Municipal, (1) County/Regional	Number of Staff (full and part time)	Demographics (2) Urban: +250,000, (1) Suburban: 250,000- 50,000, (0) Rural: - 50,000	Open to the Public	Would you predominantly use a master plan for fund- raising/marketing?
1	Anderson Gardens	4	7	1	1984	2
2	Arboretum at Flagstaff, The	4	11	1	1985	1
3	Bickelhaupt Arboretum	4	2	0	1970	1
4	Botanical Gardens at Asheville, The	4	2	1	1961	1
5	Brooklyn Botanic Garden	4	130	2	1910	2
6	Brookside Gardens	1	26	1	1969	2
7	Chatham College Arboretum	3	4	2	1997	2
8	Descanso Gardens	4	57	2	1954	2
9	Hawaii Tropical Botanical Garden	4	15	0	1984	
10	Holden Arboretum	4	86	1	1950	1
11	Iowa Arboretum	4	5	0	1981	1
12	Kalmia Gardens of Coker College	3	5	0	1935	2
13	Queens Botanical Garden Society, Inc.	4	40	2	1948	1
14	Santa Fe Botanical Garden	4	1	1	1993	2
15	University of California Santa Cruz Arboretum	3	9	1	1963	2
16	Van Dusen Botanical Garden	2	28	2	1975	2

2) yes (1) no (0) numerical value (no answer)

<b>Director Interviews without Master Plans</b>		11	12	13	14	15
		Implementation of future gardens?	Program development?	Other... Please specify.	Is the main reason why the garden does not currently have a master plan because the garden is because your old one is out-dated?	Is the main reason why the garden does not currently have a master plan because the garden is still too young?
1	Anderson Gardens	2	2		1	2
2	Arboretum at Flagstaff, The	1	2		2	1
3	Bickelhaupt Arboretum	2	1		1	1
4	Botanical Gardens at Asheville, The	2	1		1	2
5	Brooklyn Botanic Garden	1	1		2	1
6	Brookside Gardens	2	1		1	1
7	Chatham College Arboretum	2	2	Develop coursework for Landscape Studies program	1	2
8	Descanso Gardens	1	2		2	1
9	Hawaii Tropical Botanical Garden				1	1
10	Holden Arboretum	2	1		2	1
11	Iowa Arboretum	2	1		1	1
12	Kalmia Gardens of Coker College	2	2		1	1
13	Queens Botanical Garden Society, Inc.	2	1		2	1
14	Santa Fe Botanical Garden	2	1	Will help us write our business plan.	1	2
15	University of California Santa Cruz Arboretum	1	1		2	1
16	Van Dusen Botanical Garden	1	1		1	1

(2) yes (1) no (0) numerical value (-) no answer

**Director Interviews without Master Plans**

		15	16	15	16	17
		Is the main reason why the garden does not currently have a master plan because you feel you do not need one?	Is the main reason why the garden does not currently have a master plan because of not enough time and money?	Would you hire a landscape architecture firm to prepare your master plan?	Local (1) or national (2) firm?	Would you involve the staff in the development of your master plan?
1	Anderson Gardens	1	1	2	2	2
2	Arboretum at Flagstaff, The	1	1	2	2	2
3	Bickelhaupt Arboretum	2	1	2	2	1
4	Botanical Gardens at Asheville, The	1	1	1	1	2
5	Brooklyn Botanic Garden	1	1	2	1	2
6	Brookside Gardens	2	1	2	1,2	2
7	Chatham College Arboretum	1	1	2	2	2
8	Descanso Gardens	1	1	2	1	2
9	Hawai Tropical Botanical Garden	2	1	2		2
10	Holden Arboretum	1	1	2		2
11	Iowa Arboretum	1	2	2	2	2
12	Kalma Gardens of Coker College	1	2	2	1	2
13	Queens Botanical Garden Society, Inc.	1	1	2	1	2
14	Santa Fe Botanical Garden	1	1	2	1	2
15	University of California Santa Cruz Arboretum	1	1	2	2	2
16	Van Dusen Botanical Garden	1	2	2	1	2

(2) yes (1) no (0) numerical value (1) no answer

		18	19	20	21	22
<b>Director Interviews without Master Plans</b>		Would you involve the community in the development of your master plan?	Would you involve the Board in the development of your master plan?	Is the strategic plan your most effective planning tool?	Are meetings your most effective planning tool?	What is your most effective planning tool other than the strategic plan & meetings?
1	Anderson Gardens	1	2	1	2	Mission statement
2	Arboretum at Flagstaff, The	2	2	1	2	
3	Bickelhaupt Arboretum	1	2	1	1	No planning done here
4	Botanical Gardens at Asheville, The	1	1	1	1	Ecological Theme Plan
5	Brooklyn Botanic Garden	1	2	1	1	Programmatic Long-Range Plan
6	Brookside Gardens	1	1	2	1	
7	Chatham College Arboretum	1	1	1	1	RFP document
8	Descanso Gardens	1	2	2	1	Mission Plan of Action document
9	Hawaii Tropical Botanical Garden		2	1	1	Ideas of the Founders
10	Holden Arboretum	2	2			
11	Iowa Arboretum	1	2	1	2	
12	Kalmia Gardens of Coler College	2	2	1	2	
13	Queens Botanical Garden Society, Inc.	1	2	2	1	
14	Santa Fe Botanical Garden	1	2	1	2	
15	University of California Santa Cruz Arboretum	2	1	1	2	
16	Van Dusen Botanical Garden	2	2	2	1	3-year business plan

(2) yes, (1) no, (0) numerical value, (-) no answer

<b>Director Interviews without Master Plans</b>		23	24	25	26	27
		Does the garden have a mission statement?	Would the mission statement be included in the master plan?	Do you feel budget influences the quality of the master plan (2-yes, 1- somewhat, 0-not at all)?	Do you feel master plans are a waste of time?	Is there an increase in visitation at the institution?
1	Anderson Gardens	2	2	0	1	2
2	Arboretum at Flagstaff, The	2	2	2	1	2
3	Bickelhaupt Arboretum	1	1	2	1	1
4	Botanical Gardens at Asheville, The	2	2			2
5	Brooklyn Botanic Garden	2	1	0	1	1
6	Brookside Gardens	2	2	1	1	2
7	Chatham College Arboretum	1	2	2	1	2
8	Descanso Gardens	2	2	2	1	2
9	Hawaii Tropical Botanical Garden	2				2
10	Holden Arboretum	2	2	2	1	
11	Iowa Arboretum	2	2	2	1	2
12	Kalima Gardens of Coker College	2	2	1	2	2
13	Queens Botanical Garden Society, Inc.	2	2	0		2
14	Santa Fe Botanical Garden	2	2	2	1	2
15	University of California Santa Cruz Arboretum	2	2	1	1	2
16	Van Dusen Botanical Garden	2	2	1	1	1

(2) yes, (1) no, (0) numerical value, (.) no answer

		28	29
<b>Director Interviews without Master Plans</b>		is there an increase in staff?	is there an increase in programs?
1	Anderson Gardens	1	1
2	Arboretum at Flagstaff, The	2	2
3	Bickelhaupt Arboretum	1	2
4	Botanical Gardens at Asheville, The	1	2
5	Brooklyn Botanic Garden	2	2
6	Brookside Gardens	2	2
7	Chatham College Arboretum	2	2
8	Descanso Gardens	1	2
9	Hawai Tropical Botanical Garden	2	2
10	Holden Arboretum		
11	Iowa Arboretum	2	2
12	Kalma Gardens of Coker College	1	1
13	Queens Botanical Garden Society, Inc.	2	2
14	Santa Fe Botanical Garden	1	2
15	University of California Santa Cruz Arboretum	1	2
16	Van Dusen Botanical Garden	1	2

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