

A close-up photograph of several yellow orchid flowers with brown spots on their petals, set against a blurred green background. The flowers are arranged along a thin brown stem. The petals are bright yellow with distinct brown markings, and the center of the flowers shows a white and yellow structure.

Sex, Lies, & Conservation

the Design of a Botanic Garden Centred on Orchids

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Abstract

Orchid habitat has been destroyed for centuries and as a result many species, some not even discovered yet, have been lost. From the orchid hunters of the 17th and 18th centuries to the deforestation and reckless collection of orchid species today, orchids and their habitats have continued to be at risk. Efforts such as *in situ* conservation, an approach to protecting orchids in their natural habitat, and *ex situ* conservation, the protection and propagation of orchids outside their natural habitat in places such as seed banks, laboratories, herbariums, and botanic gardens, have helped to preserve orchid species all over the world.

This work includes the design of a botanic garden centred on orchids and their conservation. Situated in Ecuador, the garden design incorporates research, education, and conservation in a way that is inspiring and delightful to the visiting public. Orchids are featured in the design of the garden, and the conservation of this plant family is emphasized.

A history of botanic gardens explores the evolution of this specific type of garden, providing a background for modern-day design. Case study analyses of contemporary botanic gardens provides additional information and insight into the changing role of botanic gardens in the 21st century.

This Practicum explores the creation of an educational garden that is also entertaining and challenges the notion of what a botanic garden is today and what it can be in the future.

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Introduction

What is it about orchids that seem to captivate and mesmerize us? What is it about them that have intrigued so many people for so many centuries? Why is the orchid still to this day such a mystifying and obsession-inducing flower? These are some of the questions that I have asked myself over the years as my passion for orchids has grown.

Orchids are mysterious - they seduce, they deceive, they intrigue. An orchid can resemble its pollinator or it can emit the sweetest of fragrances to the most vile of odours in order to attract its pollinator. It seems even orchids have evolved and adapted to attract humans. Today, orchids are a multi-billion dollar industry and people travel around the world, hiking deep into jungles to see them in their natural habitat. The uniqueness and beauty of an orchid and its ability to seduce may just be the thing that saves it.

Before starting the Master of Landscape Architecture program in September 2006 I was presented with an opportunity to travel to Ecuador to work with orchids and learn about their propagation and culture. Ecuagenera, an orchid growing company that promotes the conservation and protection of Andean orchid species, was founded in 1991 by two brothers – Mario Portilla and José Portilla (widely known as Pepe). The business grew out of a love for orchids and their conservation. Fifty years prior Father Angel Andreetta, a Catholic priest, had researched, selected, and collected Andean orchid species in the region. Wanting his work to continue, Andreetta found help from Mario who would later enlist the help of Pepe in creating Ecuagenera. The Portilla brothers, with the help of their brother Ivan Portilla, have built this company from the ground up and have since expanded the company. Today Ecuagenera micropropagates orchid species in their laboratory, thus conserving them and reducing the pressure on wild collections.

Working at Ecuagenera I learned about the orchids that are indigenous to the area and was able to travel to their habitats. It was also at this time that the First Scientific Conference on Andean Orchids was taking place that I had the opportunity to meet other orchid enthusiasts and experts from around the world. Dr. Henry Oakeley, perhaps the first to get me interested in orchid hunting, has been growing them since the 1950s. Now retired, he travels to Peru and Ecuador and retraces the footsteps of infamous orchid hunters in search of orchids *in situ*. During my time in Ecuador, I was able to search for orchids *in situ* and experience the thrill of finding an orchid “en flor” in its natural habitat. Travelling again to Ecuador in early 2009 I attended the Third Scientific Conference on Andean Orchids. At this time I was able to focus on how these orchids could become the topic of my Practicum. Learning about the devastating loss of primary forest habitat, I was inspired to investigate conservation efforts of Andean orchid species. Meeting other such enthusiasts I have wondered how I could express this passion in my own work.

This passion has led me to investigate orchids and learn their stories, stories of orchid hunting in particular. Tales of deceit, intrigue, and obsession have surrounded the orchid for centuries. Orchids, often anthropomorphized, have an ability to seduce and deceive humans, much like they do their pollinators. People throughout history have been enticed by these exotic and erotic flowers. Entire forests and jungles have been destroyed as orchid hunters collected entire populations for fear that rival hunters would discover a species and name it before them. This particular aspect of orchid hunter stories, of loss and destruction, inspired me to design a botanic garden focused on the conservation of this plant family. Unfortunately, loss and destruction of orchid habitat still occurs today due to the reckless collection of species from the wild and the deforestation that is occurring at an alarming rate.

Opposite Page: Mario Portilla
(Photograph by Kyle Lucyk)

Botanic gardens play an important role in the conservation of many plant species. Today they are at the forefront of *ex-situ* conservation efforts as many gardens





Climbing *in situ*

incorporate research facilities on site such as seed banks, laboratories, and herbariums. These efforts help to ensure the protection of endangered species as well as educate the public on issues such as the loss of biodiversity, habitat loss, and climate change. Education has always played a fundamental role in the botanic garden. However, there has been a recent shift in the design and focus of botanic gardens all over the world. This shift from private ordered collections to ones that welcome and inspire the visiting public is examined in this Practicum. What role does the landscape architect play in the design of a botanic garden that is both educational and delightful? And how can orchids and their mystique be incorporated into a botanic garden as a teaching tool for the conservation of their genera? These are the questions I aim to address in this Practicum.



Phragmipedium kovachii in situ
(Photograph by John Valle)



Chapter 1
Orchids

A Passion for Orchids

In 1816 a box sent to England from Rio de Janeiro by William Swainson contained orchids as a packing material for other exotic plants. An English plant enthusiast, William Cattley, brought the plant to flower in 1818 and was astounded by the beauty before him. It was later named *Cattleya labiata*, and its sheer beauty set off a flurry of excitement within the plant world (www.kew.org). The intoxicating scent, beauty, and uniqueness of the orchid has fascinated people throughout history. Dating back to the 18th and 19th century orchid hunters, tales of deceit, intrigue, and obsession have surrounded these plants. Never has a plant been so widely collected and admired for its curious nature and exotic beauty. The voracious desire of Victorian Europe led to the extinction of many orchids and the loss of botanical records due to the dismal conditions at sea. Jungles and forests were looted and destroyed as orchid hunters were sent to collect rare and exotic species. Accounts of death, betrayal, and deception surround this flower and add to its mystique. In the wake of the 19th century orchid obsession, entire forests and jungles were destroyed by orchid hunters. These stories continue to interest and intrigue orchid enthusiasts today.

The seduction and lure of the orchid caused people back in Europe to go wild over newly acquired plants from far off, exotic locales. Thousands of orchids were collected from tropical forests and jungles and shipped back to Europe where they awaited auction and a hefty profit. One collector, Frederick Sander, was named the "Orchid King" due to the sheer volume of plants he collected and the new varieties he acquired. His 3-acre farm in St. Albans, 20 miles north of London, had over 20 glasshouses, a printing press for orchid description and documentation, and a large importing room to sort through endless boxes of orchids shipped from jungles from around the world (Swinson, 1970, p. 16). One account upon arrival of a large shipment reads:

Previous Page: *Cattleya labiata*

“Cases are received by fifties and hundreds, week by week, from every quarter of the orchid world, unpacked, and their contents stored until space is made for them up above...Orchids everywhere! They hang in dense bunches from the roof. They are suspended on the walls. Men pass incessantly along the gangways, carrying a load that would fill a barrow. And all the while fresh stores are accumulating” (Swinson, 1970, p. 17).

Orchid collecting had become a unique status symbol in Victorian society. During this time orchid collecting was reaching an astonishing level of greed. For example, on May 4th 1878 William Bull announced the arrival of, “two of the largest consignments of orchid that have ever been made. The number is estimated at 2,000,000” (Swinson, 1970, p. 42). As the demand for orchids increased, so did the amount of collecting from the wild. The jungles were being plundered, and from 1850 onwards complaints and warnings appeared in horticultural journals. Herr Orgies, director of the Botanic Gardens in Zurich condemned ‘the doings of collectors of the present day’. He alleged that:

“Not satisfied with taking 300 or 500 specimens of a fine orchid, they must scour the whole country and leave nothing for many miles around – the environs of Quito and Cuenca have been perfectly plundered and no collector henceforth will find any *Odontoglossums* there. These modern collectors spare nothing. This is no longer collecting; it is wanton robbery and I wonder that public opinion is not stronger against it” (Swinson, 1970, p. 42).

In addition to the mass collection of orchid species from around the world were the losses after collection. Many shipments did not make the journey overseas or perished soon after due to unsuitable growing conditions and a lack of knowledge on how to grow orchids outside their natural environment. Ships were slow, and collectors lacked packing knowledge of orchids, so a lot of them died at sea or arrived nearly dead and perished shortly thereafter. Sander was receiving

enormous amounts of orchids on a daily basis from around the world. In one of his letters he writes:

“Yesterday there came a huge consignment from the travellers in the Philippines, probably all dead—certainly a loss of about £600 to £800. Shortly before that three cases of *Cypripedium* from the same area arrived frozen. Fourteen days ago a ship carrying 177 cases of orchids went under. I damn near went mad. Work like a dog and not to know what’s coming out of it” (Swinson, 1970, p. 29).

Many of the collectors died from disease and the majority retired young, worn out by exhaustion and fever. Their trade went out of existence in 1914 (Swinson, 1970, p. 43). New methods of shipping orchids and orchid culture improved significantly towards the end of the 19th century. Orchids were becoming more commonplace and not just for the elite class. With the introduction of orchids to many nurseries, they became accessible to the larger public.

The orchid craze of the 18th and 19th centuries died down to a certain extent as major events took place in Europe, most notably World War I. As Europe and the rest of the world recovered from the aftermath, orchids came into fashion again and developed into a multi-billion dollar industry. Today, orchid enthusiasts can be found at meetings of local orchid societies, attending conferences, congresses, lectures, and shows on this fascinating plant family. People travel around the world to visit special collections of orchids or search for them *in situ*. The tourism industry has also picked up on this passion as “eco-tours” and “adventure packages” feature orchids as the main marketing tool. A love for orchids is as strong today as it was centuries ago. People go to great lengths to grow orchids in their homes, whether on windowsills, in climate controlled greenhouses, in outdoor gardens, or in basements under artificial lights. Hobbyists can even go to their local Rona or Home Depot and pick up a *Phalaenopsis* hybrid for as little as 20 dollars. New species continue to be discovered, and a passion for orchids is evident in our society today.

These are just a few of the many accounts of orchid hunting and the mass collection of orchid species. The spell that orchids cast during the Victorian orchid craze slowly wore off as time went on but certainly has not gone away. New laws have been enacted to protect orchid species and their habitats, but unfortunately that has not stopped some collectors. People continue to be mesmerized by the orchid and go to great lengths to collect the plant whether for reasons of beauty, greed or fame.

What is an Orchid?

The following brief summary focuses on Andean orchid species, as these are the species explored and designed for in this Practicum.

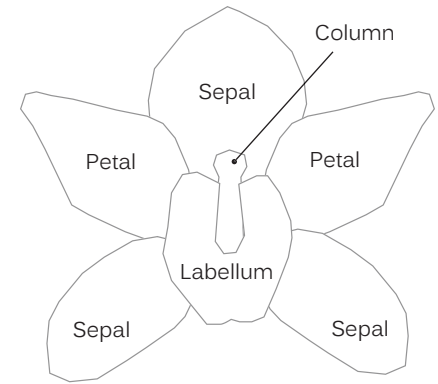
It is often thought that orchids are exotic plants from far-off locales, hidden deep in tropical forests and jungles. For many orchids this is the case as they reach their greatest development and diversity in the tropics. However, orchids can be found all over the world and even here on the Canadian Prairies. The Orchidaceae is one of the largest and most diverse flowering plant families in the world with an estimated 25,000 to 30,000 different species with many new species yet to be found (Koopowitz, 2001, p. 10). They are found on every continent, with the exception of Antarctica, and are often referred to as "nature's most highly evolved plant" due to their complex pollination mechanisms and ability to grow in adverse conditions (www.kew.org).

Orchids are varied and unique in their size and appearance, ranging from a tiny pleurothallid flower to a gigantic *Cattleya* bloom. Of all the flowering plant families on earth, no other group can match the incredible diversity and variability of the orchid family. According to Dressler (1981), orchids can be defined by a set of



Top Left: *Dracula hirtzii*
Top Right: *Masdevallia polysticta*
Bottom Left: *Acronia titan*
Bottom Right: *Stanhopea embreea*

three morphological features. The first of these features are the stamens, which are arranged so that they open up and shed their pollen towards one side of the flower so that the pollinator lands or crawls on only one side of it. The second common feature is the partial to complete fusion of the stamen filaments with the style to form a column. The third feature is the microscopic nature of the seed. All orchids produce large numbers of very tiny seed. Some numbers have been estimated at as many as 1.6 million in a capsule from *Cattleya guttata* (Koopowitz, 2001, p. 10). Another interesting feature of the orchid is its structure. As a general rule, orchid flowers have three petals and three sepals. There is much variation in appearance on this structure, however all orchids have one petal that is usually modified or unlike the other two and is referred to as the “lip” or “labellum” (Dressler, 1981, p. 7). Here the pollinator is usually enticed into the orchid by a particular species’ pollination mechanism.



Basic structure of an orchid
(Sketch by Author)

Orchids and their Ecology

Ecology is a branch of science concerned with the relationships between living things and their environment. The ecology of orchids is interesting as they have an incredible ability to adapt and grow in adverse conditions. Also of interest are the various pollination mechanisms and the distribution of orchids.

As mentioned, orchids can be found on every continent with the exception of Antarctica. Orchids reach their peak diversity in the tropics. However, they are not evenly distributed. Within the Neotropics, Panama, Mexico, and Ecuador appear to be the “hotspots” that are rich in diversity (Koopowitz, 2001, p. 12). More specifically, Ecuador is home to many different orchid genera and species, some not even yet discovered. Orchids can grow in the ground (geophytes or terrestrials), on trees (epiphytes), and on rocks (lithophytes) but most orchids in the tropics grow on branches of trees, perched high in the forest canopy (Koopowitz, 2001, p. 22). This

particular group of orchids, the epiphytes, is the major type of orchid emphasized in this Practicum. Epiphytes are abundant in Ecuador and can be found in the coastal habitat all the way up into the cloud forests and páramo or high elevation grasslands of the Andes.

Epiphytes have evolved and adapted in response to their need for light. This causes them to grow high up in the forest canopy where available light can be converted into energy for the plant (Simon, 1975, p. 76). Epiphytes find themselves in unusually harsh conditions high up in the canopy competing for water and nutrients. The humid air most often associated with epiphytic environments helps to reduce the loss of water. Epiphytes are able to gain some of their nourishment from nutrient-rich water secreted from other forest plants. Trees with rough bark help to anchor these plants, and to collect water and leaf litter thereby providing additional nutrients to the epiphytes (Simon, 1975, p. 77). Lastly, epiphytes have fleshy, water-storage organs such as pseudobulbs, roots, stems, and leaves that help to store and retain water. Advantages of living high up in the forest canopy include more light, better exposure to pollinators, greater seed dispersal, and avoidance of predators (Dressler, 1981, p. 81).

Orchids often employ complex pollination mechanisms either by deception or seduction of their pollinator. Most times the pollinator is left with nothing in return while the orchid goes on to produce seed. The unique interaction that orchids have with their pollinators has fascinated scientists and laypeople for centuries. Darwin wrote a book that investigated the various contrivances by which orchids are pollinated, and many books have followed. The curious nature of these pollination mechanisms has seemed to anthropomorphize orchids and turned them into creatures that deceive and seduce their pollinator.

There are many ways in which orchids can be pollinated. In general, the pollination system of an orchid is simple – if a certain behaviour results in removal of pollinia from a flower, the same behaviour in another flower of the same species will result



Epiphytic orchids
growing on tree bark

in the deposition of pollinia in the stigma of that other flower (Dressler, 1981, p. 99). The following are four main mechanisms in which orchids are pollinated (Dressler, 1981, Koopowitz, 2001):

1. Mimicry – in which natural selection has favoured a resemblance between individuals of different species. For example, some *Oncidium* species mimic the flowers of malpighiaceae vines, vines that female bees are known to gather oil from. These same bees have been seen to seize *Oncidium* flowers for an instant and then fly away. Presumably, the bees are deceived and then fly away when they find no oil and go on to pollinate another plant when they make the same mistake again.
2. Pseudoantagonism – another form of mimicry in which the orchid appears to have traits resembling a pollinator's enemy or another insect trespassing in that pollinator's territory. For example, an Ecuadorian *Oncidium* species has flowers that are delicately attached to the rest of the plant where even the slightest breeze sets the petals dancing. These movements catch the eye of a particular species of bee, a species whose males defend their territory against others of their sex. The territorial male charges the flowers, defending his territory. Markings on the flower encourage the male to collide with the column and the male comes away with pollinia attached to its head and thus deposits it on another flower the next time he charges (Alcock, 2006, p. 36).
3. Pseudocopulation – another form of mimicry where orchid flowers mimic female insects and are pollinated by male insects in search of mates. For example, an Ecuadorian species of *Telipogon* mimics the appearance of a tachinid fly, thereby attracting male flies that try and mate with the orchid (A. Pridgeon, personal communication, October 21, 2009).
4. Seduction or reward – some orchids can mimic the scent of carrion in

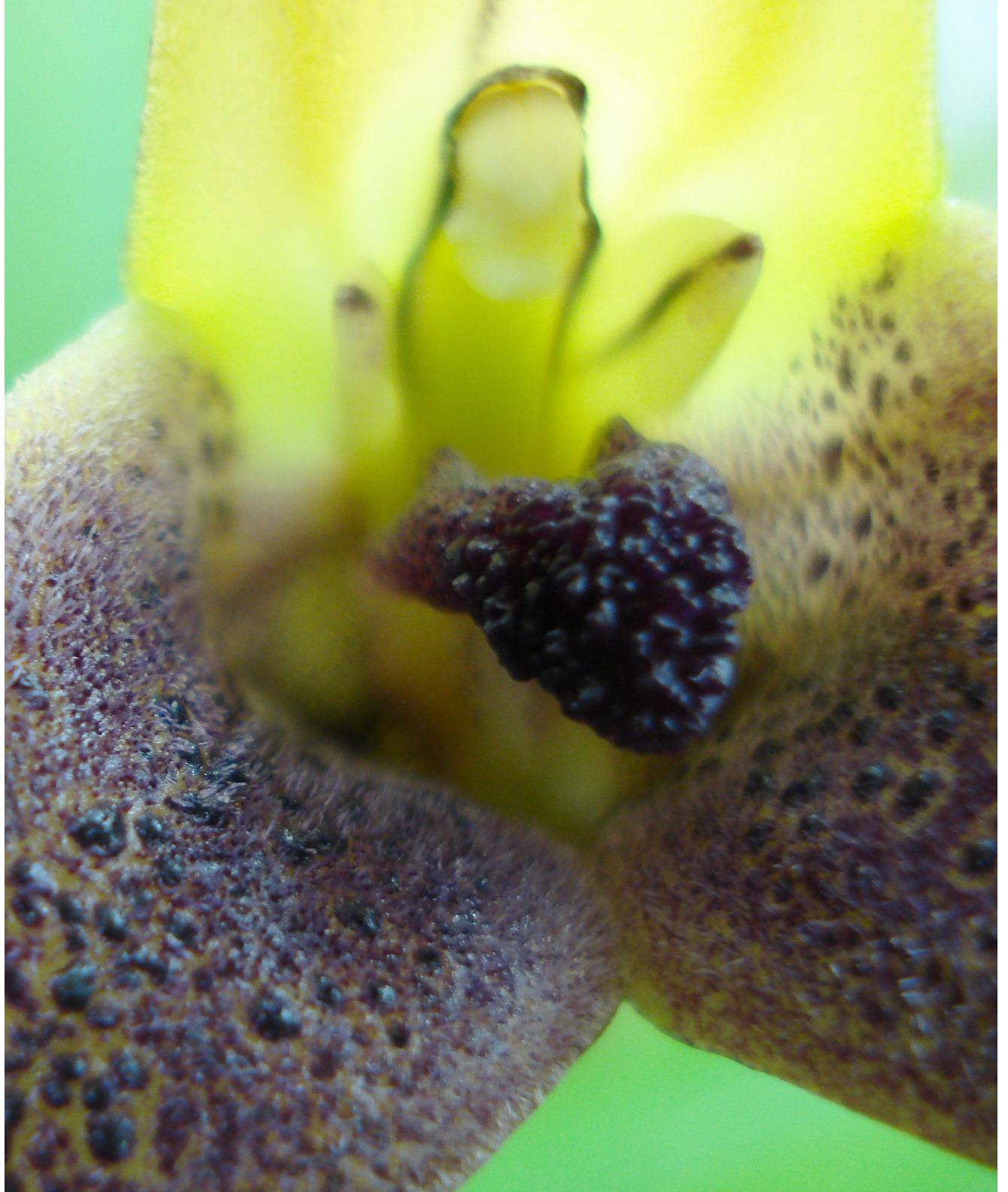


Female *Catseum* orchid and its pollinator
(Photograph by Kyle Lucyk)

order to attract flies that would normally feast on it. Other orchids can produce an attractive scent that is only emitted at night. The pollinators of these orchids are usually moths that are nocturnal and only come out at night.

These examples can serve as possible design concepts for the proposed botanic garden. Perhaps the visitor becomes the pollinator, seduced and attracted to the garden. The garden's "pollen" or message of conservation is firmly attached to the visitor as they leave, hopefully transferring it to another place or person.

Orchids are highly evolved and specialized plants. By their very nature, orchid genera and species are narrowly confined to certain ecological niches. When the delicate balance of such environments is altered even slightly, the orchid is immediately endangered. The same can be said about the loss of orchid pollinators as they, too, are highly specialized. The loss of those pollinators may lead to the loss of those orchids. Concerns over the destruction of habitat and the conservation of this plant family are examined further in Chapter Four.



Chapter 2
A History of Botanic
Gardens and their
Changing Role

Botanic gardens have a history dating back to the Garden of Eden and the belief in an earthly paradise. As a society's cultural and political views have changed throughout history, so too has the botanic garden. The botanic garden has come a long way from collecting the scattered pieces of Eden to a garden more about conservation and entertainment. However, one key element has always remained fundamental to the botanic garden – education. The botanic garden's changing role throughout history becomes evident as one delves deeper into a specific time in history. Largely a product of an era's political, economic, or cultural influences, the botanic garden has adapted to reflect these beliefs.

Botanic gardens today extend their roles to be – places of recreation, education, and entertainment. The new botanic garden offers a place to delight and inspire the visiting public while maintaining its fundamental purpose of education and conservation. In order to understand botanic gardens today, one must look at how they have evolved over time and came to be what they are today.

What is a Botanic Garden?

“There are few persons, when enjoying the recreation of a walk in the garden, or shrubbery, but who are desirous of possessing some knowledge of the beautiful objects which surround them” (Clarke, 1822, p.5).

What makes a botanic garden distinct from other types of gardens? How is a botanic garden different from a public park or pleasure park? What components constitute a botanic garden? Is it botanical or botanic garden? Used interchangeably, botanical or botanic gardens are unique in that they have a scientific focus and a strong commitment to plant conservation and involvement in environmental education (Barlow Rogers, 2007, p. 17). A botanic garden is a place

that cultivates documented collections of living plants for the purposes of scientific research, conservation, display, and education (Johnson, 2007, p. 76-80). Perhaps the most comprehensive definition comes from Botanic Gardens Conservation International (www.bgci.org) as they describe a botanic garden as any institution that meets in part or whole the following criteria:

- A reasonable degree of permanence
- An underlying scientific basis for the collections
- Proper documentation of the collections, including wild origin
- Monitoring of the plants in the collections
- Adequate labelling of the plants
- Open to the public
- Communication of information to other gardens, institutions and the public
- Exchange of seed or other materials with other botanic gardens, arboreta or research institutions
- Undertaking of scientific or technical research on plants in the collections
- Maintenance of research programs in plant taxonomy in associated herbaria.

In short, a botanic garden is a place where plants are arranged for scientific study and purposes while remaining open to the public.

In contrast, public parks or pleasure gardens are for the enjoyment of the visiting public without an emphasis on taxonomic displays of plants. Elizabeth Barlow Rogers (2001), in her book *Landscape Design: A Cultural and Architectural History*, defines the botanic garden as, “a didactic garden in which families of plant specimens are arranged and labelled according to taxonomic categories of genus and species” (p. 514). In this definition there is no mention of public use or enjoyment, suggesting instead that the botanic garden is a place for scientific purposes and study only. That might have been true in earlier iterations of the botanic garden, but it is certainly not true today as botanic gardens have evolved

over the centuries and have recently experienced a shift in their purpose and hence their design. Instead, a more inclusive definition of the botanic garden exists today. The definition not only includes “the study and display of plants”, but also “to engage and inform the visiting public” (Schafer, 2008, p. 16). Botanic gardens are becoming more about the entertainment and delight of the visiting public as the public is viewed as funder, investor, and supporter. This theoretical shift views these gardens not only as places of scientific study and research but also as landscapes that inform, inspire, and delight the visiting public. More and more, botanic gardens are addressing the needs and wants of the public and not just of the scientific community. However, it should be noted that many botanic gardens still adhere to a certain level of formality. For instance, botanic gardens such as Kew, the Chicago Botanic Garden, and the Missouri Botanical Garden discourage picnicking and recreation such as cricket, Frisbee, or the like. Furthermore, some of these gardens also prohibit outside food or drinks. Recreation and leisure are offered in designated areas and usually only under certain circumstances such as a festival or special event. This change in focus has occurred recently and is an important consideration in the design of new botanic gardens. It can be traced back to early botanic gardens and how they have changed over time.

A History of Botanic Gardens

The Garden of Eden

For centuries people have been cultivating plants and arranging them into gardens. The first examples of plant cultivation date back 3000 years to ancient Egypt and Mesopotamia. The Romans identified medicinal qualities of plants. The monastic gardens of the 8th century were amongst the first gardens to order plants according

to their properties and uses (www.bgci.org). However, it is the idea of the Garden of Eden that influenced the early botanic gardens of the world.

In *The Garden of Eden: The Botanic Garden and the Re-creation of Paradise*, John Prest (1981) writes with reference to the Garden of Eden and how the beliefs held about it have shaped early botanic gardens and fuelled plant explorations of the 15th and 16th centuries. A commonly held belief of the time was that the Garden of Eden had survived the flood and that its re-discovery would yield all the plants that God had created (Prest, 1981, p. 38). When an earthly paradise was not found, the belief was slightly altered. Instead of one garden on earth growing all the plants God had created, the belief was then held that God had scattered all the plants from the Garden of Eden to the four corners of the world (Prest, 1981, p. 6). The task therefore was to collect all these plants from around the world and bring them back into one garden, the re-creation of paradise on earth.

This re-creation of paradise on earth was reflected in its design. These gardens emphasized the four cardinal directions and embodied the biblical concept of a paradise as an enclosed, geometrically ordered, quadripartite space with four dividing paths symbolizing the four rivers that flowed out of the Garden of Eden; the Euphrates, the Tigris, the Phison, and the Gihon (Barlow Rogers, 2007, p. 13). It was believed that God was reflected in plants and thus each plant was capable of healing a specific ailment. Therefore plants were collected and cultivated in botanic gardens that would provide all the medicine for any given illness or ailment. Factors other than the study of plants also influenced the design and layout of early botanic gardens. Many gardens incorporated astrological, cosmological, and religious notions into their layout (Barlow Rogers, 2007, p. 12). This was a 'divine' way of ordering the world and channelling positive energy into the plants in the garden, thus increasing their healing abilities.

Similarly the notion of 'paradise on earth' was replicated in Islamic gardens. Closely following the Bible, the Quran also has four rivers emanating from paradise as



The four rivers in the Garden of Eden flowing from its enclosing wall (Source: Ludolphus of Saxonia *Leven Jhesu Christi*, 1503)



Bagh-i-Vafa, or the Garden of Fidelity, displays the four rivers flowing from paradise
 (Source: Illustration from a Mughal book of manuscripts, c. 1590)

they do in the book of Genesis. However, the rivers are more metaphorical than geographical and represent flowing streams of milk and honey (Barlow Rogers, 2001, p. 29). The Quran presents the garden as a place of paradise, a prize for the godly in a desert climate. Islamic and Christian gardens of paradise share a similar spatial organization.

Towards the end of the 15th century beliefs were challenged as exploration and colonialism expanded. Modern science was emerging, and theories about the world were being tested and disputed. As Prest (1981) writes, “the botanic garden evolved from the ‘Garden of Eden’ into a ‘garden of modern science and reason’” (p. 38). What followed were the botanic gardens of the 16th and 17th centuries, the ‘physic gardens’.

Physic Gardens: 16th & 17th Century Gardens

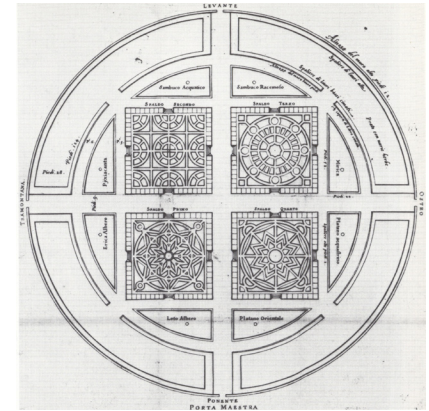
The physic gardens of 16th and 17th century Europe evolved from early botanic gardens. The botanic garden became a ‘living encyclopaedia’ of plants that one could consult for reference, and were thus laid out accordingly (Prest, 1981, p. 57). Many botanic gardens today still reflect these original design principles. These gardens were teaching gardens that contained collections of ‘simples’ or herbs that possessed medicinal or healing qualities (Prest, 1981, p. 57). These teaching or ‘physic’ gardens are widely quoted as being the first botanic gardens of the world and were usually affiliated with universities. Training of medical practitioners of the time included the identification and use of different plant species found in the botanic garden.

The first botanic garden was created at the University of Pisa by Luca Ghini in 1543 (www.bgci.org). Luca Ghini recognized a need for a herbarium, accurate botanical illustrations, and most importantly, live plant specimens as teaching tools for the University. Gardens in Padua (1545), Florence (1545), and Bologna (1574) soon followed out of this necessity (www.bgci.org). Gardens elsewhere

in Europe appeared at the end of the 16th century in Kassel, Leipzig, Breslau, Leiden, Heidelberg, and Montpellier (www.bgci.org). The first garden created in the United Kingdom was at the University of Oxford in 1621 with a mission, “to promote learning and the glory of God” (Oldfield, 2007, p. 13). Even though botanic gardens were moving towards ‘modern science and reason’, a connection was still maintained to God and the Garden of Eden.

These early botanic gardens were not that different from the botanic gardens we know today. Places like the Chelsea Physic Garden, the Royal Botanic Gardens, Kew, and the Royal Botanic Garden, in Edinburgh still reflect these principles in their form. These gardens are sometimes quoted as being created, “solely for the purpose of the academic study of medicinal plants” (Barlow Rogers, 2007, p. 13). However, botanic gardens were also becoming places of pleasure for their visitors. The botanic garden at the University of Pisa was not only a place for scientific study but also a place of pleasure for the members of the Medici family and their guests (Gabari, 2007, p. 128). The botanic garden at Leiden was also known to be created for the study and enjoyment of plants rather than as a simple herb garden focused solely on medicinal plants (Gabari, 2007, p. 132). Botanic gardens were becoming places where science was not the only driving force behind their design and purpose.

With this change in focus came an important shift in the design of botanic gardens towards the end of the 17th century. Botanic gardens were no longer about the gathering of the scattered pieces of the Garden of Eden or the harnessing of medicinal plants from around the world. They became places of pleasure and enjoyment. Coupled with the ‘golden age of exploration’, botanic gardens began to focus on display beds and featured exotics from around the world. As a consequence, the gardens began to look more like landscapes of ‘botanical loot’ and became more about the gathering of the pieces of imperialism and colonialism of the 18th and 19th centuries.

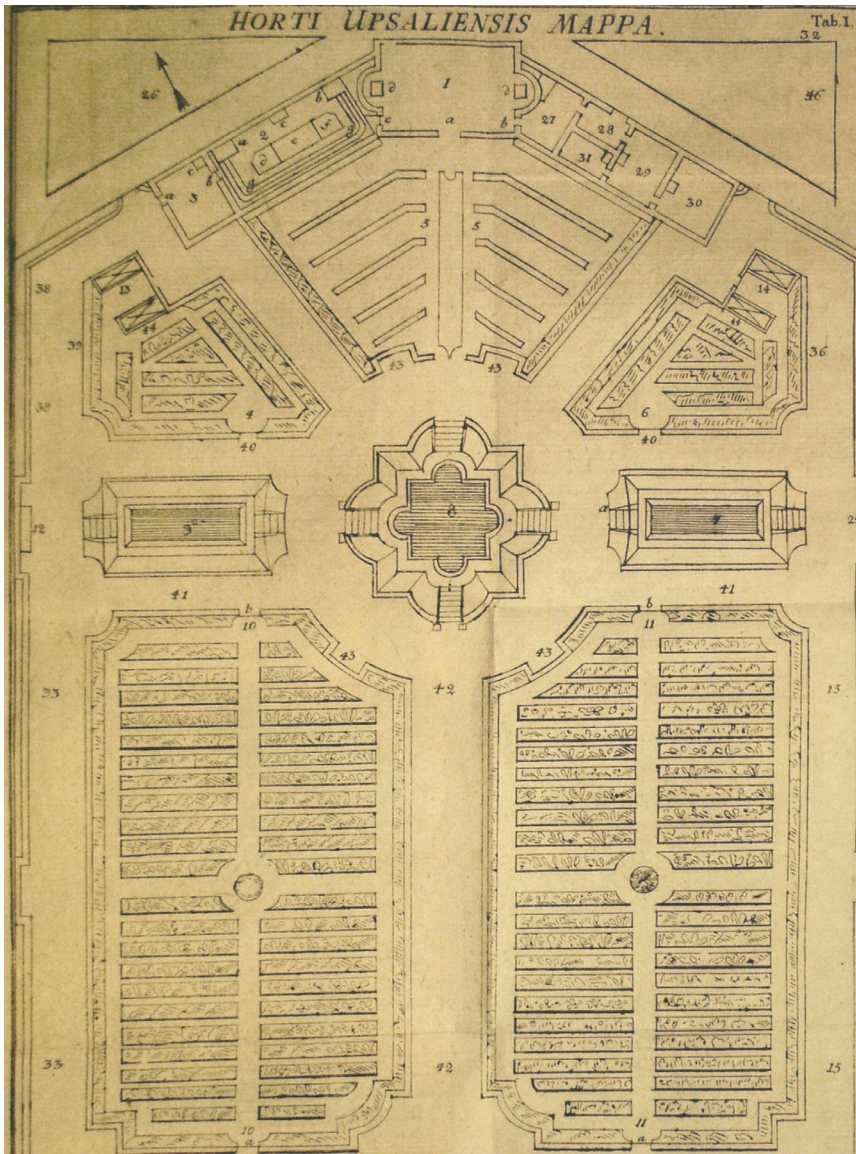


Plan of the Garden at Padua
(Source: G. Porro *L'horto de i semplici di Padova*, 1591)

Exploration, Classification, & Leisure: 18th Century & 19th Century Gardens

During the 18th and 19th centuries the design and layout of botanic gardens was experiencing a great shift. In the history of botany, the 18th century is a distinct time of change in the scientific development of the botanic garden. As taxonomic theories evolved, so did the botanic garden. Around 1800 the positioning of botany as a scientific discipline influenced the design of the botanic garden (Robin, 2008, p. 382). Exploration and the beginnings of international trade from the 17th century onward saw the creation of botanic gardens in tropical colonies as “holding gardens” for plants to be shipped back to Europe. Expeditions to the tropics brought exotic plants back to Europe. Imperialism, colonialism, and new methods of classification (binomial nomenclature) were the driving forces behind the botanic garden during the 18th and 19th centuries.

The late 18th century was dubbed the ‘age of classification’ (Fara, 2003, p. 20). Perhaps the most important influence on the design of the botanic garden at this time was Carl Linnaeus’s classification system of plants and animals known as ‘binomial nomenclature’ (Barlow Rogers, 2007, p. 14). This system changed the design of botanic gardens as an emphasis was placed on taxonomic displays and in the naming of new species being discovered around the world. This new mode of arrangement in botanic gardens displayed the most logical and practical way of displaying plants, especially for teaching purposes (Robin, 2008, p. 388). As a result, Linnaeus redesigned the botanic garden at the University in Uppsala, collecting plants not for their rarity but for their commercial potential and interest (Fara, 2003, p. 38). He wanted European countries to be able to produce all the goods they needed for their own economic survival. He believed that by a process he termed ‘slow adaptation’ temperate species and some tropical species could slowly be moved to northern climates and eventually thrive there (Fara, 2003, p. 36). Botanic gardens of this era were concerned with trialing and displaying new species from foreign lands.



Original Plan of the Botanic Garden at the University in Uppsala
 (Source: Caroli Linnaei, *Amoenitates Academicae* [Academic Delights].
 Holmiae [Stockholm] et Lipsiae [Leipzig], 1749.)

Linnaeus's binomial naming system became a statement of possession. Tropical agriculture and colonial expansion towards the end of the 18th century saw botanic gardens at Kew and Edinburgh displaying 'tropical treasures' that could be termed 'botanical loot'. Expeditions from Europe to the tropics and the Americas were sent, and subsequently plants, animals, and even people were brought back as curiosities from 'foreign lands' (Fara, 2003, p. 118). Possibly one of the most interesting expeditions was that of the *Endeavour* by James Cook and Joseph Banks. On this expedition many 'curiosities' of exotic and erotic specimens from the Southern Hemisphere were brought back to Europe for the elite to feast their eyes on.

During the late 18th century, botany was laden with sexual allusions. Perhaps a covert way of expressing a repressed Victorian era towards sexuality, botany became almost erotic in its descriptions and even in its classification (Fara, 2003, p. 38). Tales of Cook's and Banks' escapades during the *Endeavour* expedition reached Europe and were widely written about and parodied. Banks befriended many indigenous women and acquired plants, while Cook was securing Pacific territories for the British Empire (Fara, 2003, p. 72-73). One might even liken this to theft on a national scale. As in so many research projects that supposedly pursue knowledge, science and the state were inextricably linked together. One of the main instructions for the *Endeavour* was to 'secure new territory' (Fara, 2003, p. 72-73). However, it was Banks' discovery of many plants that contributed to the growth of botanic gardens in Europe and, later, elsewhere in the world. Banks' plant discoveries and systematic naming of them, made the Linnaean system central to British science. Banks was also the scientific advisor to King George III and was responsible for converting Kew into the world's leading botanic garden, making it a central clearinghouse for an imperial trade in agricultural development (Fara, 2003, p. 135). Many plants at Kew were grown not only for their scientific importance but also for their commercial value. Banks scoured the world for useful crops to cultivate in Britain, while he simultaneously altered the patterns of international vegetation by exporting plants to British colonies and also by moving them around

the empire from one country to another (Fara, 2003, p. 136). By the early 19th century, botanic gardens had become a standard symbol of colonial conquest.

During the 19th century, botanic gardens shifted yet again to reveal the geography of plants and how they grow in their natural environments (Robin, 2008, p. 394). Keeping plants alive in alien climates is something that botanic gardens continue to address. This 'natural classification' method displayed plant collections according to their cultural requirements. Species were arranged according to their natural families and their habitats. This marked the transition towards new considerations of the ecology of plants seen in the 20th and early 21st centuries of botanic gardens.

During the 18th and 19th centuries the number of newly discovered plants increased so rapidly that botanic gardens had to select and specialize in their plant collections. Botanic gardens such as the Royal Botanic Gardens, Kew began to occupy land that had already been designed for other uses such as parks or pleasure gardens. The growth of public parks pushed the design of the botanic garden to a new level as they became places of recreational resort and leisure as well as taxonomic displays of plants. The look of the botanic garden eventually took on a picturesque or landscape style with its natural plantings, wide open expanses, serpentine pathways, and large water bodies. Examples include the gardens at Kew and Edinburgh (Dixon Hunt, 2005, p. 145). Furthermore, advances in greenhouse technology also contributed to the layout of botanic gardens of this time. John Claudius Loudon, a landscape planner, developed the 'gardenesque' style of featuring individual plantings rather than mass plantings. This became a popular mode of displaying new exotic species in the botanic garden (Dixon Hunt, 2005, p. 145). Consequently public parks, such as Central Park in New York, were also being influenced by botanic gardens as they began to incorporate specimen plantings of exotic trees and display beds for flowers (Barlow Rogers, 2007, p. 17). Despite this overlapping of functions, botanic gardens remain places of education and display first and foremost.



Another important consideration that changed the face of the botanic garden of the late 19th century was the commercialization of horticulture. Commercial nurseries supplied garden and estate owners with a variety of variously priced plants (Dixon Hunt, 2005, p. 146). Display gardens were featured in botanic gardens educating the visitor in what they might re-create in their own gardens. The development of the horticultural industry made 'exotic' plants accessible to the public. Along with this accessibility of exotic plants were the advances in the manufacturing of glass and iron which led to improvements in the construction of glasshouses (Barlow Rogers, 2007, p. 16). These architecturally striking features became the centrepieces of many botanic gardens and parks throughout Britain and its colonial gardens. Places like the Great Conservatory or the 'Great Stove' in Chatsworth, England, by Joseph Paxton in 1836, the Palm House at the Royal Botanic Gardens, Kew by Decimus Burton and Richard Turner in 1848, or Kibble Palace at the Glasgow Botanic Gardens by John Kibble in 1873 (Whalley, 2003, p. 104-117) are a few examples of glasshouses as focal points to the design of botanic gardens. The glasshouses of the late 19th century continue to be built and re-interpreted in new botanic gardens today.

The Conservation Garden: 20th Century Gardens and the Gardens of Today

At the end of the 19th century botanic gardens were developing with the emergence of public parks. A desire for clean, open spaces away from the pollution of the city was pursued in Europe and North America. At the turn of the 20th century botanic gardens were being established all around the world and recognized as valuable resources to the communities residing nearby.

During the mid to late 19th century, botanic gardens were being established in

Opposite Page: The Palm House at the Royal Botanic Gardens, Kew (Photograph by Alec Pridgeon)

North America. Places like Missouri, New York, Montreal, and Florida were creating 'American' versions of the great botanic gardens of 18th century Europe. A focus on correct labelling of collections and the exchanging of seeds became important functions of the botanic garden (Oldfield, 2007, p. 22). A change in funding was also taking place. Gardens of the 18th and 19th centuries were, for the most part, privately funded. However, gardens of the 20th century saw a change in funder and investor as the government and the public realized the value of these resources. This resulted in a focus on the enjoyment and education of the visiting public. According to BGCI about half of the world's botanic gardens have been created since 1950, and since 1990 more than a hundred new botanic gardens have been developed (Oldfield, 2007, p. 140). In addition, botanic gardens became places of conservation as the world began to face the problems of environmental harm and consequence.

Towards the end of the 20th century, the design and message of botanic gardens began to respond to the earth's changing climate. Conservation and the importance of safeguarding the planet is the subtext of nearly every exhibit in most gardens today (Soderstrom, 2001, p. 214). The 'conservation garden' has emerged as the new botanic garden of the late 20th century and of gardens today (Maunder, 2008, p. 16). Conservation and education of the public has come to the forefront in botanic gardens through various means. Interactive displays, guided tours, storytelling, and educational programs have helped botanic gardens communicate the importance of conservation. A global survey carried out by BGCI revealed that 91% of botanic gardens include education in their mission (www.bgci.org). Interpretation of the plant collections has become a major focus as places like the Eden Project in Cornwall, England and the Singapore Botanical Gardens weave stories of conservation and evolution into the landscape (Leadlay & Greene, 1998, p. 105). In addition to educating the visiting public, conservation efforts have also become one of the major mandates of botanic gardens of the late 20th century and today.

Many different types of conservation methods are now at the forefront of botanic garden design. Examples of this include *ex situ* and *in situ* conservation efforts, seed banks, herbariums, storage of pollen and genetic material, and of course, live collections (Leadlay & Greene, 1998, p. 31). Many botanic gardens include laboratories, greenhouses, field nurseries, and seed banks all dedicated to the *ex situ* conservation of threatened plant species. For example, the Missouri Botanical Garden incorporates botanical research and education as part of the garden's mandate in the form of seed banks, herbariums, and research laboratories. *Ex situ* conservation can be defined as "the preservation of plants outside their natural habitat", whereas *in situ* conservation can be defined as "the preservation of plants in their natural habitat" (Oldfield, 2007, p. 28). Propagation and cultivation techniques also contribute to *ex situ* conservation efforts. Some botanic gardens even house species that are now extinct in the wild. Furthermore, in response to



The Evolution Garden at the Singapore Botanic Gardens
(Source: Monem, 2007, p.189)

the earth's changing climate, botanic gardens have undertaken research trialing and acclimatizing of plants (Oldfield, 2007, p. 149). Some gardens even have 'satellite' gardens that provide *in situ* conservation of primary habitat (Leadlay & Greene, 1998, p. 31). Habitat protection is becoming an increasingly important component of botanic gardens around the world.

In addition to conservation efforts, botanic gardens have also focused on community involvement. Volunteers, community groups, and local organizations play an important role in the operation and funding of botanic gardens today. Giving back to the communities that support them has become an important theme in the establishment and creation of new gardens (Leadlay & Greene, 1998, p. 118). Furthermore, botanic gardens have also become catalysts for social change and rejuvenation of urban areas, as evidenced in the design of the Jardín Botánico in Medellín, Colombia (see case study analysis three in Chapter Three). Botanic gardens are involved in projects, often involving their local communities, which use plant diversity in a sustainable manner to improve human well-being. This includes work on medicinal and nutritional plants, as well as projects that aim to alleviate poverty by addressing social and community problems (www.bgci.org).

Botanic gardens are increasingly featuring plant collections that are indigenous to their countries of origin. A focus on conservation efforts *in situ* and *ex situ*, exchange of plants and information, and communication of that information is at the forefront of gardens today. Places like the Missouri Botanical Garden, the New York Botanical Garden, and the Royal Botanic Gardens, Kew all incorporate conservation methods as part of their garden's mandate. Collection policies of many botanic gardens determine strict guidelines on how and where to collect plants, if at all (Leadlay & Greene, 1998, p. 41). The convention on international trade of endangered species known as CITES also provides rules and regulations on collecting plants from the wild (Oldfield, 2007, p. 34). Botanic gardens take pressure off wild populations of plants as new propagation techniques are widely researched in many research facilities of botanic gardens. Display, interpretation,



The Ethnobotanical Garden in Oaxaca, Mexico displays plant collections indigenous to the region (Source: Schafer, 2008, p. 12)

and conservation of the indigenous flora in the countries in which they occur seem to be at the forefront of collections in new botanic gardens. Places like the Eden Project in Cornwall, England, the Jardín Ethnobotánica de Oaxaca in Mexico, and the Australian Garden at the Royal Botanic Gardens, Cranbourne, are examples of new botanic gardens focusing on display, interpretation, and conservation. However, the traditional teaching ideal of the botanic garden is still present today as many gardens feature outdoor classrooms, herbariums, libraries, research facilities, and promote conservation awareness. It is this scientific tradition that distinguishes the botanic garden from other kinds of parks and gardens. Nonetheless, botanic gardens provide large green spaces and habitat for mammals, birds, and insects in large cities and urban areas. Today, botanic gardens offer a wide range of programs and amenities to their visitors. Some of these amenities include community gardens, roof gardens, school projects, tree plantings, interactive displays, workshops, treetop walks, and interpretation (Oldfield, 2007, p.22-23). As botanic gardens continue to develop around the world, each garden is different,

The Australian Garden at the Royal Botanic Gardens Cranbourne focuses on display and interpretation
(Source: Schafer, 2008, p. 4)



its unique characteristics reflecting historical origins and current purpose, style of plantings, and visitor attractions.

Many botanic gardens at the moment employ what are called 'unique selling propositions' or USPs. This is a marketing term which involves creating a strategic advantage over competitors in the product market place (Harrison, 2007, p. 1). USPs attract people to visit the garden and provide an experience not offered elsewhere. They have a desired effect of drawing crowds because they offer something unique over the competition. The biomes at the Eden Project in Cornwall, England is a good example of a USP that attracted hundreds of people. Reliance on USPs is a dangerous undertaking as the novelty of any attraction may wear off over time. First and foremost, botanic gardens should promote awareness and inspire us to change and make smarter, wiser choices about the environments we live in. A successful garden should be both informative and beautiful and attract people of all ages and from every part of society year after year. Botanic gardens of

the future should not have to compete with amusement parks and theme parks for income from admissions in order to survive. Botanic gardens should be a balance of entertainment and education and should not rely on 'gimmicky' amusement park antics as their sole income.

Future Role of Botanic Gardens

Botanic gardens are adapting to address the environmental concerns of the 21st century. These concerns include the introduction of invasive species, unsustainable exploitation of plant species, loss of biodiversity, habitat modification and destruction, and climate change to name a few (Oldfield, 2007, p. 145-149). These issues can all be linked to our activities as human beings. Communicating that message, one of plants and people, is important to most botanic gardens today. Botanic gardens protect plant species not only in their gardens but also in their natural habitats with *in situ* conservation efforts, as mentioned. National parks, nature reserves, and other protected areas act as satellite gardens to larger botanic gardens. For example, the Missouri Botanical Garden has 970 hectares of protected natural Ozark Border landscape in the Shaw Nature Reserve, a division of the main garden (www.mobot.org). More than 400 botanic gardens around the world manage natural areas for conservation within their boundaries and are also involved in the study and conservation of plants outside garden walls (Oldfield, 2007, p. 26). Networks and organizations such as the BGCI, Convention on Biological Diversity (CBD), and the National Committee of the Netherlands (IUCN) all work towards the goal of conservation and protection of the world's plant species and habitats (Leadlay & Greene, 1998, p. 119). Botanic gardens are making major contributions to our knowledge of plant diversity, through research in areas such as taxonomy, genetic diversity, conservation, and restoration ecology (www.bgci.org). Technological advances are allowing botanic gardens to be more productive and data-efficient and are facilitating the management and exchange

of information. Information management systems such as computerized plant recording and monitoring systems and databases allow gardens to efficiently collect and store data. As we look to the future of botanic gardens it is clear that education, research, and conservation are key elements to the garden. In addition, recreation and leisure add to the botanic garden's message of education and conservation. The future role of the botanic garden is a place of beauty, inspiration, and delight where visitors are educated in innovative ways. In the next chapter we take a look at botanic gardens from around the world that display and exemplify these qualities.



Chapter 3
Case Study Analyses

Why Case Study Analysis?

The evolution of the botanic garden has run parallel to the changing religious and scientific beliefs of the times. From the gardens that expressed religious notions of the Garden of Eden and the re-creation of paradise on earth to the gardens of the 16th century that cultivated plants for their medicinal properties, botanic gardens have largely been a reflection of an era's political or social beliefs. The gardens of the 17th and 18th centuries dealt with economic expansion, greed, and imperialism whereas the gardens of the 19th century were stimulated by the Industrial Revolution that created interest in the aesthetic value of landscapes and landscape design. The botanic garden of the 20th century and beyond is a garden of conservation, research, and education. Whether a particular botanic garden was driven more by God, science and education, or economics was largely a product of an era's political or cultural attitudes towards the natural world. The role of the botanic garden has evolved along with history and continues to evolve with a society's changing beliefs on how they view the world today.

The definition of a botanic garden is also evolving and changing with the times. Gone are the days of highly structured and ordered gardens laid out for taxonomic study or medicinal knowledge and long gone are the days of collecting the scattered pieces of the Garden of Eden. Today a definition of a botanic garden might include one of art and science melding together to provide a place of education, inspiration, and enjoyment. In the botanic garden of today, ideas are experimented with, communicated, and made beautiful. Plants, architecture, and people come together in the 'new botanic garden' to inform, inspire, and delight the visiting public. Issues such as the loss of biodiversity, climate change, sustainable development, and poverty alleviation are some of the main concerns that botanic gardens address today.

As a means of investigation, case study analysis can provide a comprehensive

Previous Page: *Oncidium* spp.

illustration of a contemporary botanic garden. Through this method a clearer understanding can be gained of what the roles and mission of a particular botanic garden are. Evaluation of these case studies reveals how they function, successfully or otherwise. Selection of case studies was determined on the basis of a garden's innovation and uniqueness in employing new methods of education and entertainment while still maintaining a dedication to its botanical collections. Other important factors in selecting case studies were based on the relevance to my Practicum work – the design of a botanic garden centred on orchids. For example, gardens which incorporated orchids as part of their main collection was an important factor in determining appropriate selections. Lastly, a garden was selected on the basis of its *ex situ* conservation, education, and ongoing research efforts. Conservation, education, and research are key to botanic gardens today and close attention was paid in selecting case studies that exemplified this. The following three case studies were investigated in depth whereas the subsequent examples are provided as brief studies in order to illustrate unique features such as design, conservation efforts or experiences in botanic gardens.

Case Study Analysis One: Missouri Botanical Garden

Location: St. Louis, Missouri, United States

Previous Land Use: Pasture

Client: Missouri Botanical Garden

Landscape Architect: Environmental Planning + Design (Shoenberg Temperate House interior)

Architects: Murphy and Mackey (Climatron), Christner Partnership, Inc. (Shoenberg Temperate House), George I. Barnett (Linnaean House), Hellmuth, Obata, and Kassabaum (Ridgway Visitor Center)

Director: Dr. Peter H. Raven

Plant Records Officer: Rebecca Sucher

Area: 32 hectares

Opening Date: Gardens 1859, Linnaean House 1882, Climatron 1960, Ridgway

Visitor Center 1982, Children's Garden 2006

Context

The Missouri Botanical Garden was founded in 1859 by Henry Shaw and was, from its inception, a public botanic garden – a place to study and display plants. The mission statement of the Garden reads, “To discover and share knowledge about plants and their environment, in order to preserve and enrich life” (www.mobot.org). The Garden set out to do just that and continues to today. Henry Shaw, 40 years after his arrival from England, vowed to the city of St. Louis that the land would always remain a botanical garden (Schuster, 2007, p. 268). Shaw, sharing his friend's and botanical advisor's enthusiasm for St. Louis, envisioned the city's potential as a centre for civilization and education (Grove, 2005, p. 47). Henry Shaw believed that a botanic garden should be, “for all classes of society, considered an object of interest, of instruction, and amusement ... horticulture and botanical science will thus contribute to the promotion of pure taste and pleasant recreation” (Grove, 2005, p. 47). Shaw traveled extensively in Europe and was heavily influenced by the great botanic gardens there and their majestic glasshouses. Particularly fascinated with the Royal Botanic Gardens at Kew, he modeled the Missouri Botanical Gardens after them, calling the new garden in St. Louis a “Kew in miniature” (Grove, 2005, p. 47). One of the oldest botanic gardens in continuous operation in the United States, the Missouri Botanical Garden has remained a gift to the city's residents and a historical landmark. Referred to as ‘Shaw's Garden’ by local residents, the Garden is still home to Shaw's original estate from 1850 (www.mobot.org). Now a historical interpretive centre, the house is a museum offering tours and information on how the Garden started and evolved over time. Shortly after Shaw began development of the Garden in 1851 news reached Dr. George Englemann, a German physician-botanist who had come to the United States

several decades earlier (Schuster, 2007, p. 268). He persuaded Shaw to include a herbarium and a library in his garden, making the Missouri Botanical Garden a leader in education and research to this day (Schuster, 2007, p. 268). The Garden celebrates its sesquicentennial anniversary this year, 2009.

The grounds of the Missouri Botanical Garden feature gardens, modern and traditional, and living collections of major groups of ornamental and practical plants. Greenhouses and conservatories display collections of exotic plants from around the world. In particular the Linnaean House features a large collection of camellias and the Climatron boasts having one of the world's largest collections of rare and endangered orchids (www.mobot.org). Special collections in the garden include: Arizoaceae, Araceae, Asclepiadaceae, Cactaceae, Euphorbiaceae, Nymphaeaceae, Orchidaceae, Camellia (11 spp., 86 taxa), Haworthia (44 spp.), Ilex (16 spp.), Iris (144 taxa), Quercus (21 spp., 21 taxa), Rhododendron (60 spp., 98 taxa), and *Rosa mediterranean* (www.bgci.org). The number of living plant accessions include 31,388 with 15,649 taxa in cultivation (www.bgci.org).

Out of the 32 hectares of the Garden, 14 are devoted to North America's largest Japanese Strolling Garden (www.mobot.org). The Garden experiences approximately 750,000 visitors a year (www.bgci.org). The Missouri Botanical Garden also has a satellite garden, the Shaw Nature Preserve, formerly known as the Shaw Arboretum. The Preserve encompasses 1,000 hectares of land and includes natural Ozark landscapes and managed plant collections (www.shawnature.org).

Sections of the garden include: the Magnolia Grove, the Gladney Rose Garden, the Ottoman Garden, the Sensory Garden, the Hosta Garden, the Blub Gardens, the Iris Garden, the Dry Streambed Garden, the Daylily Garden, the Victorian Garden, the German Garden, the English Woodland Garden, the Japanese Garden, the Boxwood Garden, the Lehmann Rose Garden, the Chinese Garden, the Center for Home Gardening, the Children's Garden, the Dwarf Conifer Garden, the Rock

Garden, the Azalea – Rhododendron Garden, and the Climatron, the Temperate House, and the Linnaean House (www.mobot.org).

Garden Sections

The Children's Garden features hands-on learning and is geared towards family fun. An additional admission of \$3.00 (USD) for children between the ages of 6-12 is charged. This garden offers different 'discovery paths' for children to choose from upon entry. These include: the Settler's Path, the Botanist's Path, the Adventurer's Path, and the Discoverer's Path, each offering a unique experience through this garden. Features also include 'Germination Stations' that are interpreter-led experiences through this garden, family backpacks to explore the garden with, and themed exhibits engaging children in a hands-on manner. Here, children learn about pollination biology, where our food comes from, and how a wetland works.

The William T. Kemper Center for Home Gardening is the nation's most comprehensive resource centre for gardening information and includes 23 residential scale demonstration gardens (Schuster, 2007, p. 270). The Center features on-staff experts, adult education classes, a reference library and website, and over 3 hectares of display gardens. It is, as the garden suggests, the largest and best-supplied gardener's resource in the United States (www.mobot.org).

Also worth noting is the Garden's orchid collection. The Missouri Botanical Garden has a long and proud history of involvement with orchids. The first specimens were given to Henry Shaw in 1876 and the collection has grown steadily through gifts and collecting. In 1954, St. Louis was the site of the 1st World Orchid Congress. Emphasis has been placed on the most extensive genera – *Cattleya*, *Laelia*, *Epidendrum*, *Oncidium*, and *Paphiopedilum* because they can survive the hot and humid St. Louis summers, and offer a diversity of colour and form (www.mobot.org).

The Climatron is one of the most celebrated features of the Garden. Built in 1960

1. Linnean House
2. Magnolia Grove
3. Gladney Rose Garden
4. Ottoman Garden
5. Sensory Garden
6. Hosta Garden
- 7-8. Blub Gardens
9. Spink Pavilion
10. Iris Garden
11. Dry Streambed Garden
12. Daylily Garden
13. Mausoleum
14. Tower Grove House
15. Victorian Garden
16. Observatory
17. Maze
18. German Garden
19. English Woodland Garden
20. Japanese Garden
21. Carver Garden
22. Boxwood Garden
23. Lehmann Rose Garden
24. Chinese Garden
25. Centre for Home Gardening
26. Children's Garden
27. Climatron
28. Dwarf conifer Garden
29. Rock Garden
30. Temperate House
31. Azalea-Rhododendron Garden
32. Parking



Plan of the Missouri Botanical Garden
(Sketch by Author)

William T. Kemper Center for
Home Gardening





View of the Climatron

and taking up ½ acre, this was the first geodesic dome to be used as a greenhouse (Oldfield, 2007, p. 109). The design won the 1961 Reynolds Award, an award for architectural excellence in a structure using aluminum and was also named one of the most significant architectural achievements in United States history in 1976 (www.mobot.org). The term 'Climatron' was coined to emphasize the climate-control technology of the greenhouse dome. The dome was inspired by the designs of R. Buckminster Fuller and houses over 2,800 tropical plants such as bananas, cacao, coffee, ferns, orchids and other epiphytes (www.mobot.org). Several pools and waterfalls give a sense of lushness, immersing the visitor in a tropical rainforest setting. The Climatron has no interior support and no columns from floor to ceiling, allowing more light and space per square foot for plants than conventional designs. It rises 21m (70 feet) in the centre and spans 53m (175 feet) in diameter at the base (www.mobot.org). The temperature is controlled by a computerized climate control system ranging from 18°C (64°F) at night to a high of 29°C (84°F) during the day. The average humidity is 85% (www.mobot.org). A ground-level entrance and energy-conserving automatic doors make the entire Climatron accessible to disabled visitors. The Shoenberg Temperate House abuts the north side of the building.

The Shoenberg Temperate House features plants from the Mediterranean and has a Moorish garden as its centrepiece. Dedicated in 1990, the house replaced the 1913 Mediterranean House that occupied the same site (www.mobot.org). The new house is glazed with the same low-emissivity, energy-efficient glass used in the Climatron, and its southward-sloping roof allows for the maximum penetration of the sun's rays. A computerized climate control system maintains the house at temperatures between 4°C (40°F) and 32°C (90°F) (www.mobot.org). There are over 8,000 square feet of displays of warm temperate-zone species which include coastal California, the central coast of Chile, the Mediterranean Sea basin, the Cape region of South Africa, and the southern and western United States (www.mobot.org). Another portion of the house features warm temperate zones of Japan, China, and Korea.



Left: Orchid Collection inside the Climatron
Bottom: Tropical plants inside the Climatron



The Linnaean House, built in 1882, was originally designed as an 'orangery'. The house underwent a major renovation shortly after World War I, its purpose shifting from a warm overwintering house to a cool display greenhouse. Plantings include many conifers, heaths, azaleas, rhododendrons, and a large collection of camellias (www.mobot.org). During the winter months the temperature ranges from 5°C (42°F) to 15°C (60°F). The house is whitewashed in the summer months to shade the camellias. The whitewash gradually wears off in the rain and snow, providing the house with sunshine to warm the winter visitors and prevent freezing (www.mobot.org).

In addition to the Garden's collections and greenhouses, the Garden is also a major centre for botanical research, science education, and conservation. The herbarium has over 6 million specimens with over 5.5 million accessions of ferns, conifers, and flowering plants and 500,000 specimens of mosses, making it the second largest botanical garden in the United States (the New York Botanical Garden is the first) (www.bgci.org). The herbarium is known as an outstanding international research resource with a major emphasis on the New World and African tropics, as well as western and central North America (www.mobot.org). Approximately 123,000 mounted specimens are added each year to the collection through the exploration and collecting activities of the Garden's botanists and of collaborating institutions in countries such as Bolivia, Ecuador, Peru, Nicaragua, and Panama for example (www.mobot.org). The William L. Brown Center facilitates these endeavours. The Garden's conservation work also includes the establishment of the Center for Plant Conservation (CPC), a powerful force for the conservation of US native plants that works to conserve and restore the rare native plants of the United States (Oldfield, 2007, p. 36). The CPC consists of a network of 33 participating institutions located through the country, from Hawaii to Massachusetts (Oldfield, 2007, p. 36). In addition, the Center for Conservation and Sustainable Development (CCSD) explores and implements new, science-based approaches to the conservation and sustainable use of plant diversity. Operating under the auspices of the Garden and as a part of its division of Science and Conservation, CCSD builds upon the



Inside the Linnaean House

Garden's institutional expertise, scientific programs, influence, and resources (www.mobot.org). Lastly, the Garden is home to the Monsanto Center, the Garden's research facility opened in 1997 and joins the Commerce Bank Center for Science Education (CBEC) which contributes to the Garden's expanding educational programming (www.mobot.org). The Missouri Botanical Garden is committed to its science research, education, and conservation mandate.

Site Analysis

Upon entering the Garden one gets a sense of Henry Shaw's original vision for the Garden. The Ridgway Visitor Center, inspired by the Crystal Palace of the 1851 Great Exhibition in London, evokes a 'Kew in Miniature' as Shaw had intended (www.mobot.org). Walking through the Garden's 32 hectares, one is educated, delighted, and inspired. The plant collections offer a spectacle for the senses and include newer types of gardens such as the Children's Garden, the Center for Home Gardening, and the Sensory Garden. The Missouri Botanical Garden offers something for everyone and changes throughout the year, over the years. Festivals and events keep the public coming back to the garden as themes change from year to year. The Garden also offers itself up for private events such as weddings, functions, and birthdays. The Climatron is a landmark and inspiration for future new botanic gardens (the Eden Project is strikingly similar). Most importantly, the Garden's message of education, research, and conservation is delivered not only in its interpretive signage and design of the Garden, but also in its leading-edge research facilities and work. Most research and learning facilities are housed right in the Garden giving the visitor a glimpse of the 'behind-the-scenes' work that the Garden is renowned for. Known as a world leader in research, the Missouri Botanical Garden strives to maintain this message throughout its Garden displays, use, and design.

Despite the Garden's research and education efforts as well as its ability to generate a large number of visitors each year, the Garden fails to represent one of its most

important features - its orchid collection. The Garden is touted as having “one of the world’s largest collections of rare and endangered orchids” (www.bgci.org), yet they seem to be missing from the Garden. The collection is, for the most part, housed in the Climatron. However, only a small number of orchids are present there – certainly not an accurate representation of a large orchid collection. The orchids are dispersed throughout the Climatron with nothing acknowledging their presence in the tropical plant collection housed there. Because of this, the orchids tend to blend in to their surroundings and to a visitor not familiar with orchids, they might miss them all together. A small cluster of orchids in flower are denoted with a tiny black plaque that describes the orchid genus. This does not do the collection justice as the orchid collection is not treated at anything special or unique in the Garden. Visitors not looking for this collection of “rare and endangered” orchids probably don’t know it exists. Furthermore, this failure to display the orchid collection in a convincing manner disregards the Garden’s rich history of orchid collections and involvement in the orchid world. Perhaps this failure is due to the Garden’s untrained staff that has taken over the orchid collections or due to a lack of staff altogether. One can only speculate as to why the Garden’s once magnificent orchid collection has slowly declined and decreased in number. Trained, knowledgeable staff is key to maintaining a rare and endangered orchid collection and proper signage and acknowledgement of this collection would surely set it apart in the densely vegetated Climatron. For a botanic garden to boast such a claim as having a large rare and endangered orchid collection, it should do something to honour and respect that.

Case Study Analysis Two: The Eden Project

Location: Cornwall, England, United Kingdom

Brief: Botanical institute for education, research and public attraction

Previous Land Use: China clay pit
Client: The Eden Project, Tim Smit (chief executive director)
Landscape Architect: Land Use Consultants, Dominic Cole, Lucas Greysmith, Jane MacCuish
Architect: Grimshaw Architects (Formerly Nicholas Grimshaw & Partners), Andrew Whalley, AIA, Jolyon Brewis, David Kirkland, Michael Pawlyn, Perry Hooper, Bill Horgan
Project Manager and Cost Consultant: Davis Langdon & Everest
Planning Supervisor: Waterman Burrow Crocker
Horticultural Director: Peter Thoday
Plant Procurement Coordinator: Tom Keay
Structural Engineer: Anthony Hunt Associates
Services Engineer: Ove Arup & Partners
Contractor: McAlpine Joint Venture
Area: 15 hectares (outdoor gardens), 2.2 hectares (biomes)
Cost: £65 million (approx. \$125,000,000 CAN dollars)
Opening Date: May, 2000 (visitor centre), March 17, 2001 (full site)

Context

The Eden Project, a showcase for global biodiversity, has been acclaimed as one of the most innovative and high-profile Millennium Projects – part of the National Lottery-inspired collection of good causes funded by the Millennium Commission (Yoshida, 2001, p. 4). It has also been the subject of much scrutiny and review by the press. Conceived as a place where the public could reconnect with its local and global environment, the Eden Project is the largest plant enclosure in the world, built in the lightest and most ecological way possible. The Eden Project, built in a former China clay pit, encompasses 15 hectares of landscaped area and includes two major biomes, the Mediterranean biome and the Rainforest biome. A green roofed 'link building' connects the two biomes together (Yoshida, 2001, p. 4). The site also includes a Visitor's Centre upon arrival, a newly constructed education

centre called the 'Core', and what is termed the 'outdoor biome' or outdoor gardens to complement the biomes (McLeod, 2008, p. 84). The total footprint of Eden is approximately 50 hectares and 60m (197 feet) at the deepest point in the pit (Holden, 2002, p. 57).

The concept behind Eden is human responsibility for the ethical use, management and conservation of plants across the globe, regardless of climate or continent (Fieldhouse, 2001, p. 25). Eden's mission statement reads, "to promote the understanding and responsible management of the vital relationship between



Aerial View of the Eden Project
(Source: Landscape Institute, 2003. p. 24)



Plan of the Eden Project
(Source: Grimshaw, 2003, p. 101)

plants, people, and resources leading to a sustainable future for all" (www.bgci.org). The Eden project aims to communicate its story through a 'living theatre of plants and people'.

The location of Eden can be attributed to many factors. In 1994 Tim Smit and horticulturists Philip McMillan and Peter Thoday proposed the idea of a 'living theatre', a place to display the world's flora - horticulture, agriculture, and forestry (Holden, 2002, p. 56). This developed into an idea to show both wild and cultivated plants in a range of exotic climate houses as well as establishing a contemporary, outdoor temperate garden. In 1991 Smit, McMillan, and Thoday collaborated on a garden project in Cornwall, the restoration of the Victorian "Lost Gardens of Heligan" a few miles to the east of the current site of Eden (Holden, 2002, p. 56). The garden was a precursor for Eden as it proved to be quite a successful tourist attraction and provided year-round employment for substantial numbers of people in Cornwall (Grimshaw, 2003, p. 7). The success of the Heligan project convinced Smit that the region could support something much larger and more ambitious. The climate also played a role in where Eden was located. Near Cornwall, Eden experiences some of the warmest temperatures of the British Isles and is situated in a protected valley that produces energy savings (Grimshaw, 2003, p. 7). Many people holiday here, which in terms of Eden would provide a captive audience and an alternative attraction to the beach. In addition to this ideal location was the history of the area that fed into Eden's concept and mission. The historical ports of Cornwall were the first landfalls encountered by many 18th and 19th century sea captains returning from botanical explorations with numerous collected plant specimens (Grimshaw, 2003, p. 7). The stories that Eden tells reflect on this history.

Envisioning a 21st century version of the glasshouses of Kew and of the 18th and 19th centuries, Grimshaw Architects (formerly Nicholas Grimshaw & Partners) was chosen by Tim Smit for their expertise in large-span glazed enclosures. In particular the Waterloo International Terminal in London by Grimshaw was looked upon as a solution and response to the contours of the China clay pit that would

later become the Eden Project. However, preliminary studies of this design solution (leaning glass panels against the walls of the pit contours) did not prove a good fit. Furthermore, as excavations took place, areas of China clay were exposed and thus extracted, constantly changing the shape of the pit (Grimshaw, 2003, p. 22). And finally in an attempt to get the 'grand plan' for the Eden project off the ground, funding fell through as the initial idea cost of £106m was twice rejected by the Millennium Commission (Grimshaw, 2003, p. 20). Funding was eventually secured in 1997 with the Millennium Commission agreeing to grant £37.5m. The European Union Regional Fund followed with a grant of £10m, and bankers lent £18m (Holden, 2002, p. 57). Despite the initial lack of funding and support, Eden owes some of its success to these early setbacks. Because of these setbacks, Eden's team was forced to edit and revisit design ideas strengthening the concept and design of Eden (Grimshaw, 2003, p. 20). Out of these problems came one of many solutions, the geodesic domes. The adaptability of the domes suited the changing contours of the site and maximized the use of space.

Eden faced many problems in its early days of construction. Problems of slope stabilization, water management, and topsoil issues were all handled in environmentally sound techniques and methods. China clay is loose and unstable, and the decision was made to stabilize it with vegetation supplemented with coconut matting and to avoid sprayed concrete, meshes, or gabions (Holden, 2002, p. 60). In addition, the water table is above floor level in the pit. Water is collected via swale systems and then pumped out or used in irrigation, thus containing the water on site. Additionally, there was no topsoil to begin with so surplus sand and reject clay from two China-clay operations served as the basis, to which was added forestry bark as an organic component for interior soils and composted, domestic green waste outside (Holden, 2002, p. 61).

The Eden Project is home to 2,577 taxa, representing 2,215 species, 1,032 genera, and 3,794 accessions (www.bgci.org). A horticultural staff of 40 manages the collections year-round while 6 full time staff deliver Eden's educational message.

A seed bank, micropropagation and tissue- culture facility are also present on the site (www.bgci.org). Many of Eden's plants were grown only five miles away at Watering Lane Nursery (Keay, 2000, p. 30). Started in October 1997, the nursery provided the opportunity to grow plants which are not commercially available. All plant material is either commercially grown or sourced through other botanic gardens through the Index Seminum system, a system through which botanic gardens keep a record of all plants in their collections and offer an exchange (Keay, 2000, p. 31). Seed of non-commercial crop plants was obtained from Britain's genetic resource centres, such as the John Innes Institute, Scottish Crop Research Institute, and Horticultural Research International (Keay, 2000, p. 31). The plant exhibits display a vast array of economic plants and their various uses such as food, fibre, fuel, medicines, perfumes, and so on. Other exhibits focus on conservation issues and ecological habitats, and some of the plant displays are purely ornamental, adding structure and contrast (Keay, 2000, p. 30).



View of the Biomes from the Visitors' Centre
(Photograph by "Wigulf" made available under the Creative Commons License: Attribution 2.5)



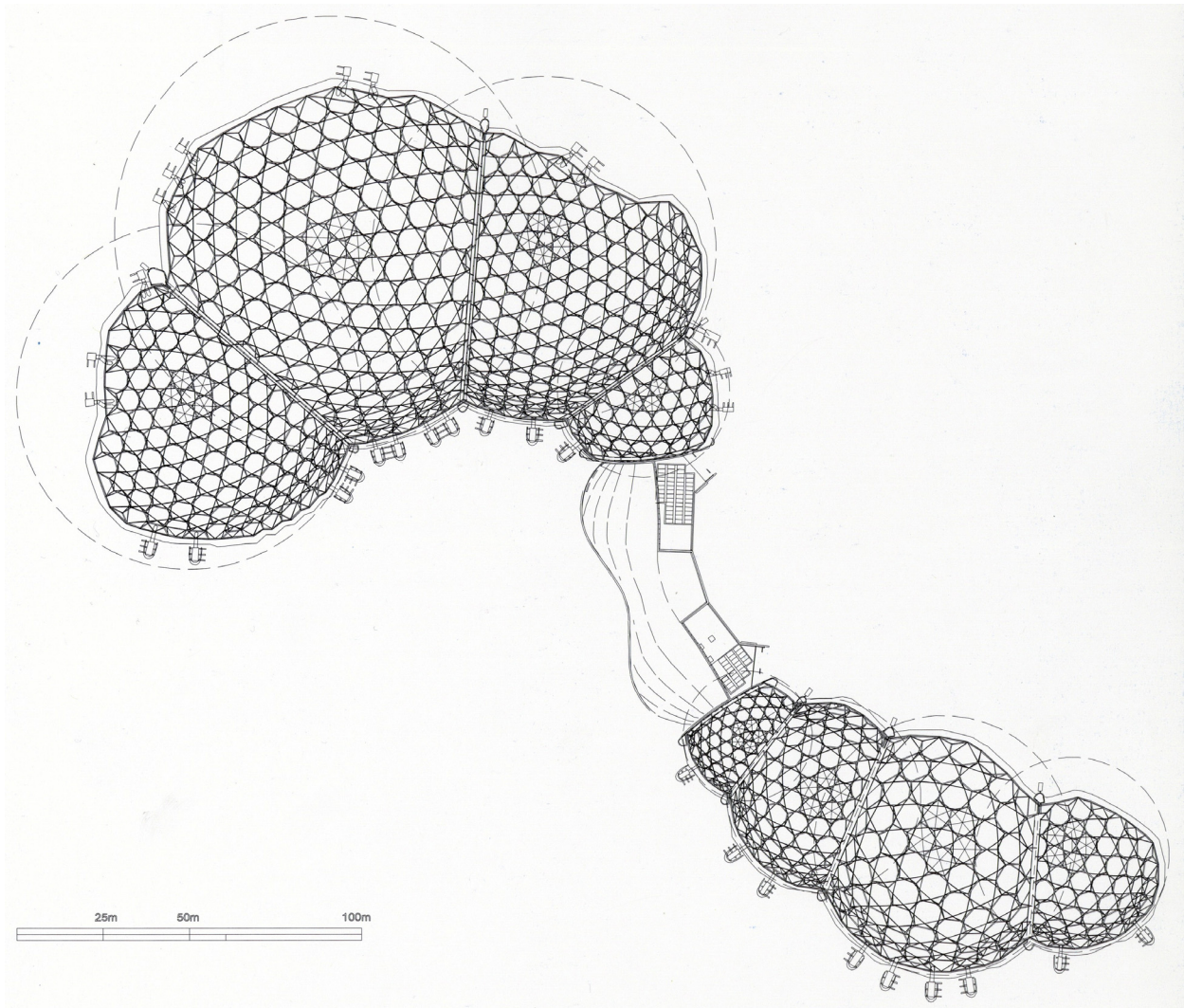
The Outdoor Gardens
at Eden
(Photograph by Alan Tate)

Outdoor Biome

The outdoor gardens or 'outdoor biome' as it is called at Eden, comprises three-quarters of the whole of the site's plantings. Dominic Cole and Peter Thoday designed the outdoor gardens to reflect shape, colour, texture, and shadow (Fieldhouse, 2001, p. 27). Cole comments on the design of the outdoor gardens that there is a danger that people would think of Eden and all they would remember was the biomes: "The biomes might have become visually too dominant – very exciting, but as a visitor you only see 50 per cent of them at any one time. We created a path structure in proportion and a large pool to maximize the reflective qualities of the biomes." (Fieldhouse, 2001, p. 27). The overall idea for the design of the outdoor gardens was to reflect a "mesh of references working as a picture" (Fieldhouse, 2001, p. 28). Many of the outdoor landscape plants have come from local nurseries in the southwest of England that were already acclimatized to the conditions at Eden (Keay, 2000, p. 31). The outdoor gardens encompass an area of 13 hectares and display over 1,890 different species and plant cultivars (www.edenproject.com).

Biomes

The Eden Project defines a biome as a, "climatically and geographically defined area of ecologically similar communities of plants, animals, and soil organisms, often referred to as ecosystems" (www.edenproject.com). The biomes house only one-quarter of Eden's plantings (www.edenproject.com). These 8 inter-linked domes range in size from 18m (60 feet) to 65m (213 feet) in radius and have a footprint of 2.2 hectares (Yoshida, 2001, p. 3). This range in size accommodates the varying heights of plant life housed within the biomes. The exact location of the biomes on site was determined by solar modeling, "a sophisticated technique that indicates where structures will benefit most from passive solar gain" (Yoshida, 2001, p. 4). The domes are constructed out of an innovative technology engineered by FOILTEC, headquartered in Germany with offices in the U.S. and London, using its unique Texlon Transparent Roof System of relatively thin tubular steel



Plan of the Biomes
(Source: Grimshaw,
2003, p. 76)

frames that are infilled with hexagonal-shaped pillows made of DYNEON ETFE (ethyltetrafluoroethylene) film (Russell, 2002, p. 96). Despite their light and fragile appearance, the domes are engineered to endure the elements in Cornwall. FOILTEC designed the domes to withstand a wind suction load of 45 pounds per square foot and a snow load of 65 pounds per square foot (Russell, 2002, p. 96). The pillows are made from three layers of ETFE with the interior layer 0.1mm thick, and the middle and outer layers 0.2mm thick (Russell, 2002, 96). The air between the layers of foil provides a highly efficient thermal insulation for the domes. It should also be noted that, unlike glass, ETFE film is self-cleaning, meaning all exterior dirt is washed off by rainfall (Russell, 2002, p. 96). In addition to this, the roof weighs only one percent of a comparable roof made of glass, ETFE is extremely hard-wearing and cheaper than Teflon, and the roof is permeable to UV rays while maintaining a resistance to deterioration due to sunlight or lack of maintenance for about twenty-five years (Paganelli, 2001, p. 18). The whole structure is supported by galvanized steel tubes with six straight segments comprising the hexagonal modules (McLeod, 2008, p. 84). The primary layer is joined to a secondary one by diagonal circular hollow sections at the node points. Structural stability is guaranteed by the meeting of inner and outer structural members to form pinned connections. These are anchored to reinforced concrete strip foundations at the perimeter (McLeod, 2008, p.84).

The rainforest biome includes plants from the humid tropical regions of the world, over 1,290 different species and cultivars, and has an average temperature of 24°C (75°F) and a humidity level of 90% (www.edenproject.com). Tropical plants such as fruiting banana trees, coffee, rubber, bromeliads and orchids, balsa, mahogany, spices, tropical ferns, and giant bamboo are housed here. The stories and interpretation in the rainforest biome aim to connect people and plants on a global level. Economic botany, ethnobotany, and why plants grow where they do are emphasized in the rainforest biome (www.edenproject.com). The massive amounts of water required to create the humid conditions of this biome come from sanitised rainwater (Monem, 2007, p. 242).

Inside Eden's Biomes
(Photographs by Alan Tate)



The Mediterranean biome houses plants from the warm temperate regions of the world. These include the Mediterranean basin, equatorial South Africa, and the Californian landscape. Plants include citrus, olives, herbs and vines, South African proteas and aloes, Californian annuals including poppies and lupines, and shrubs of the chaparral (www.edenproject.com). Inside this biome stories are told of the classic Mediterranean diet of fresh vegetables, fruit, olive oil, and red wine, how the citrus family breeds, how perfumers use plants and how olive oil is made. The biome is 30m (98 feet) high, 6,540 metres-squared, and houses 1,015 species and cultivars. The climate in the biome has a minimum temperature of 9°C (48°F) in the winter and a maximum temperature of 25°C (77°F) in the summer (www.edenproject.com).

There is a proposal for a Dry Tropics Biome that has yet to be built. Preliminary designs have been produced, but funding has yet to materialize.

Buildings

Eden's education centre, also known as the 'Core' has three floors connected via stairs and an elevator. The £15m building serves three functions: as an education centre, with a mission to explain the vital role of plants in the ecosystem; as an exhibition venue for permanent features and temporary exhibits; and as a venue for public events (Finch, 2005, p. 68). The ground floor, which children can reach from outside through a tiny door and down a slide, has exhibitions that focus on the world of plants (www.edenproject.com). The second floor branches out into spaces for exhibitions, films, lectures, and children's workshops. On the third floor is Jo's Café with a terrace view of the biomes (www.edenproject.com). At the centre of the Core lies an 80 tonne silver-grey granite sculpture by Peter Randall-Page named the 'Seed'. It is meant to serve as an object of contemplation and meditation, a still quiet hub; both fossil and seed (www.edenproject.com). The Core is touted as, "one of the most sustainable buildings in the world" (www.edenproject.com). Every effort was put into minimizing its impact on the environment during its construction

and its future use. The roof is created from an intricate web of curved timber beams and is based on the Fibonacci spirals. Copper used in the roof was sourced from a single US mine: Kennecott Utah Copper Company's Bingham Canyon mine, which has amongst the highest environmental and social standards of any copper mine in the world (www.edenproject.com). Sustainable features of the Core include automatic taps in washrooms to save on water usage. Rainwater is collected and used to flush the toilets. Roof runoff is filtered through limestone to remove any copper runoff. Photovoltaic panels on the roof are used to provide electricity to the Core. Walls are insulated with Warmcel (100% recycled newspapers), and buying into green tariff is sought after for extra power needs (www.edenproject.com).

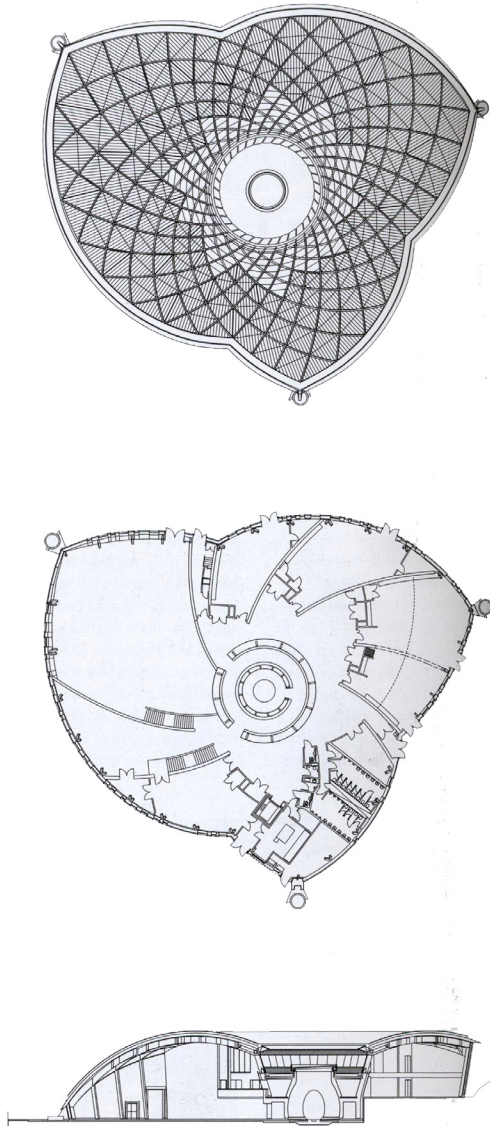
The Biome Link building is the entry point into Eden's two major Biomes. This building links the two biomes, creating an entry into the complex. It is essentially two structures in one: a front-facing public facility, incorporating a raised walkway into the biomes, and a two-storey service area to the rear (Yoshida, 2001, p. 4). The roof plane is warped at both ends, and its profile steel decking supports a green roof system. Access is by way of a path that winds down through this zone from the Visitors' Centre.

The Visitors' Centre Entryway
(Source: Grimshaw, 2003, p. 94)

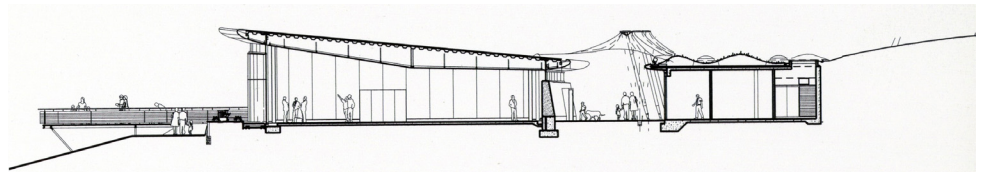


The Visitors' Centre is located at the apex of the site. It is primarily an educational facility, with multimedia exhibits serving to introduce the aims and objectives of the project (Yoshida, 2001, p. 4). The building dramatically curves to fit the contours of the quarry and thrusts outwards, offering a panoramic view of the biomes. The Visitors' Centre consists of a single-storey building linked by a partially covered courtyard. To the south, the roof surface (a steel deck capped with aluminum) forms an overhang that shelters a rammed-earth elevation (Yoshida, 2001, p. 4).

The Eden Foundation was completed at the end of 2002 and designed to provide a comfortable working environment for Eden staff (Grimshaw, 2003, p. 28). The building, located to the north of the biomes, is simply a timber box wrapped inside a lightweight metal skin and is both naturally ventilated and lit. The Eden Foundation



Left: The 'Core' building in plan and section
Bottom: Elevational view of the Visitors' Centre
(Source: Grimshaw, 2003, p. 89)



along with the Core and the proposed new Dry Tropics Biome should not be looked upon as 'add-ons'. Instead, it puts back into the mix the original proposals set out for Eden that were omitted along the way.

Site Analysis

The experience at Eden from arrival to departure is designed to take the visitor through a series of vignettes and stories. As the visitor arrives at Eden they are directed through the Visitors' Centre and given a taste of what is to come as views open onto the pit and to the main attraction, the biomes. According to Grimshaw (2003), "the Visitors' Centre is the first contact with Eden and it underlines the idea that learning is a cornerstone of the project. It informs those arriving about what they are going to see so that they look at things with intelligent eyes" (p.7). If this is indeed what the visitor experiences as they arrive, this 'stage-setting' would allow the visitor to explore Eden and look at the landscapes in a focused way. However, this is not where the experience starts. What the designers fail to address is that the experience starts the minute a person leaves their vehicle or any other means of transportation be it public, or on foot. Most visitors arrive by vehicle, and the parking lot is the first experience at Eden. The parking lot does little to address the concept of Eden and is an uncomfortable walking distance to the entrance, where Eden's experience supposedly starts. On a busy, hot and sunny day, one can imagine the feeling a visitor might have by the time they finally "arrive" at Eden. The designer's should have addressed the visitor's experience from the moment they arrive and not just where they say the arrival should be.

Buzz was created early on in the construction of Eden. In the year before it opened, nearly half a million people paid just to come and see it being built (Grimshaw, 2003, p. 24). When it did finally open at Easter in 2001, crowds in the thousands flocked to see Eden (Holden, 2002, p. 62). This strained the local roads and required that additional parking be added. The Eden Project's website (www.edenproject.com) claims to have a million visitors every year. However, the Botanic Gardens

Conservation International reports a much lower number of 65,535 visitors per year (www.bgci.org). Quite possibly this is because the novelty or 'buzz' is wearing off at the Eden Project, one of the dangers of employing a USP. When a botanic garden relies heavily on 'buzz' or some other sensational gimmick, they run the risk of eventually losing the public's interest and thus a decline in visitor numbers. If Eden had a strong plant collection and the garden spoke for itself, rather than relying on the architectural design of its biomes, perhaps the visitor numbers would still be up at Eden. The design of the landscape and how that informs a botanic garden's plant collections should be the basis on which people keep coming back to the garden again and again. The architecture of a botanic garden should complement the landscape, not define it.

Critiques of the project have focused heavily on the establishment of plant material at Eden, or rather the lack of it. Grimshaw (2003) admits that when it opened in 2001, it was still not really 'finished' in the accepted sense. The outdoor planting was still to take hold, planting in the biomes was not complete, and transportation around the site was somewhat rudimentary. In *An Unsustainable Attraction*, Neil Spiller (2001) comments, "the whole thing has been opened too early, only half of it is there and what is there was planted yesterday" (p.104). Of course it takes time to establish a great botanical and ecological collection and perhaps this criticism is too much in haste. Perhaps the public should be presented with a landscape in progress and realize that plants need time to grow and establish themselves, rather than a quick fix of re-vegetation. Grimshaw (2003) states that, "the opening date was just a staging post" and that, "Eden was intended to grow and mature in three ways: through the growth of plants, through the growth of buildings and landscape, and through the growing international awareness of Eden as an enabling ecological device" (p.14). Other peer reviews revere Eden as a great success. Winner of the inaugural Landscape Institute Peter Youngman Award for Landscape in 2006, the Eden Project has enjoyed astonishing success since it opened in 2001. It has attracted more than 8 million visitors and is said to have generated £800m for the regional economy in the past six years (Landscape Institute, 2007, p. 25). Jane

Knight, landscape project manager for the Eden project, is a supporter of Eden. Jane says, "I think its success is due not just to its iconic architecture, but also to the drama and boldness of the landscape. It helps draw people here and I believe people are not disappointed when they leave" (Landscape Institute, 2007, p. 25). Neil Spiller (2001) as mentioned above would strongly disagree. He has criticized Eden as being "a massive failure" (p.104). Spiller (2001) complains that upon entering the biomes the disappointment is all-consuming. There is no information, no creative jumps, just signs that include what a plant can be used for (Spiller, 2001, p. 104). He goes on to attack local artists declaring, "alas, as we all should know, contemporary English artists are mostly unimaginative, literal and intellectually unambitious" (p.104). Furthermore, Spiller (2001) believes that the mission statement has been lost, he learned nothing while at Eden, and the 'dumbing down' has gone too far. After complaining about the Greek taverna fonts used, Spiller (2001) does make one remark worth noting – the pathways through the domes are too narrow, badly planned, and congested. Perhaps this is worth overlooking as the President of the Landscape Institute, Nigel Thorne, says of the scheme: "It is one of the most significant projects that has ever happened in this country. It's an exemplar of multidisciplinary working. Although this is a project that has received plaudits before from many quarters, I still don't think we've praised it enough for what it is, what it does and for its engagement with the landscape" (Landscape Institute, 2007, p. 25). The majority of praise for Eden comes from its creators and supporters. A lot of this praise, not surprisingly, focuses on the architecture of Eden rather than on its landscape. The biomes do nothing to engage with the landscape and in fact deny the history of this landscape. Plants are grown under adverse and artificial conditions, and stories are forced onto the landscape as 'one-liners' that do little to entice the visitor to return. This "route march" provides little opportunity for the visitor to explore and discover Eden in new and unique ways. As mentioned previously, a reliance on architects to do the work of landscape architects has proven unsuccessful at Eden. The design of the landscape should be the USP employed to attract visitors, delight as well as educate, and have visitors come back time and time again. Eden reads as more of a theme park than an educational

garden that has strong plant collections to inform and delight the visitor.

Despite Eden's reliance on architecture, and its somewhat varied reviews, the project has been a success in terms of its continued attendance and its conservation efforts. Eden's conservation work and awareness includes initiatives such as Edinburgh's Conifer Conservation Program, the preservation of the Seychellois Coccode-mer, and a training program for researchers working on mangroves (Oldfield, 2007, p. 46). Eden tells the story of how people rely on plants for the necessities and amenities of everyday life, and thereby inspiring a greater concern for the natural world. An integration of science and art, Eden has relied on its stories to educate the public through its site design rather than relying on written words and visual display units. Environmental innovations and the promotion and practice of sustainable living have been demonstrated at Eden. Its early success and numbers have slightly declined since its opening in 2001, yet the numbers today are still of a size worth noting.

Eden has continued to inspire and create new buzz with events such as the 'Eden Sessions' in which the garden is opened to musical acts the likes of Oasis, The Kooks, The Verve, Kaiser Chiefs, Lily Allen, Amy Winehouse, Pet Shop Boys, and Peter Gabriel to name a few. The Eden Sessions, started in 2002, have been a huge success as a means of revenue generation and by bringing people to the garden that might not otherwise make the trip. As one peer review puts it, "Eden's undeniably brilliant technical design, faultless scheduling and time-keeping during construction, and achieved ecological self-sufficiency are undoubtedly the most interesting features of this living theatre of scientific research and education" (Foppiano, 2001, p. 79). The Eden Project is unique in that it raises the question of what contemporary botanic gardens should have, be it recreation, education, or conservation. Regardless of the modern form the botanic garden takes, the Eden Project has a desire to return to nature at the heart of its operations. Built with the luxuries of modernity, the Eden Project has forged a new ecological role for botanic gardens and has created a new dialogue of what a botanic garden can be. Despite

Eden's flaws, the project has proved effective in reinterpreting the botanic garden message, attracting a new audience, and creating a dialogue pertaining to the design of new botanic gardens.

Case Study Analysis Three: Jardín Botánico de Medellín

Location: Medellín, Colombia, South America

Client: Jardín Botánico de Medellín Joaquin Antonio Uribe

Director: Pilar Velilla Moreno

Landscape Architect: Taller de diseño del Jardín Botánico

Architects: Nicolas Hermelin Bravo (coordinator); Juan Diego Mesa (technical director); Plan B, Felipe Mesa, Alejandro Bernal and JPCR, J. Paul Restrepo, Camilo Restrepo (Orquideorama); Santiago Caicedo (Patio de las Azaleas); Ana Elvira Velez, Lorenzo Castro (Cafe del Bosque), Oscar Mesa, Taller de diseño del Jardín Botánico

Collaborators: Viviana Pena, Catalina Patino, Carolina Gutierrez, Jorge Buitrago

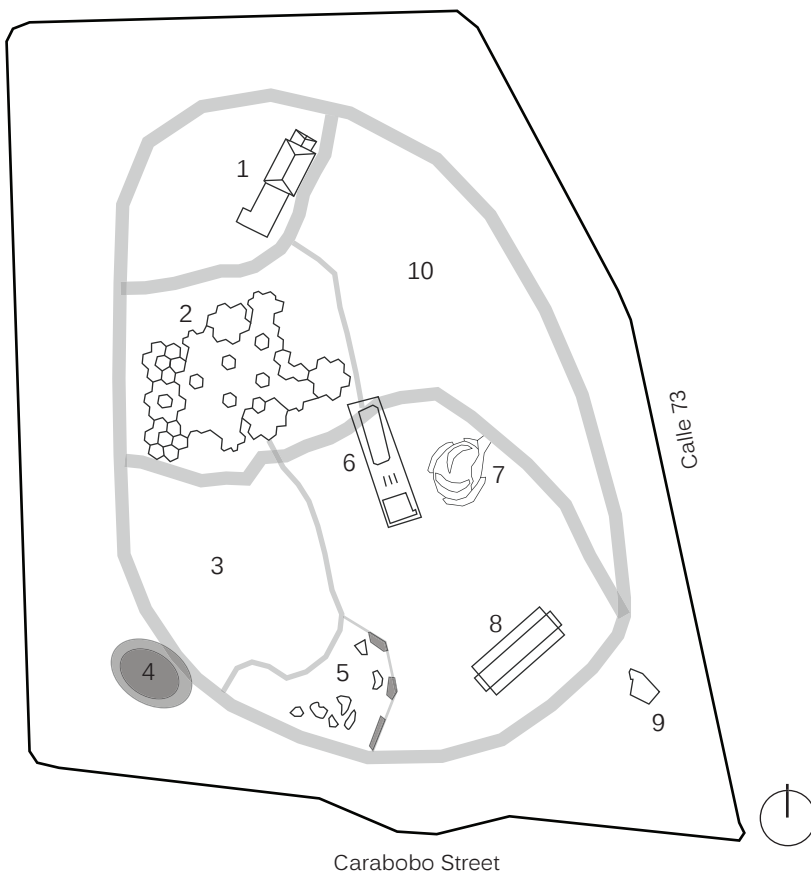
Renovation: 2005-2008

Area: 12 hectares

Costs: 34 million Colombian pesos for the Orquideorama (approx. \$20,000 CAN dollars)

Context

The Jardín Botánico de Medellín Joaquin Antonio Uribe is named after natural scientist Joaquin Antonio Uribe (Bravo, 2008, p. 36). Situated in the north end of the city of Medellín, Colombia, the garden borders onto the Parque Norte and the Explora Museum of Science and Technology to the east and Carabobo Street to the west. This street has been turned into a large avenue leading from north to south, thus covering an area of 32 hectares. Calle (street) 73 runs along its south



1. Patio de las Azaleas
2. Orquideorama
3. Bosque Tropical
4. Cafe del Bosque
5. Jardín de Palmas
6. Teatro al Aire Libre
7. Jardín del desierto
8. Científico
9. Mariposario
10. Laguna

Plan of the Jardín Botánico de Medellín
(Sketch by Author)

perimeter. The botanic garden itself covers 12 hectares of this urban park-like complex (Bravo, 2008, p. 36). The original renovation and design of the park was to be done by one single architect. However, faced with many different issues it was decided that a group of specialists would be brought in for each part of the project. The commission for the park and the Cafe del Bosque was given to national architects Ana Elvira Velez and Lorenzo Castro. The renovation of the *Orquideario* or orchid garden was completed by the architectural firms Plan B and JPCR, who won the competition for their Orquideorama, the heart of the renovated botanic garden and the focus of this case study (Bravo, 2008, p. 37). Architect Oscar Mesa designed a research building dedicated to science, housing equipment for research and education, and for students and researchers that was not previously housed in the gardens (Bravo, 2008, p. 37). The building has a floor size of about 2,400 square metres with possibilities of extension, and houses research equipment as well as a herbarium, laboratory, library, documentation centre, and space for the Garden's administrative body (Bravo, 2008, p. 38). At present a butterfly garden and open-air theatre are under construction.

The renovation of the botanic garden was part of the larger strategic urban project which evolved from the much wider view of the city taken by its Mayor Sergio Fajardo. It was among several strategic landscape projects to rehabilitate Medellín's long-neglected north side: Parque de los Deseos, a new public gathering space for cultural and recreational activities; Parque Norte, a more bucolic and classic park; and Explora, a cultural complex that integrates museums and open spaces (Martignoni, 2008, p. 54). This 32 hectare complex shifts the city centre's limit from Calle 30 in the south to Calle 78 in the north thereby creating a new centre for the city of Medellín and injecting some much needed attention to the city's neglected north. The gardens previously covered 8,000 square metres that were surrounded by a 'fortresslike' concrete wall, more than 10 feet high and covered with graffiti (Martignoni, 2008, p. 52). From 8,000 square metres it has grown into an area of 32 hectares, integrating huge traffic projects and urban open spaces (Bravo, 2008, p. 36).

Garden Collections

The collections of the Garden focus on the local flora from the different regions of the country. Currently, the living collections are being completed by an interdisciplinary team of the Gardens. These collections include the Palm Garden (Jardín de Palmas), the Desert Garden (Jardín del Desierto), the “spontaneous” Forest (Bosque espontaneo), the Laguna, and additionally a series of ornamental gardens throughout the entire area (Bravo, 2008, p. 38). Many of the collections created years ago are currently being improved and completed. Other gardens created by the scientific team will include living samples for educational purposes.



Right: Palm Garden (Jardín de Palmas)
Left: Tropical Forest (Bosque Tropical)
(Source: Bravo, 2008, p. 38)



The 'Orquideorama'

The Orquideorama or orchid garden was constructed to replace the aging and deteriorating *Orquideario*. This area offers a space for all types of events, meetings, conferences and so on. Twenty-four architects in seven groups participated in the competition, and the jury selected a group from JPCR together with the firm Plan B. The Orquideorama was created to house the Garden's orchid collection which was previously housed in an aging metal conservatory. The concept for the Orquideorama grew out of organic shapes that would provide both a shelter for the orchid collection and create a flexible space for outdoor events (Martignoni, 2008, p. 55). In addition it had to be both quick and easy to build. Plan B together with JPCR shared an interest in organic shapes and natural systems, and they were inspired to create a fractal composition, expressed in the overall plan of the roof canopy, and the spiralling hexagonal "trunks" that support it. "When we saw the old orchid garden we were very attracted to the integration of architecture and nature," says Camilo Restrepo of JPCR. "We wanted to apply the kinds of shapes that are represented in natural systems" (Martignoni, 2008, p. 55). He added that when they were invited to create a design, they were attending a local lecture series presented by Spanish biologist Jorge Wagensberg. This lecture inspired the team's thinking and design of the Orquideorama as they began to think about a repetitive module and about the shape of a tree as one that generates repeating modules (Martignoni, 2008, p. 56).

The design is based on a flower-shaped module that is repeated 10 times and expands, creating one roof. Some of the modules house the service areas, while most house the Garden's orchid collection. The "trees" are constructed of wood frames and metal columns that contain rainwater drainpipes and electrical ducts. Each roof petal is made of translucent polycarbonate elements and pine boards, obtained from reforested plantations (Gallanti, 2008, p. 85). The design's geometrical matrix is repeated in the floor pattern of custom-made triangular concrete tiles which also increase local humidity levels, making it suitable for



Flower-shaped modules
in the 'Orquideorama'
(Photography by Kenneth
Helphand)

growing orchids (Gallanti, 2008, p. 85).

Each hexagonal “trunk” is rotated slightly counter clockwise from the one below. From the canopy, each 6-metre-high “tree” tapers into a ground-level structure that exhibits the orchids, creating a space of approximately 20 square metres. The entire structure occupies a 4,200-square-metre area (Martignoni, 2008, p. 55).

The Orquideorama is intended as a venue both for temporary exhibitions of native flora and for public meetings and socializing. The area creates a blurring of indoors and outdoors with sequential clustering and offers differing scales. The space offers protection from the elements while creating a regulating area for humidity, temperature, and rainwater drainage (Gallanti, 2008, p. 85). The Orquideorama is also often used at night as a venue for events, performances, dj sets, and concerts (Gallanti, 2008, p. 90). The striking architecture of the Orquideorama blends with its surroundings, creating both a melding of organic and built form and serving as a landmark for the garden. These “fractals of nature” have revitalized the garden and created a landmark and attraction within the city of Medellín.

Fence



Fence in the Botanic Garden
(Photograph by “XalD” made available
under the Creative Commons License:
Attribution 3.0)

Before the renovation of the garden was undertaken in 2005, a 3-metre-high fence screened views into and out of the garden serving as a barrier in the city’s run-down north end. The redesign of the fence was done by Lorenzo Castro and Ana Elvira Velez with a focus on creating transparency between the garden and the city. In 2005 the city knocked down the unsightly barrier – an event locally known as “the fall of the wall” – and replaced it with a nearly transparent screen fence that allows passersby to share the sights and smells of the garden (Martignoni, 2008, p. 52). Lorenzo Castro’s and Ana Elvira Velez’s design of the fence introduces a bold graphic element to the garden with a repeating series of slanting steel beams between vertical posts framing wire-mesh panels. The fence is painted black and constructed in units that rise and fall with the undulating surface of the land

(Martignoni, 2008, p. 54). Because of the wall's symbolic value, it is seen as the garden's first real integration with the city.

Site Analysis

The renovation and design of the Jardín Botánico de Medellín has not only rejuvenated the garden itself but has also revitalized the area surrounding it. The redesign of the orchid house has created a landmark for the garden and for the city of Medellín as well. People from affluent neighbourhoods would not have even thought of visiting the city's violent and dangerous north end. However, the redesign of the area and of the garden has injected some much needed care into this area. Unlike the Eden Project, the Orquideorama is an eloquent space that integrates natural and built forms, blurring the boundaries between indoors and out, between architecture and landscape. However, orchids still have yet to establish themselves on these structures. Perhaps the structures of the Orquideorama were intended as display areas where plants are rotated as they flower, rather than an actual growing medium for the orchids. In addition, the garden staff has had to add shadecloth to the structures as an added measure against the strong equatorial sun. The space is well used in the garden not only for its orchid collection but as well for social events and festivals. The repeating patterns of "tree-flowers" create a functional space as well providing shelter against the elements and creating a micro-climate that regulates the environment for the optimal growing of orchids. The distinct beauty of the Orquideorama serves as an attraction and tourist destination for visitors from around the country and around the world. People come to see this structure and marvel at its innovation and beauty.

In addition to the Orquideorama, the redesign of the garden's fence has also played an important role in the city's rejuvenation of the north end. No longer a barrier between the garden and the neighbourhood, people passing by are now able to enjoy the garden from outside its walls. This was an important step in integrating the garden with the city not only physically, but socially.



This botanic garden displays innovation in technology in the design of the Orquideorama which also provides a once run-down area with a new landmark that revitalizes the neighbourhood. The Orquideorama is well used not only for plant related events but also for social events and activities. The garden is well received by its community and has helped to reshape the city's neglected north end into a revitalized urban space. Showing interest and initiative in scientific research the garden strives to promote its message of conservation with orchids at the forefront.

Gardens at a Glance

Jardín Botánico de Quito

Location: Quito, Ecuador, South America

Client: City of Quito, Parque La Carolina

Landscape Architect: Mónica de Navarro and the collaboration of Shannon Smith and Judith Parker from the Missouri Botanical Garden

Collaborators: Héctor Pastor, Esteban Sevilla, Alvaro Ponce, Edgar Villareal, Yolanda Herdoiza (Natural Science Museum of Ecuador)

Area: approximately 3 hectares

Opening Date: 2004

Context

The Jardín Botánico de Quito was founded in 1989 by a group of scientists concerned with the immense habitat loss and destruction occurring in Ecuador. Also of concern was the inadequate scientific and cultural knowledge of Ecuadorian natural heritage. Most flowering plants found in Ecuador have been

Opposite Page: Shade cloth provides added protection against the elements
(Photography by Kenneth Helphand)

introduced from places like Africa, Asia, or Europe. Most Ecuadorians do not know that these plants are not indigenous to Ecuador (www.codeso.com). The City of Quito, the Natural Science Museum of Ecuador, and the Quito Garden Club proposed a botanic garden in order to address these concerns (www.bgci.org). The Fundacion Botanica de Los Andes (Andes Botanical Foundation) was established to commission the garden and serve as its administration and management.

The Garden is located in the north end of the city in a large urban park known as Parque La Carolina. The park is home to an insectarium and vivarium located near the botanic garden. A paddle boat lake and skate park are also located in the park. This park receives intense public use and is valued as an important green space in the heart of the city.

The main objective of the Garden is to cultivate, inventory, conserve, reproduce, exhibit, and disseminate knowledge of important botanical species native to the Andes and present them in an aesthetic and creative garden design (www.bgci.org). Here schools can introduce their students to the richness of Ecuador's natural heritage and enrich their education. Furthermore, the aim of the Jardín Botánico de Quito includes saving endangered species *ex situ*, a seed bank for reproduction *in vitro*, and developing new horticultural techniques for growing Ecuador's native plants. The Garden was also created with the expectation that it would become an important tourist attraction in Quito (www.bgci.org).

Garden Collections

Travelers who do not have time to visit all of Ecuador's incredibly diverse habitats can have a notion of them in the Jardín Botánico de Quito. The Garden features collections of genera and species endemic to Ecuador which include a wetland, a cloud forest, a páramo or dry grassland, a dry forest, the greenhouse orchid collection, a dry season plant collection, and a theme garden which includes

brugmansias, fuchsias, tibouchinas, and outdoor orchids. The Garden also includes an ethnobotanical section and rose garden featuring many of the roses Ecuador is known to export. A main feature of the garden is its greenhouses with over 1,200 species of Andean orchids.

Orchid Collection

The greenhouses that house the Garden's orchid collection occupy approximately 1,500 square metres. The Orchidarium is divided into three parts – an area of 185 square metres for warm-growing orchids, an area of 462 square metres for cool-growing orchids, and a covered canopy dividing the two greenhouses for social gatherings and other events held in the garden (www.codeso.com). The Orchidarium is constructed of polycarbonate, and the interior is comprised of volcanic rock and tree fern with pathways of cocoa shell husks. Three cascades are constructed in the Orchidarium and help to increase the humidity levels needed for growing these orchid species. Approximately 3,000 orchid plants were transplanted to the Orchidarium by the Quito Orchid Society and from rescued sites all over Ecuador (i.e. habitat destruction due to road construction). The irrigation system consists of a computerized spraying and fogging system with electronic controls (www.codeso.com).

Site Analysis

Overall, the Jardín Botánico de Quito has accomplished what it originally set out to do – promote public awareness and conservation of Andean plant species. It is a popular tourist attraction and is also visited frequently by local residents and school groups. The addition of this garden into Parque Carolina has added to the richness of the park, and the Garden has benefited from the park's already high use. Another advantage of the Garden has been Ecuador's climate, which has helped to speed up the growth of the collections in a relatively short amount of time. Having visited the Garden in 2006 and again in 2009, I could see that growth was

evident in that three-year interim. The overall design of the Garden is simple and straightforward with one central circuit leading the visitor through all the Garden collections. The use of cisterns and catch basins for collecting the high amount of precipitation Quito receives (800-1100 mm per year vs. Winnipeg at 514 mm per year) is a sustainable design feature of the Garden as it reduces the use of potable water in the Garden (Palmerlee, 2006, p. 386). The use of indigenous plants that are well adapted to the climate also provides an aspect of sustainability to the design. The Orchidarium attracts many visitors both locally and internationally. The design in the Orchidarium is similar to the habitats found in nature, educating the visitor about the ecology of orchids.

Taken as a whole, the Garden is easy to navigate on one major circuit through the Garden. Information signs are dispersed throughout the space adding to the ease of movement through the Garden. One criticism of the Garden would be that these signs are only in Spanish. Since the Garden is intended for an international audience as well as Ecuadorians, bilingual signs would benefit the Garden or interactive displays that communicate the message graphically might also help. The signs are also heavily worn after just five years. The sun and rain in Quito have cracked and bleached many signs which as a consequence, need replacing. In addition, pathways have also been heavily worn and even the slightest slope has led to intense run-off in a climate with high amounts of precipitation. Furthermore, the rose garden has suffered from the rainfall. Ecuador is known as a world leader in the exportation of roses, but unfortunately its rose garden does not live up to this standard. Roses are usually propagated and grown in controlled conditions inside greenhouses in Ecuador. However, the designers have chosen to grow them outdoors, and because of the rain and poor circulation the roses have been infected with powdery mildew, rust, and black spot. Additionally, the Garden seems to lack the presence of any wildlife. Birding is another huge tourist draw to Ecuador. Providing habitat to attract hummingbirds or other such birds would add to the delight experienced in the garden. The Jardín Botánico de Quito's best feature is its orchid collection, but even that must be supplemented with shade cloth outside or grown under greenhouse conditions in the Orchidarium.



Top Left: Cacti Collection
Top Right: Inside the Orchidarium
Bottom Left: Garden Pathway
Bottom Right: Garden Pathway



Singapore Botanic Gardens

Location: Singapore City, Singapore

Director: Dr. Chin See Chung

Plant Records Officer: Dr. Nura Abdul Karim

Area: 64 hectares

Opening Date: 1822

Context

The Singapore Botanic Gardens, located on Government Hill and now a public park as well as an experimental station, were founded by Sir Stamford Raffles in 1822 as a place in which to grow plants that had an important economic role to play in the colonies of the ever-expanding British Empire. The Gardens closed in 1829 and were re-established some 30 years later by the Agri-Horticultural Society who, in 1866, added a further 10 hectares to the Gardens. In 1928, Professor Eric Holttum, Director of the Gardens from 1925-1949, established laboratories and conducted the first experiments in orchid breeding and hybridization, marking an important point in the development of the Garden as a leader in orchid culture. During the mid 1960s the Garden took on a leading role in the greening of Singapore by supplying plant material for its urban landscapes and recreational areas. However, it was in 1990 that the Garden hugely expanded its grounds to include new attractions, such as the Ginger Garden, Evolution Garden, Coolhouse and the Children's Garden. Today, the Garden is expanding yet again to include 9.8 hectares of parkland that will include a learning forest, marshland, and a healing garden. Currently the Garden is home to a herbarium with over 65,000 specimens and a micropropagation and tissue culture facility (www.bgci.org).

Garden Collections

The number of recorded living plant accessions is listed at 12,816 with the number of taxa in cultivation at 7,437 (www.bgci.org). Special collections include tropical trees, shrubs, ornamentals, and fruit trees. The major families in the collection are Acanthaceae, Anacardiaceae, Annonaceae, Apocynaceae, Bignoniaceae, Bombacaceae, Burseraceae, Combretaceae, Dipterocarpaceae, Euphorbiaceae, Moraceae, Myrtaceae, Orchidaceae, Araceae, and Palmae (www.bgci.org). Important collections worth noting are the 'Evolution Garden' and orchid collection.

Evolution Garden

The Evolution Garden serves as an educational attraction centred on the theme that plants are not only beautiful but crucial to the survival of all life. It tells the story of how plants have evolved into the myriad of complex life forms that are present today. The Evolution Garden takes visitors on a journey through time, from ancient times, through the planet of the dinosaurs, and on to the modern world of 250,000 different flowering plants that the world enjoys today (www.bgci.org).

At the entrance to the garden huge columns of stone, known as the 'trees of stone', create a feeling of grandeur and set the mood for the Garden. Across a bridge, the educational journey begins some 4,600 million years ago. As the visitor 'journeys' through the Evolution Garden, they are told an evolutionary story of plants until the present day. Various groups of plants are displayed in an evolutionary sequence along a path sculptured by boulders and terrain change (www.bgci.org). As an educational tool, the Garden offers a unique experience and provides educators with an opportunity to make learning fun.

Orchid Collection

The Garden's first Director, Henry Nicholas Ridley, came to the Gardens in 1888 and worked for the next 23 years to usher the Gardens into the 20th century – its most productive period historically. It was also during Ridley's administration that



Singapore's national flower, *Vanda* Miss Joaquim, was discovered. An Armenian lady, Agnes Joaquim, was in her garden when a new hybrid caught her attention. Thrilled with the beautiful discovery, she rushed to Ridley with the plant. Ridley confirmed that a new orchid hybrid, previously unknown to science that flowered freely year-round, had been discovered (www.sbg.org.sg). As mentioned, in 1928 Professor Eric Holttum, Director of the Gardens from 1925 - 1949, set up laboratories and conducted the first experiments in orchid breeding and hybridization. The results of these experiments were free-flowering and hardy orchid hybrids. Since then, outstanding hybrids have been cultivated in the Gardens and received recognition worldwide (www.sbg.org.sg).

National Orchid Garden

As Singapore orchids gained fame they were used as agents to promote goodwill and foster closer ties among nations. The Singapore Government began to honour State visitors and other VIPs by naming selected orchid hybrids after them. This prized collection of "VIP Orchids" has become an important attraction of the National Orchid Garden in the botanic garden (www.sbg.org.sg). To date, the Garden has named over 100 VIP orchids. The first VIP orchid was *Aranthera* Anne Black in 1956, after Lady Black, wife of a former Governor of Singapore, Sir Robert Black. Other VIP orchids on display include *Dendrobium* Margaret Thatcher, *Renantanda* Akihito, *Dendrobium* Masako Kotaishi Hidenka, *Dendrobium* Asean Beauty, *Dendrobium* Memoria Princess Diana and *Vandaenopsis* Nelson Mandela (www.sbg.org.sg). The Orchidarium, also situated in the National Orchid Garden, houses approximately 400 species in a simulated tropical forest. It holds the garden's species collection.

The Tan Hoon Siang Misthouse contains rare orchid cultivars from the Garden's extensive collection. These award-winning specimens are set amidst a lush setting of tropical foliage and cultural artefacts from centres of orchid distribution from around the world (www.sbg.org.sg).

Opposite Page:
Left: Entrance to the Evolution Garden (Photograph by "Sengkang")
Top Right: The National Orchid Garden (Photography by Claire H.)
Bottom Right: *Phalaenopsis* sp. in the Tan Hoon Siang Misthouse (Photograph by Javier Martini)
(all images made available under the Creative Commons License: Attribution 2.5)

The Cool House encloses a montane tropical forest. Trees and rocks are draped with orchids and carnivorous plants. The cool air, drifting mist, and air circulation provide a representation of high-elevation sites in the tropics (www.sbg.org.sg).

Site Analysis

The Singapore Botanic Gardens provide an invaluable green haven close to the city centre (approximately 3km), attracting over two million visitors each year, more than half of whom are from overseas (Oldfield, 2007, p. 83). The herbarium collection established in 1875 provides one of the most important centres for plant taxonomic research and biodiversity research in southeast Asia. New attractions such as the Evolution Garden, the Children's Garden, and Ginger Garden keep the Garden current as a leading destination. The Gardens are also home to a small tropical rainforest, around 15 acres in size, which is older than the Gardens themselves (Monem, 2007, p. 188). Furthermore, the Garden's orchid collection is one of the world's largest and continues to be a major attraction for many visitors. The outdoor orchid plantings offer spectacular displays of colour and are colour-themed to represent the four seasons of the year. The Singapore Botanic Gardens offer an impressive orchid collection and display innovation in research and conservation efforts.

Jardí Botànic de Barcelona

Location: Barcelona, Spain
Client: Barcelona City Council
Director: Josep Ma. Montserrat i Martí
Landscape Architect: Bet Figueras
Horticulturalist: Artur Bossy
Biologist: Joan Pedrola

Architects: Carlos Ferrater and Josep Lluís Canosa

Area: 15 hectares

Opening Date: 2000

Context

Sitting high up on Mount Montjuïc, where sea and mountains meet, the Jardí Botànic de Barcelona overlooks the city and the Llobregat delta. The Garden is a result of a design competition held by the Barcelona City Council with the objective of creating a new public open space and taking cultural, educational, and scientific aspects into consideration (Figueras, 1999, p. 28). The Garden features collections from the Mediterranean and other Mediterranean climates around the world. Comprised of an interdisciplinary team of architects, a landscape architect, a horticulturist, and a biologist, the Garden is a mix of sharp lines and angles, softened by vegetation. The design of the Garden with its triangular shapes is a logical attempt to take advantage of the site's topographic conditions while creating a new space that showcases vegetation adapted to the climate of Barcelona.

Design

Two fundamental considerations were taken into account when designing the Garden. The first consideration was how to structure the vegetation and second, how to avoid as much earth moving as possible on such a sloping site. The layout was planned according to geographic criteria, grouping the plants according to the world's five Mediterranean regions and the ecologies of those regions. The result was a triangular-shaped network adapted to the available space and to the mountain slopes (www.jardibotanic.bcn.es). The use of triangles and their apices to structure the garden collections creates a series of angular perspectives in the Garden. As Carlos Ferrater explains, "like every fractal, it organizes what is irregular and gives order to what is fragmented" (Ferrarter et al., 2000, p. 60). The paths are paved with concrete and edged with oxidized corten steel, fitting into the



Top Left: Walkway
Detail
Top Right:
Boardwalk in the
Garden
Bottom Right: View
of the Garden's
geometry
Bottom Left: Seating
in the Garden
(Photographs by
Brenda Brown)

topography seamlessly (Ferrarter et al., 2000, p. 60). This distinct geometry is also expressed in the architecture of the garden and its construction details. Seating is accommodated by the placement of elegantly bent stainless steel chairs in groups of threes, pairs, and singles. The placement of these chairs was determined by the architects and landscape architect walking through the Garden and placing chairs where they felt they were needed (Brown, 2001, p. 34). This allowed the designers to place seating in places that optimized the experience of the Garden.

As mentioned, the Garden collections feature plants from the Mediterranean region. In addition they include plants from similar climate regions in Australia, California, the Canary Islands, north Africa, South Africa, and Chile (www.jardibotanic.bcn.es). The climactic similarity between these regions provided the inspiration for the Garden. First, the plants in the Garden are organized according to geographical origin. Second, they are grouped to form artificial re-creations of the landscape and plant communities found in nature. And third, Mediterranean forest landscapes are represented in the higher areas of the Garden, whereas shrubland communities are concentrated in the central and lower areas (www.jardibotanic.bcn.es).

Research

The Garden houses a seed bank and participates in the exchange of plant information and material with other botanic institutions. It features plant collections suited to the climate of Barcelona and experiments with new plants and methods to promote sustainable gardening. This research can be used to plant new parks and urban spaces while minimizing the negative impact on the environment (www.jardibotanic.bcn.es).

The Garden's nurseries and greenhouses are used to cultivate and maintain plants of scientific and educational interest. These cultivated plants are then introduced into the Garden's exhibition spaces. Through the use of acclimatized plants the Garden raises visitors' awareness of the importance of plants and of conserving the

environment. Moreover, the information provided includes details about the conservation of endangered species in the region, as well as descriptions of ongoing projects and the results obtained from them (www.jardibotanic.bcn.es).

Analysis

The layout of the Garden, determined by a network of triangles, adapts particularly well to the sloping site while forming the basis for a system of paths of various widths. The novel use of retaining walls where the site becomes too steep is well suited to the topography of Mount Montjuïc and hints to the retaining walls used throughout the region. The design addresses the issue of topography with an innovative solution that minimizes the amount of earth moved while providing usable, beautiful spaces for the collections. Furthermore, the use of indigenous plantings and plants well suited to the climate provides an example of gardening practices and design with plants that minimizes the negative impact on the environment. The interdisciplinary team of a horticulturist, biologist, and landscape architect gave much consideration to the careful selection and location of the plant collections. Because of this attention to detail, the plants have not been arbitrarily placed where they “look pretty”. Instead, the species selected and planted have been thoroughly researched for their adaptability and suitability in the landscape.

The fragmented geometry lends itself to the Garden's collections and to the topography of the site. However, it is stiff and does not allow one to transition from space to space smoothly. Sharp, directed views lead the visitor through the space, controlling the experience in the landscape. Despite this stiffness, the geometry is simple and consistent throughout the space. It anchors the Garden's collections and provides clarity to the landscape.

The Gardens of Trauttmansdorff Castle

Location: Merano, South Tyrol, Italy

Client: Province of Bolzano

Landscape Architect: Bureau B + B (Amsterdam)

Architect: Matteo Thun (Viewing platform)

Director: Klaus Platter

Engineer: Manfred Ebner

Plant Records Officer: Dr. Karin Kompatscher

Area: 12 hectares

Opening Date: 2001

Context

The Gardens of Trauttmansdorff Castle are set against spectacular scenery, protected by Mount Tschigat, a 3,000 metre windbreak which shelters the deep green valley below it. This creates a mild micro-climate in which, despite snowy winters, tender species are able to grow (Pontin, 2009, p. 82). Located at the top of the Garden is the Castle of Trauttmansdorff. Here visitors can park on the opposite side of the road and enter the Garden via a pedestrian bridge. The Garden is divided into four areas: Forests of the World, Sun Gardens, Water and Terraced Gardens, and the Landscapes of South Tyrol (Brown, 2004, p. 62). An artificial stream runs through the Garden, whose waters feed the brooks, marshes, and shady ponds that are home to an array of plants (Pontin, 2009, p. 82). Throughout the site are eleven pavilions or follies designed by artists, some of which serve as small exhibition spaces (Pontin, 2009, p. 82). Along the entrance to the Garden, via the pedestrian bridge that connects the parking lot to the Garden, are 10 oversized vases set at 10-metre intervals. Depending on the season or event being held in the Garden, the plantings are changed to signal to the visitor an indication of what is happening in the Garden (Röwekamp, 2001, p. 86). Various 'Experience Stations',

including the Viewing Platform designed by architect Matteo Thun, the Aviary, the Grotto with its multimedia show, the Dragonfly Clock, the Forbidden Garden, and the pavilions add to the landscape of the Gardens.

Pavilions

Eleven Artist Pavilions help to interpret the processes of nature playfully and aesthetically as well as didactically. Made from oak logs, stainless steel, masonry, and plastic, each is intended to describe, explain, or dramatize a different aspect of the Garden (Brown, 2004, p. 62). These pavilions were designed to act as follies in the Garden, giving the visitor a better understanding of the type and character of plants surrounding them, explaining their origin and living conditions. They provide the visitor with a wide range of scientific information in a unique way. These pavilions combine art and architecture in the Garden, allowing visitors to linger and admire South Tyrol's impressive landscape. Through form and material the pavilions pose such questions as: why don't water lilies drown and why do cactuses prick? (Klammer, 2003, p. 33). Another pavilion, a wide rectangular arch built from downy oak logs stacked in a steel frame, shades a simple marble bench. The arch's straight lines, right angles, and containment offer a contrast to the forms and gestures of the live trees around it (Brown, 2004, p.75). The Mediterranean pavilion, conceived by Margit Klammer, is an abstract of flowers – tall pliant rods of brightly coloured, carbon-fibre holding bells that ring in the breeze, to announce the arrival of spring (Brown, 2004, p. 75).

Analysis

The Gardens of Trauttmansdoff Castle are not only educational but also pleasure gardens in which one can stroll and enjoy the beauty of the landscape. Breathtaking views in and out of the Garden provide a beautiful backdrop in which to learn about different plant species and habitats. Of importance to this Garden is its use of terraces in a steep site, its exhibition spaces, and viewing platforms from

Opposite Page:
Left: Garden Walkway
Top Right: Garden Plant
Collections
Bottom Right: View of the
Terraced Gardens
(Photographs by Brenda Brown)



which to see the surrounding hillside. Furthermore, the Gardens' pavilions also offer a unique feature in the landscape, educating the public in a thoughtful and provocative way that is both instructional and beautiful.

The Garden, however, seems to lack a cohesive language, and areas of the Garden seem disparate from one another. As Brown (2004) puts it, "the Gardens of Trauttmansdorff Castle are so diverse that they seem to be trying to please all people all the time, and the four major areas lack a consistency of concept that makes an overall organization easy to grasp" (p.62). Despite this criticism the Gardens are breathtaking and captivate and inform the visiting public.

Royal Botanic Gardens, Kew

Location: Surrey, Richmond, United Kingdom

Director: Professor Stephen D. Hopper

Area: 104 hectares

Opening Date: 1759, Treetop Walkway 2008

Context

When one hears the words 'botanic garden', one thinks of Kew. The Royal Botanic Gardens, Kew are one of the most famous and most respected botanic gardens in the world. It covers 104 hectares and over 250 years of botanic heritage. Its collections include 29,000 taxa and 110,000 living plant specimens (Monem, 2007, p. 244). At this size it is one of the largest collections in the world.

The gardens date back to the mid 17th century and were first recorded as an estate owned by the Capel family, which had a passion for horticulture. Over the next two centuries the site of Kew passed through many phases of political and monarchic change, gaining additions and structural features along the way that are still present

at Kew (i.e. The Dutch House was built in 1631). The picturesque setting on the Thames allowed it to evolve into a pleasure garden for 18th century aristocracy (Monem, 2007, p. 246). However, it was during the 19th century that Kew saw many additions and changes as it was purchased by King George III and many new acquisitions were brought back to Kew from far-off lands by the royal horticulturalist, Joseph Banks. These expeditions to tropical countries brought back many new plants and more specifically, orchids that are present at Kew today.

The mission of the Royal Botanic Gardens, Kew, is to enable better management of the earth's environment by increasing knowledge and an understanding of the plant and fungal kingdoms - the basis of life on earth. The Royal Botanic Gardens, Kew, has two sites: Kew Gardens, a World Heritage Site six miles west of London, and Wakehurst Place on the High Weald in West Sussex. These attractions are home to Kew's collections, laboratories, library, and the Millennium Seed Bank (www.kew.org).

The botanical displays are too numerous to summarize individually. Amongst the outdoor ornamental exhibits, most notable are the Lilac Garden, the Colour Spectrum Garden, the Secluded Garden, which is designed for sensory enjoyment, and the Climbers and Creepers Section, which is designed for interactivity, encouraging young children to physically engage and play with the plants displayed (Monem, 2007, p. 245). Of interest to this case study is the recent addition of the Xstrata Treetop Walkway.

Xstrata Treetop Walkway

The Rhizotron and Xstrata Treetop Walkway opened in 2008. Visitors can journey underground among the tree roots in the Rhizotron then be transported 18 metres up to the Treetop Walkway and enjoy a walk through the canopy of trees while admiring bird's eye views across the Gardens. Along the way visitors learn about how trees work and their impact on the world (www.kew.org). The Treetop



Walkway offers a unique experience new to Kew. The walkway brings people up close to the canopy, giving the visitor a new perspective of these trees and educating them at the same time. The integration of education with entertainment is an effective way of conveying the Garden's educational message. However, as of October, 2009, the walkway is still not universally accessible. Plans for an elevator have been under way since its construction, yet still there is no access. One comment on Kew's website reads, "I have been on the walkway several times, but unfortunately I cannot bring my friend who is in a wheelchair, as the lift is not working, surely after nearly 18 months the problem should have been sorted out and access available to everyone, not only those that are fit and able" (www.kew.org, posted on October 8, 2009). Despite this glitch, the Treetop Walkway offers a unique experience in the Garden that is both educational and delightful.

Orchid Collection

Kew has a long history of plant collection and acquisition. The public orchid collection is largely located in the Princess of Wales Conservatory. Kew has the oldest known collection of living orchids displayed in two specialized orchid zones in the Princess of Wales Conservatory (www.kew.org). Furthermore, the conservation work that is done at Kew is significant in the field of orchid conservation. Present at Kew are a herbarium, seed bank, and micropropagation and tissue culture facilities (www.bgci.org). In addition, Kew is training people around the world in various methods of herbarium and molecular techniques so that they can teach others in their own countries (A. Pridgeon, personal communication, July 14, 2009).

Orchids have also featured prominently in botanical art since the 17th century. In 2003 Kew staged an exhibition of the John Day Scrapbooks (1863-1888) which feature botanical illustration of orchid species from all over the world. In addition, the Marianne North Gallery displays botanical drawings and illustrations by the artist. The Shirley Sherwood Gallery of Botanical Art has been added to the

Opposite Page:
Top Left: Princess of Wales Conservatory (Photograph by "Diliff")
Bottom Left: View of the Lake in front of the Palm House (Photograph by Alec Pridgeon)
Right: Xstrata Treetop Walkway (Photograph by "Sunil060902")
(Images made available under the Creative Commons License: Attribution 2.5)

Marianne North Gallery which also displays botanical drawings and illustrations. It is a contemporary building that is simple and elegant, fitting into its surroundings seamlessly. Dr. Shirley Sherwood, a collector and authority on botanical art, donated the money to build the gallery at Kew and lent her own collection to the building, adding to Kew's extensive collection of botanical art which includes 200,000 paintings (Slavid, 2008, p. 29).

Analysis

Kew's long history with plant collecting, and orchid collecting in particular, sets this case study apart. The history of Kew is unrivalled and distinguishes it as a botanic garden rooted in the past. This history and rich body of knowledge has distinguished Kew as a world leader in conservation research and as a major centre for education. In addition, Kew's research efforts in plant communities' countries of origin have set it apart from other historic botanic gardens and institutions. New exhibits such as the Treetop Walkway and Shirley Sherwood Gallery have kept Kew current and have offered unique experiences in this botanic garden. The Garden is a reflection of its history, yet it continues to commission new exhibits in order to stay current and offer new experiences to its visitors year after year.

Application

Contemporary botanic gardens are places for people to explore, enjoy, and inspire change in a world affected by negative actions. By studying these contemporary gardens through methods such as case study analysis, a larger picture is provided of how botanic gardens have changed over time. Today botanic gardens focus heavily on the visitor's experience while still paying close attention to its original mandate of education. Entertaining the visiting public has become the new means for delivering the message of conservation, research, and education. In places

such as the Eden Project a new word has been coined – ‘edutainment’. Here people are entertained while learning about issues such as the loss of biodiversity and society’s harmful actions and consequences to the environment. Interpretative elements are also woven into the botanic gardens of today as a means of ‘edutainment’. The Missouri Botanical Garden and the Eden Project both offer unique experiences through the garden that interpret the garden’s plant collections and tell their stories.

Botanic gardens are also influential platforms for social change. For example, the Jardín Botánico in Medellín has been a powerful statement of the city’s desire to clean up their run-down north end. The Garden has integrated itself with the city and has created an area for all classes of people to enjoy. The Missouri Botanical Garden has also created positive social change by altering society’s views and practices towards the environment by setting a good example and offering classes and seminars to educate the public.

By examining botanic gardens through the case study analysis method, themes begin to appear and become common threads to most successful botanic gardens today. These include (but are not limited to): creating a landmark (whether it is through the garden’s architecture or the garden itself), research and conservation efforts such as seed banks and herbariums, ‘edutainment’ (education delivered as a means of entertainment), festivals and events (such as the Eden Project’s music festivals), a fusion of art and science, a focus on indigenous collections, creating a park-like setting for enjoyment and leisure, and a focus on children and educating future generations. Botanic gardens today move beyond ordered, educational gardens. Instead, they are places of inspiration, beauty, as well as education.

Many of the lessons gained from these case study analyses can be applied to my Practicum topic – the design of a botanic garden centred on orchids. First and foremost is the lesson learned in relying on architecture to inform the design of the garden. In the case of the Eden Project, the biomes were designed by architects

and most of the Garden revolves around these centrepieces. Simply inserting a grand architectural gesture into the landscape does not make a botanic garden. The design of a new botanic garden for Ecuagenera and its collections should speak on their own and the landscape should be both educational and beautiful. The landscape should sell the garden, not its architecture. It should inspire the visiting public and be a place of wonder and beauty. Second, plant collections based on indigenous flora will establish themselves more quickly and also provide an educational opportunity for promoting conservation efforts in their country of origin. A focus on indigenous collections will allow for minimal architectural and high-energy interventions in sustaining plant collections such as orchids. Lessons can be extended to the garden's practices and foster a stewardship of the environment. Third, a focus on learning and educating the public should be fundamental to the botanic garden. Education of future generations is an important role of botanic gardens, and the delivery of that message is made more palpable through entertainment and delight experienced in the garden. The pavilions in the Gardens of Trauttmansdorff Castle fused art and architecture with nature in an educational, yet poetic way. The pavilions were not traditional interpretive signs spouting off information on the plant name, its origin, and so forth but instead directed the visitor to see the landscape or a plant in a different manner. Fourth, creating a park-like setting that is delightful as well as educational will encourage visitors to return to the garden again and again. And fifth, the garden should offer a unique experience that delights the visitor and creates a feeling of awe and wonderment – an idea within the garden that draws visitors from around the world.

Furthermore, the roles that a landscape architect plays in the design of new botanic gardens are one of planner, innovator, and expert. The landscape architect brings a rich knowledge to a botanic garden whether they are involved in the planning process or are brought into the project after it is established. Landscape architects can contribute to the design of botanic gardens in new and unique ways. For example, the design of the Jardí Botànic de Barcelona benefited from the knowledge and expertise of a landscape architect in designing a very steep

site that stabilized the slopes while minimizing earth movement. Providing a place of inspiration, enjoyment, beauty, and education all come together in the botanic garden of today. In addition, conservation efforts of botanic gardens allow for the protection of the Earth's biodiversity, preserving it for generations to come. As John Dixon Hunt (2005) writes, "Today we still want our botanic gardens to be records of historical engagements with the natural world, exotic locales where strange and wonderful plants are carefully presented for our view, and therefore where contemporary recreation and education can be encouraged and accommodated" (p. 146). This is the botanic garden of today.



Chapter 4
Orchid Conservation

The Role Botanic Gardens Play in Plant Conservation

Botanic gardens have collectively accumulated resources and plants for centuries. They are great resources of data, plant material, and records of endangered or even extinct species. They play a key role in the conservation of many plant species. The activities of botanic gardens over the centuries and new gardens today contribute to *ex situ* conservation efforts and also play an important role in *in situ* conservation efforts. *Ex situ* conservation, as previously described, is the preservation of plants outside their natural habitat, whereas *in situ* conservation can be defined as the preservation of plants in their natural habitat (Oldfield, 2007, p. 28). The Botanic Gardens Conservation International (BGCI) (www.bgci.org) describes *ex situ* conservation more fully as “the conservation and maintenance of samples of living organisms outside their natural habitat, in the form of whole plants, seed, pollen, vegetative propagules, tissue or cell cultures. Furthermore, *ex situ* propagation serves several purposes such as:

- To rescue threatened germplasm
- To produce material for conservation biology research
- To supply material for various purposes to remove or reduce pressure from wild collecting
- To grow those species with recalcitrant seeds (seeds that do not survive drying or freezing) that cannot be maintained in a seed store
- To make available material for conservation education and display
- To produce material for reintroduction, reinforcement, habitat restoration, and management

Examples of *ex situ* conservation efforts include herbariums, seed banks, storage of pollen and genetic material, and the live collections found in botanic gardens (Leadley & Greene, 1998, p. 31).

In situ conservation has been described as “the conservation of species diversity

Previous Page: *Phragmidpedium kovachii*
(Photograph by Kyle Lucyk)

within normal and natural habitats and ecosystems” (www.bgci.org). In addition, the BGCI expands on this definition to include the development, designation, and management of protected areas, tackling invasive alien plant species, habitat restoration and re-creation, and working with communities to promote sustainable plant use and land management (www.bgci.org). It is important that *ex situ* and *in situ* conservation are designed and practised to reinforce and complement each other. For example, the living collections of botanic gardens can provide a source of material for habitat restoration. Areas where *in situ* conservation efforts are focused are ecosystem management, habitat restoration, restoration and re-creation of vegetation types within their natural settings, the eradication of invasive alien plant species, and the creation of preserves and reserves (www.bgci.org).

As defined by the BGCI, the roles botanic gardens play in plant conservation are:

- “Horticulture and cultivation skills allow us to grow plants that might be lost in nature, which means diversity can be conserved in the gardens but also allows us to consider restoration and rehabilitation of degraded habitats.
- Living collections of plants collect species under various groupings, to maintain a living store of genetic diversity that can support many activities in conservation and research.
- Seed banks, herbariums, and collections of living plants allow species to be safeguarded. Plants must be carefully collected and stored to ensure maximum genetic diversity is retained.
- Research and development into plant taxonomy and genetics, phytochemistry, useful properties, and the selection of plants that can withstand degraded and changing environments (especially important in the face of the threats posed by climate change).
- Education is a strength of botanic gardens that allows them to communicate the importance of conserving plants, reaching out to diverse audiences, and also to communicate how this may be achieved.
- Linking plants with the well-being of people, helping to conserve

indigenous and local knowledge, and to encourage the sustainable use of plant resources for the benefit of all, as part of sustainable development.” (www.bgci.org).

Botanic gardens are at the forefront of conservation efforts today as many employ greenhouses, laboratories, and research centres as part of their facilities. As previously mentioned, botanic gardens also have what are called ‘satellite gardens’ that provide *in situ* conservation of primary habitat. Research, education, and conservation combine with recreation to create the botanic garden of today.

The role botanic gardens play in conservation, research, and education efforts has been discussed thus far. Next, a look at what this Practicum aims to protect and why is examined.

Ecuador’s Primary Forest

Ecuador is the most densely populated country of South America. Population growth puts tremendous pressure on primary forests as deforestation occurs at an unsustainable rate. Cities are expanding, roads are being built, and land is being cleared for agriculture and farming purposes. According to the Global Forest Resources Assessment (2005), between 1990 and 2000, Ecuador lost an average of 197,600 hectares of forest per year. In total, between 1990 and 2005, Ecuador lost 21.5% of its forest cover, or around 2,964,000 hectares. In Ecuador, for each hectare of primary forest there is on average, half a million plants are present with a large proportion of these being epiphytes. One can conclude that the country will destroy more than 100 billion plants each year – the equivalent to 10 million per hour (www.codeso.com). It is likely that most of Ecuador’s biodiversity will disappear in the coming decades if this destruction and growth goes unchecked. As suggested previously, protection of these habitats through *in situ* conservation

Opposite Page: Cloud Forest near Mindo, Ecuador



is best, but when that cannot be achieved, *ex situ* efforts employed by botanic gardens are necessary. In time, the reintroduction of plant species to their habitats can help to rebuild what has been lost. There is much controversy surrounding the reintroduction of 'artificially propagated' plant species as ecosystems are complex and delicate systems with many factors involved in their success. However, the preservation and artificial propagation of plant species is better than the loss of the species entirely.

The conservation of orchids is a complex issue. Simply protecting a piece of land will not suffice. Factors such as the health of the ecosystem, the size of the area, the buffer zone, and human activities in and around the preserve are important. These habitats have complex ecologies, where more investigation and research is needed. What's more alarming is the fact that orchids are not a colonizing species and 100 hundred year growth is usually required for orchids to colonize a habitat. Fungus in the form of mycorrhiza must be present for orchid seeds to germinate and grow. The primary forests of Ecuador have a delicate balance that is hard to achieve and re-create. The importance of conservation in connection with ecology should to be taught in order to provide a holistic picture of conservation and research efforts. Preserving just the orchids is not enough. Instead it is about preserving the interrelationships associated with their ecosystems and the biodiversity present in these ecosystems. Educating Ecuadorians who reside in these communities is an important step in the conservation of these species. People who live there, who will stay there, and have a connection to their home and habitat will be best equipped to preserve these species. The need to promote conservation techniques in Ecuador to students, the public, government officials and decision makers, and to the indigenous people living in these 'hotspots' of biodiversity is of utmost importance in persevering these species and habitats. These species and habitats are not only important to the people who reside nearby, but also to the world as places of biodiversity and wildlife habitat. Ecuador is unique in that it is one of the world's highest places of biodiversity. A loss of these ecosystems would surely impact the world negatively.

The Third Scientific Conference on Andean Orchids

As mentioned, I was able to return to Ecuador in February of 2009 to attend the Third Scientific Conference on Andean Orchids. The conference was attended by scientists, professionals, hobbyists, judges, and vendors from around the world as well as many Ecuadorians. It was held over three days with the last day devoted entirely to conservation lectures and roundtables. I attended a lecture titled, "What will be left of the primary forests of Ecuador?" given by Alex Hirtz and was saddened to learn about the loss and destruction occurring at an alarming rate. I was also startled to learn of a new law proposed by the government of Ecuador where any land not being used to generate an income or food production could be taken by the government and converted to land for agriculture and farming purposes. Much of this "unused" land in Ecuador includes primary forest. One solution discussed at the conference was that of eco-tourism and botanic gardens. Using the land in this manner generates income while promoting and preserving the primary forest. Ecuador's tourism industry has long promoted 'birding' and the Galápagos Islands as major attractions to Ecuador. However, in an effort to promote awareness and generate income, orchids are now being viewed as a tourist attraction through botanic gardens and eco-tourism.

The conference focused on the current practices taking place in Ecuador that are having a negative impact on the environment. As mentioned, land not being used to generate an income from activities such as farming or agriculture is viewed as 'wasted' or 'unproductive' land. The overpopulation of Ecuador contributes to these large pieces of primary forest being converted to food production and a way of living. Other anthropogenic factors that are contributing to the loss of primary forest are: pesticide use, garbage, pollution, abusive collection of plants for profit, forest fires, the timber industry (pine farms), the oil industry, invasive plant species such as *Eucalyptus* (epiphytes cannot grow on the bark), soils and drainage are modified (channelization), and hydroelectric power.



Another major factor contributing to the destruction and loss of primary forest is the construction of new roads – again due to an increase in population as cities expand. When a new road is put in, approximately 12 km on each side is colonized. People are not permitted to collect from the wild (of course), but if there are special circumstances such as a landslide or a forest is to be cleared for crops, the process to get the correct permits is time-consuming and difficult for the public. The government wants to convey the message that only legitimate officials will be given the privilege of collecting from the wild. The government also claims to repair any damage after a highway is built, but it has not been a concerted effort. There is also the problem of restoring a forest after it has been cultivated for years. There is the difficult task of consulting a seed bank (who has access?) and restoring what was there before when there are no records. Furthermore, the IUCN (International Union for Conservation of Nature and Natural Resources) suggested not reintroducing orchids back into restored habitats arbitrarily. A loss of up to 5% of biodiversity by “repopulating” a forest with orchids that might not have grown there before can occur. Knowledge of the endemic species that were previously present there is an invaluable resource for restoring habitats (personal notes from the Third Scientific Conference on Andean Orchids, 2009).

Application

With the design of the Ecuagenera Botanic Garden (EBG), *ex situ* efforts as well as *in situ* efforts are employed. For example, the EBG will build on Ecuagenera's already established work in the propagation of Andean orchid species. Furthermore, a herbarium and seed bank will preserve knowledge of endemic species as well as provide for future propagation and possible reintroduction of orchid species into the wild. In addition, the naming, classification, and discovery of orchid species are important tasks to carry out in the country of origin. In years past, orchid species would be sent away to European or American institutions such

Opposite Page: Cultivated Hillside
near Gualaceo, Ecuador

as the Marie Selby Botanical Gardens in Florida or the Missouri Botanical Garden in St. Louis for identification. The problem with scientists coming from other countries is that they often collect only one specimen and then describe a species with only that limited material. A wider range of plants and a trained eye are better able to distinguish which plants are similar with variations of the same species and which are similar but different species. Most times, the “best” plants are selected for study and do not show a true range of the species. A more accurate overview of the species is needed. This is important for accurate description and identification and ultimately, conservation. Having trained and educated professionals in the country of origin is important because the people residing there know these plants best, have grown up with these plants, and know their variation, habit, habitat, etc. Furthermore, commercial propagation of orchids will take pressure off species collected from the wild and preserve species that are being lost due to deforestation and population growth within Ecuador. Dissemination of knowledge through the EBG and its research centre will inform and educate the public in an effort to prevent the future loss of Andean orchid species. In addition, the Reserves owned by Ecuagenera will aid in the protection of orchid species within their natural habitat and serve as an educational tool in future conservation efforts in primary forests. Lastly, the issue of funding for conservation efforts is a difficult one in poor countries like Ecuador. Botanic gardens can provide funds for this effort as well as contribute to the larger tourism economy of Ecuador.



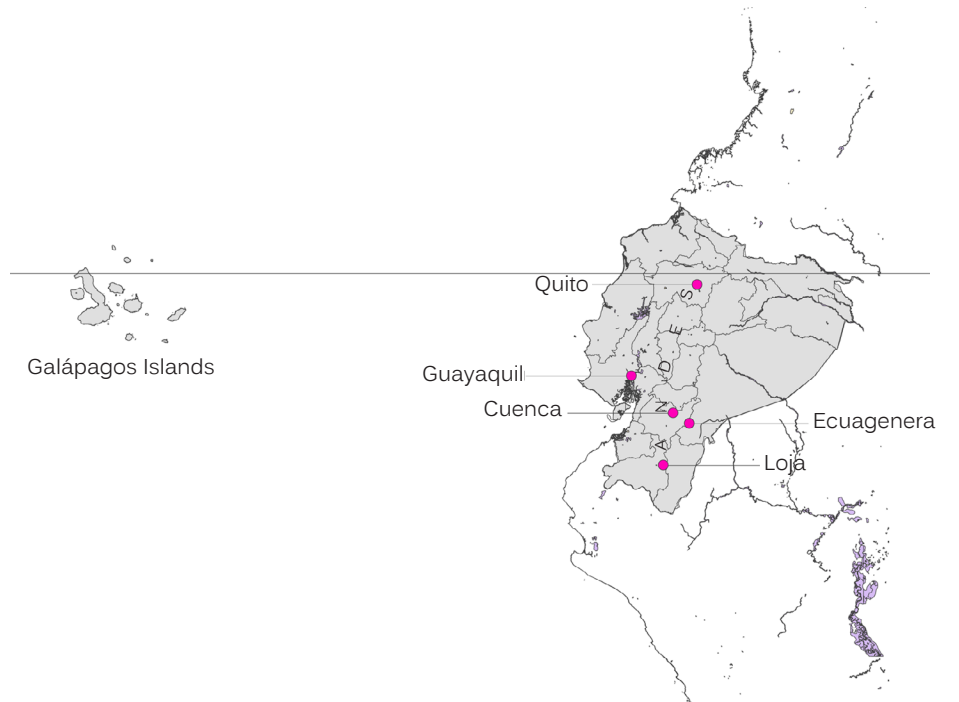
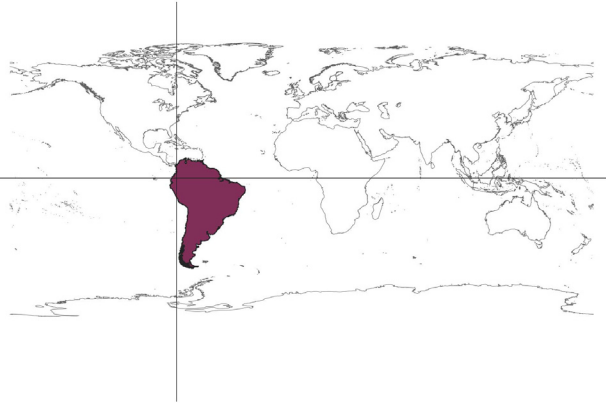
Chapter 5
Site Inventory
& Analysis

As mentioned, in the fall of 2005 I was presented with an opportunity to travel to Ecuador to work with orchids and learn about their propagation and culture. Working at Ecuagenera, I was able to travel around Ecuador and learn firsthand about orchids in their natural habitat. Working with Ecuagenera also allowed me to live on the proposed site and begin to understand the landscape's features and processes. Much of my time was spent outdoors de-flasking orchids grown from seed and potting them up into larger pots – a process known as 'community potting' or 'commpotting'. I would sit and watch the clouds roll in and out of the valley at Ecuagenera throughout the day. The 'dance of the clouds' and the beauty of the landscape inspired me to design a new botanic garden, sited right at Ecuagenera. I was fortunate enough to return in February of 2009 and visually record my experiences of place through sketching and photography. At this time a site inventory and analysis was carried out in order to accurately record the landscape and its potential. The following is a record of the biophysical and geophysical features of Ecuagenera and its surrounding landscape. An analysis of each of these features is provided after the inventories. At the end of the chapter a brief overview of Ecuagenera's "Reserves" is also presented.

Ecuador is located on the west coast of South America, bordering the Pacific Ocean at the Equator, between Colombia and Peru. It is approximately 284,000 km² or slightly smaller than Nevada in comparison. Its largest city is Quito, which is also its capital. Guayaquil is the second largest city which lies to the south along the coast. The beautiful town of Cuenca is the third largest city and is also a World UNESCO Heritage site situated in the Andes. Ecuador is divided from east to west by the Andean Mountain range which runs the length of South America's west coast. Starting from the west the coastal region of Ecuador is rich with Mangroves, tropical forests and commercial crops such as banana, sugarcane, and many shrimp farms. Heading east the landscape abruptly rises up to form the Andes with mountain peaks as high as 6200m. Here in the Andes there are many habitats such as the dry forest, the cloud forest, and the Paramo, or high grasslands of the Andes. Coming up and over the Andean Mountain range a gradual descent is made into the

Previous Page: *Phragmidpedium besseae*

Opposite Page: World map of South America with context map of Ecuador
(source: map data courtesy of www.landinfo.com)





Amazon basin or El Oriente as it is referred to in Ecuador. The Galápagos Islands located approximately 1000kms off the west coast are also part of the country.

Biological Features

Vegetation

The vegetation can be classified as humid to very humid forest before settlement. Much of the vegetation has been deforested and converted to farmland or pasture. Groupings of tall deciduous shade trees and windbreaks are present with areas of invasive *Eucalyptus*. Riverbank species are present along the Rio Gualaceo with ornamental/specimen/horticultural plantings throughout the area. Species include crops such as sugar cane, corn and beans, a vineyard and orchard with citrus trees, flowering river-bank species such as *Crococsmia*, shade trees, *Passiflora*, vines, grasses, *Agave*, *Lantana* spp., *Bougainvillea*, native walnut species, and bromeliads. A traditional kitchen garden is present with *Amaranthus*, herbs, and other species. Orchid species include; *Masdevallia virgo-cuencae*, *Sobralia* spp., and *Epidendrum* spp. ('secundum'). Tree cover is approximately 10-15% with small *Eucalyptus* trees invading. The maturity of the vegetation communities is classified as 'mature', but is not old enough for epiphytic orchids to occur naturally. A forest of approximately 100-years' growth is needed for this to occur. The colour, texture, and form is mostly deep greens with small splashes of reds, oranges, and yellows. The vegetation is lush on the east side of site with scrub/brush towards the high point of the site (west). Bunchgrass prairie of the highlands is also noted on the east side of the site.

Wildlife

Macaws have been brought in and are currently housed in outdoor cages. Cuy (guinea pigs), trout, possums, hummingbirds, butterflies, and bats, are the most

Opposite Page:
Left: View of the Rio Gualaceo looking east
Top Right: De-flasking orchids into community pots
Bottom Right: View of the 'River Walk'/Orchard area

prominent wildlife found in this area. Wild packs of dogs are troublesome, as some can become aggressive.

Analysis

Preservation of existing trees is an important consideration. Keeping mature trees is important as epiphytic orchids are not colonizing species and need old-growth trees to populate an area. An invasive species of *Eucalyptus* is troublesome along the riverbank. Removal of this species is necessary in order to protect the Garden collection's integrity. Wild packs of dogs are troublesome as some can be quite aggressive to humans. They seem to run along the roads and throughout the property, along the river looking for food. The possums eat small plants from the greenhouses. Poisoning seems to be the means of dealing with this problem. Perhaps live trapping and relocation of undesirable wildlife would be a better method of dealing with this problem.

Physical Features

Geology

The area is comprised of volcanic bedrock. The depth to the bedrock varies throughout the site. However, along the east side of the site, suitable depths are present that previously sustained corn and bean crops. The permeability and drainage is free draining in higher areas with more organic material and water-holding capacity along riverbank.

Soils

The soil type is largely Brunizemic soils that are fertile and extend over

approximately 10% of the surface of South America. This is the most important soil for growing crops as it is highly fertile and is a deep, dark-coloured prairie soil, developed from wind-deposited loess. Also present, but in smaller areas are chestnut soils and ferruginous tropical soils. The soil is comprised of 30% clay. The farmland area is red to brown-yellowish soil, moderately deep with clayish texture, and an accumulation of calcium in several places (higher pH, thus slightly alkaline in these areas). The grassland area has deep soil with a variable texture and a presence of an argillite horizon in several places (lithified muds and oozes). Areas of gravel are also present throughout the site. Forest soils are susceptible to erosion with a presence of gravel and stones. The water-holding capacity is moderate to high with soils dry for less than 3 consecutive months out of the year. Rocky outcrops with little to no soil are a constraint. Areas of high erosion also pose as a constraint to the site.

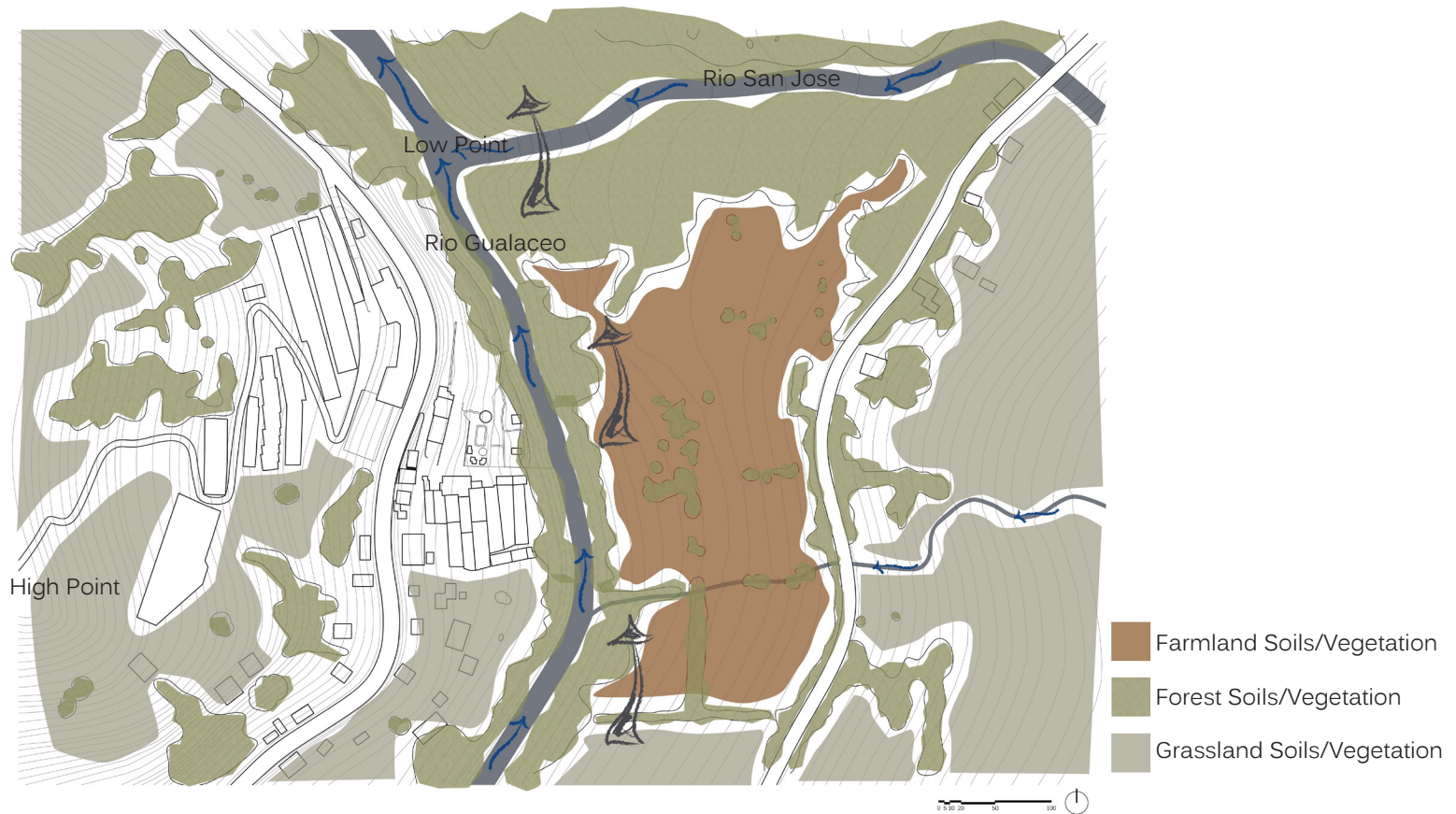
Topography

The Rio Gualaceo divides the site in two from east to west. The site is somewhat steeper on the west side of the Rio Gualaceo (20% or more) with flat plateau areas. Area east of the Rio Gualaceo are less steep with slopes of 5-15%. The elevation is approximately 2300m above sea level at the highest point, down to 2238m at the lowest point of the site. There is a 62m change in elevation on west side of site. On the east side the elevation is approximately 2238m from the lowest point up to 2278 at the highest point. There is a 40m change in elevation on east side of site.

Hydrology

The Rio Gualaceo (also known as the Rio Santa Barbara) divides the site from east to west and floods seasonally approximately 3 metres from April to July. The Rio Gualaceo runs into the Rio San Jose in the north and then eventually turns into the Rio Paute which flows west to the city of Cuenca. Run-off during the rainy season is high and runs down to the Rio Gualaceo from the east and west. Water is often

Bio-Physical Features Map



polluted from further up the hill and contaminates and litters the river down below. Garbage is present in the vegetation along the riverbank. The Rio Gualaceo moves from south to north and carries with it pollution from the nearby town of Gualaceo (bus and car washing takes place in the river by Gualaceo). On the east side of the river a small intermittent stream that runs from the east down to the Rio Gualaceo. The watershed drains into the valleys from south to north. Areas of erosion are high where slopes exceed 15%. The roads seem to act like dry creek beds in that they move the water fast and down to the gutters, which empty into the Rio Gualaceo.

Climate

The climate is classified as sub-humid with dry forest and small areas of montane forest. The equatorial sun can be strong during the day, but is not unbareable as can be experienced on the coast on in the Amazon. The annual precipitation is 800-1100 mm (vs. Winnipeg with 514 mm). The wettest months are April, May, June, and July. The driest months are August, September, October, and November. The mean temperature is 17°C (63°F) with a minimum of 6°C (43°F) and a maximum of 25°C (77°F). The winds are mostly from the south with some fog patches in the early morning and late afternoon. Cloud cover is present throughout the day.

Analysis

Some areas may need considerable stabilization and organic matter added to the soil. For the most part, the soil is fertile and will support new vegetation quite easily. There are areas of high erosion due to “channelized” water run-off. The flow of run-off should be slowed while bio-remediating the water. The topography of the site is challenging. Terracing is most likely to be a necessary solution for stabilization and maximizing space. The area has a great elevation change, which makes mobility and movement through the site difficult. Again, terracing and switchbacks are a suitable solution. There is much pollution along the river as well as to the water entering it. Bio-remediation is a consideration for dealing with this problem, as well

as education of the public in order to change current practices of waste removal and treatment. This is an opportunity to set an example of 'best practices' for the environment. East/west orientation does not pose a problem since sun is directly overhead. Temperature is comfortable most of the year and favourable for growing orchids outdoors with little or no protection. However, supplemental shade and protection will need to be provided for growing the orchid collection outdoors to protect it from the sun and rain.

Cultural Features

Land Use

Land use is largely farmland, pasture, and homesteads. The small town of Gualaceo is located approximately 2 kms to the south. Commercial greenhouses are present on the site belonging to Ecuagenera. Small, commercial "convenience stores" are sprinkled throughout the area along the west road that leads to Gualaceo and Cuenca. Commercial greenhouses that specialize in rose production are located approximately 2kms to the north. Residential properties are owned by Pepe Portilla, Guido Portilla, and employees. An institutional property is located to the west of the road near the upper greenhouses on the west side of the site - Colegio Nuevo Mundo (bilingual primary school). Cuenca is approximately a 60 minute drive from the site to the west and is also a UNESCO World Heritage site. An agriculture university is located near Uzuphud to the north, which is a popular resort. The towns of Sig Sig and Chordeleg are located 30 minutes to the south of the site and are known for their Panama hats and filigree jewellery.

Legal

The entire site totals an area of 34 hectares.

Circulation

There is low to moderate traffic volume along the two roads. The main road divides Ecuagenera on the west side of the Rio Gualaceo. The road connects to Cuenca and Gualaceo. A smaller arterial road is located on the east side of river that connects to smaller villages and homesteads. The Rio Gualaceo is not used as a means of transportation. Some leisure fishing occurs in the Rio Gualaceo. Pathways run mostly in a north/south direction to connect greenhouses and run the length of the east-facing slope with many switchbacks. Bridges are located approximately 1km north and approximately 3 kms to the south in Gualaceo. The main "Gualaceo" bus runs between Sig Sig, Chordeleg, Gualaceo, and Cuenca.

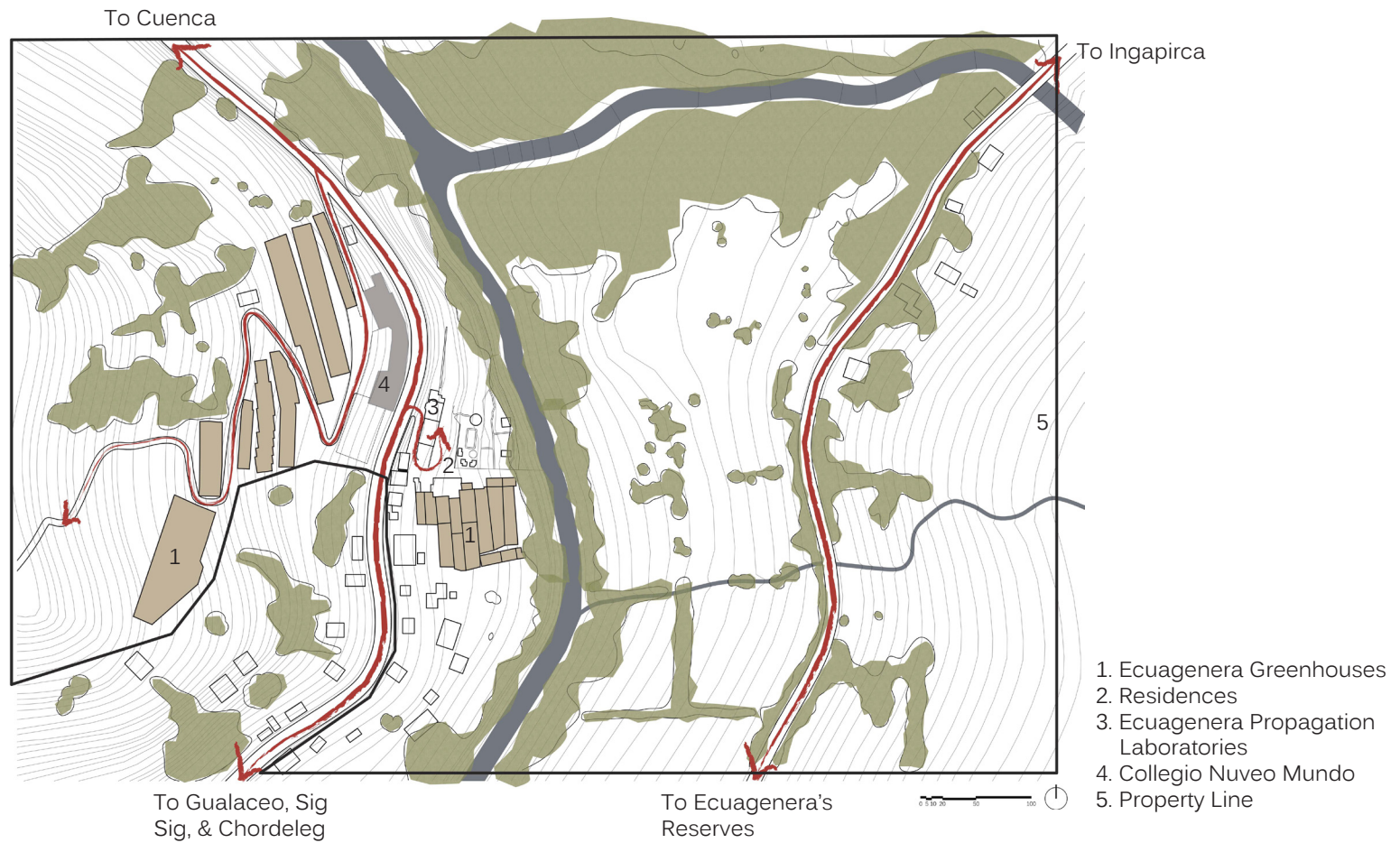
Historic

Worth noting is the archaeological site of Ingapirca, which lies to the northeast approximately 60 kms. It is one of the oldest Inca ruins found in Ecuador, and is a popular tourist destination.

Sensory

Views of the surrounding countryside are breathtaking. Sounds of the river can be heard when close down by it. The feeling of being surrounded by lush vegetation and enclosure is experienced near the river. The sound and air pollution of buses and lorries going between Gualaceo and Cuenca poses a problem. Houses and buildings tower above on the slopes, creating a feeling of grandeur. There is a damp, cool air at night and hot, moist air during the day. Lush vegetation is omnipresent as well as the organic smell of the greenhouses, oranges of orchard, and scent of orchids. An undesirable smell of diesel exhaust from the main road poses a problem. The taste of fresh fruit from the market, sugar cane alcohol, and the "oatmeal" drink of the region add to the sensory experience of Ecuagenera.

Cultural Features Map



Analysis

Cuenca, Sig Sig, and Chordeleg are popular tourist destinations in Ecuador as well as the archaeological site of Ingapirca. The botanic garden could be part of tour packages or a draw for visitors already visiting this area. The total area in hectares is on the smaller side compared to other botanic gardens around the world. However, the Quito Botanical Garden is only 3 ha and is adequate for a garden that focuses on Ecuadorian species. Roads are frequently traveled and serves as a main means of connection between Gualaceo and Cuenca. Some of the sensory inventories prove a problem. The design should address the undesirable sounds of buses and traffic from the highway. Tree belts could screen out unwanted noise and views. Views should be optimized into the site as well and out of the site (mountainous countryside, borrowed landscape).

Census Data

(Taken from the CIA World Factbook, July 2009)

History

Ecuador formed part of the northern Inca Empire until the Spanish conquest in 1553. Ecuador was ruled by the Viceroyalty of New Granada (Spain) until 1822 when Ecuador re-gained independence.

Environment

Natural resources include Petroleum, fish, timber, and hydropower. Current issues include deforestation, soil erosion, desertification, water pollution, pollution from oil production wastes in ecologically sensitive areas of the Amazon Basin and the Galápagos Islands.

People

The population is estimated at 14,573,101 (July 2009). The life expectancy is 75.3 years. The total fertility rate is 2.51 children born/women (2009 est.). Ethnic groups include Mestizo (mixed Amerindian and white) 65%, Amerindian 25%, Spanish and others 7%, and black 3%. The religion is predominately Roman Catholic at 95%, with other religions at 5%. The official language is Spanish with Amerindian languages such as Quechua.

Economy

More than half of Ecuador's export earnings are from petroleum in the north-east region. In 1999/2000 Ecuador experienced a severe economic crisis as banks collapsed and they had to adopt the US dollar in order to stabilize the economy. The poverty rate is high at 38% (2006). The GDP per capita is estimated at \$7,500 (2008) whereas Canada is estimated at \$39,300 (2008). Exports include petroleum, bananas, cut flowers, shrimp, cacao, coffee, hemp, wood, and fish.

Analysis

Ecuador has a long history of being 'ruled' by someone else. This 'imperialistic' nature parallels that of orchid hunters as they would spare no expense to collect as many orchids as they could from Ecuador and surrounding countries. Sometimes this meant taking advantage of the indigenous people with bribery, trickery or force. The imperialistic nature of early botanic gardens also adds another layer to the design of a new botanic garden (i.e. plants and imperialism - past, present, and future). Even today, taxonomy most often does not take place in the country of origin.

Deforestation is at the top of the list of current environmental issues. Ecuagenera's Reserves are an important part of the design in that they demonstrate the

importance of protecting primary forest, while at the same time giving local people an income (jobs are created). Coffee plantations are also replacing primary forest.

Ecuador is experiencing an overpopulation crisis, which is having negative effects on the environment. Large tracts of primary forest are being converted to farmland and pasture in order to make a living. Birth rates are increasing and overpopulation continues to threaten primary forest habitat.

Context

Character

Fragmented uses and buildings create a conflict of interest between public and private uses (multiple uses going on in the same areas – school, store, greenhouses, residences, etc.). There is a ‘family feel’ to the business as some staff live on site and their children attend the school there. A scientific community is omnipresent as scientists from institutions such as the Florida Museum of Natural History of the University of Florida (i.e., the lab of Norris Williams and Mark Whitten), the Jardín Botánico de Lankester of the University of Costa Rica (Franco Pupulin) have working relationship with Ecuagenera. Research in regards to new propagation techniques is currently taking place. Business and pleasure are intertwined. The river walk/orchard area is a nice “discovery” in the sense that you cannot really see it from above until you move down into the site (west side of the Rio Gualaceo). The architecture works with the topography, maximizing space while taking up a little footprint (built up, not out). The site can be difficult to walk with its steep slopes and inadequate pathways or stairs (usually eroded or washed out).



Buildings

The buildings include: Pepe and Guido's houses, staff apartments, a store front, guest accommodations, two propagation laboratories, a scientific room for research and taxonomic record keeping, a herbarium, administration, 20 greenhouse, and the primary school Colegio Nuevo Mundo. The architecture is Spanish Colonial with bright colours, clay shingles, glass, brick, wood work overhangs, open areas, and the deconstructing of the boundaries between indoor and outdoor spaces. The buildings are unobtrusive and blend into the topography of the landscape.

Hardscape materials

Hardscape materials include: interlocking brick, cocoa shells as mulch and pathways, gravel, concrete, tile, and stone retaining walls.

Site Functions

The staff work Monday to Friday, 7 a.m. until 5 p.m. and Saturday from 7 a.m. until noon. Tour groups visit usually once or twice a month with outdoor feasts and shopping during the day. People from abroad visit, usually helping in the lab or with taxonomic description and identification. Locals buy orchids as cut flowers or house plants. Other foreign tour groups in Ecuador for reasons other than orchids (usually religious and/or outreach programs) visit less frequently. School groups from Cuenca are also less frequent than the school groups from the Colegio Nuevo Mundo.

Analysis

There is a conflict between private and public functions. Ecuagenera is open to the public but will accommodate groups with a staff member escorting you around

Opposite Page:
Top: View looking east across the Rio Gualaceo
Bottom: View looking south-west across the Rio San Jose



the grounds. The solution may be to avoid the greenhouse area of Ecuagenera altogether and concentrate the design on the large piece of vacant land to the east. Some of the design can be brought into Ecuagenera (i.e. the orchard/river walk area). Plus, some of the staff live on site, and privacy is desirable. Keeping public and private separate with a middle ground of “scientific community/research” is sought. The presence of the scientific community adds to the research aspect of the program and provides a buffer between public and private uses. The River walk/orchard area is an ideal location for the design of the “orchid area” in that it is secluded, and the visitors ‘discover’ it like a hidden gem as they walk around the site. However, this conflicts with the private uses on the west side of the Rio Gualaceo. Views of the surrounding countryside are masked in this area, and one focuses inward on the garden itself rather than the overpowering surrounding mountains. Tour groups with Ecuagenera will now have another stop on their itinerary. Tourists coming to Ecuador share similar travel interests and the creation of a botanic garden will compliment such activities as birding, eco-tours, and orchid tours.

Ecuagenera’s Reserves

Located approximately a three-hour drive to the south of Ecuagenera lies the Reserves. Ecuagenera owns three pieces of land, all primary cloud forest, totaling an area of 300 hectares. A main road runs through these Reserves, connecting them together. Small tour groups are taken here but with minimal hiking into the actual Reserves. Instead people are able to view orchids on the side of the road or by walking in just a few metres. The beauty of the cloud forest is embodied here in its pristine state.

Opposite Page:
Top Left: Sketching in the scientific room at Ecuagenera
Top second from left: Cocoa shell mulch
Top second from right: Stone paving material
Top Right: Cobblestone paving material
Bottom: View of Ecuagenera looking east





Application

Looking at the site inventory and analysis as a whole, the design of a botanic garden for Ecuagenera must take into consideration the following factors:

1. Preservation of existing trees is highly important as orchids need old growth to establish themselves. Mature trees will add to the landscape and provide areas of shade. Removal of *Eucalyptus* and other invasive plant species are also necessary measures to ensure the integrity of the garden's collections.
2. The creation and preservation of habitat will enrich the garden and demonstrate the interrelationships present in an ecosystem.
3. Terracing is one possible solution in dealing with the difficult topography of the site. The use of stone will heat the earth, creating a microclimate within the garden for garden collections that do not normally grow in this specific region of Ecuador. Furthermore, the terraces gesture to the physical and cultural history of the Andes.
4. The river offers an opportunity to promote the stewardship of the land. The stream running down from the east side should be bio-remediated and "cleaned" as it passes through the garden into the river and out into the larger hydrological system.
5. Areas of shade and shelter should be provided for against the intense equatorial sun and heavy rainfall received near Ecuagenera.
6. Breathtaking views of the surrounding landscape are an important feature of this place. Emphasis of these views will enhance the experience in the garden and help to frame the garden in the landscape.
7. Traffic issues could be resolved with the use of pedestrian bridges or tunnels and screening with dense vegetation and trees.
8. Pollution, overpopulation, and deforestation are main concerns in Ecuador at present. The garden will be an example of proper

- stewardship of the land through its design, construction, and practices.
9. Keeping private and public functions separate is of concern. Dividing the research area from the public area would help to address this issue. The botanic garden can wrap around this area, 'embracing' it in the landscape.
 10. The use of local materials will give the garden a coherent design language and tie it to the local aesthetic.
 11. Ecuagenera's Reserves could act as the 'satellite' garden for the proposed new botanic garden providing conservation and protection of primary habitat *in situ*. Research and repopulation efforts could be incorporated into the function of the proposed botanic garden.

These concerns and suggestions help to form the design intention and program presented in the next chapter.



Chapter 6
The Ecuagenera
Botanic Garden

Design Intention

“We are where beauty resides in life: in the simplicity of an orchid “

-Ecuagenera

The intent of this Practicum is to apply and expand on the knowledge gained from case study analyses of contemporary botanic gardens. In addition to the case studies, a history of botanic gardens is also meant to inform the design of a “new botanic garden” – a place of inspiration, delight, and wonder. Botanic gardens today are places that are both educational and pleasurable. Visitors are entertained as botanic gardens address the importance of the visitor as funder, investor, and supporter. More and more the public is at the forefront of design decisions of new botanic gardens and the gardens have taken on an almost amusement park-like atmosphere. Due to this shift in focus, the original purpose of botanic gardens seems to be lost – that of education and research. With the design of the Ecuagenera Botanic Garden (EBG) a return to education, research, and conservation is brought to the forefront of the design. The design of the garden presents these educational components in a way that is also delightful and entertaining to the visiting public. Creating a space that is more park-like than institutional encourages visitors to return to the garden throughout the year, again and again. Presenting educational and conservation information in a manner that is pleasurable to the visiting public reinforces the original purpose of a botanic garden – a place of education. The EBG is a place of inspiration, beauty, and delight that is intended for the people of Ecuador and people abroad as a tourist destination and attraction. Furthermore, the garden is intended to serve as an educational tool for schools in the area.

Program

Previous Page: *Pleurothallis truncata*
(Photograph by Kyle Lucyk)

As a first step to the design of a botanic garden the development of a concise

mission statement that addresses the garden's goals, objectives, and philosophy is necessary. Defining a program for the space and its users also helps to set a foundation from which the garden can grow and evolve but also anchors the design and development of the garden.

The mission statement for the Ecuagenera Botanic Garden is threefold:

1. To *educate* and promote public awareness of the conservation of Andean orchid species and Ecuadorian habitats.
2. To *accommodate* scientific research and *ex situ* conservation efforts of Andean orchid species and Ecuadorian habitats.
3. To *engage* the visiting public through interactive displays, landscape immersion, and exploration of Andean orchid species and Ecuadorian habitats.

Education, research, and conservation play an important role in the design of the Garden. Presenting these three elements in a way that is enjoyable and also beautiful is the main design intention. The Garden focuses on Andean orchid species as well as other orchid species found in the different habitats of Ecuador. Conservation of these orchid species is a feature of the EBG that expands on the research and conservation efforts already being carried out by Ecuagenera. Displaying the Garden collections as intact habitats rather than taxonomic displays takes the design of contemporary botanic gardens one step further than gardens of the past. Not only are the Garden collections a beautiful arrangement of habitats, but they are also instructive in educating the public about the interrelationships of these plants with their environment.

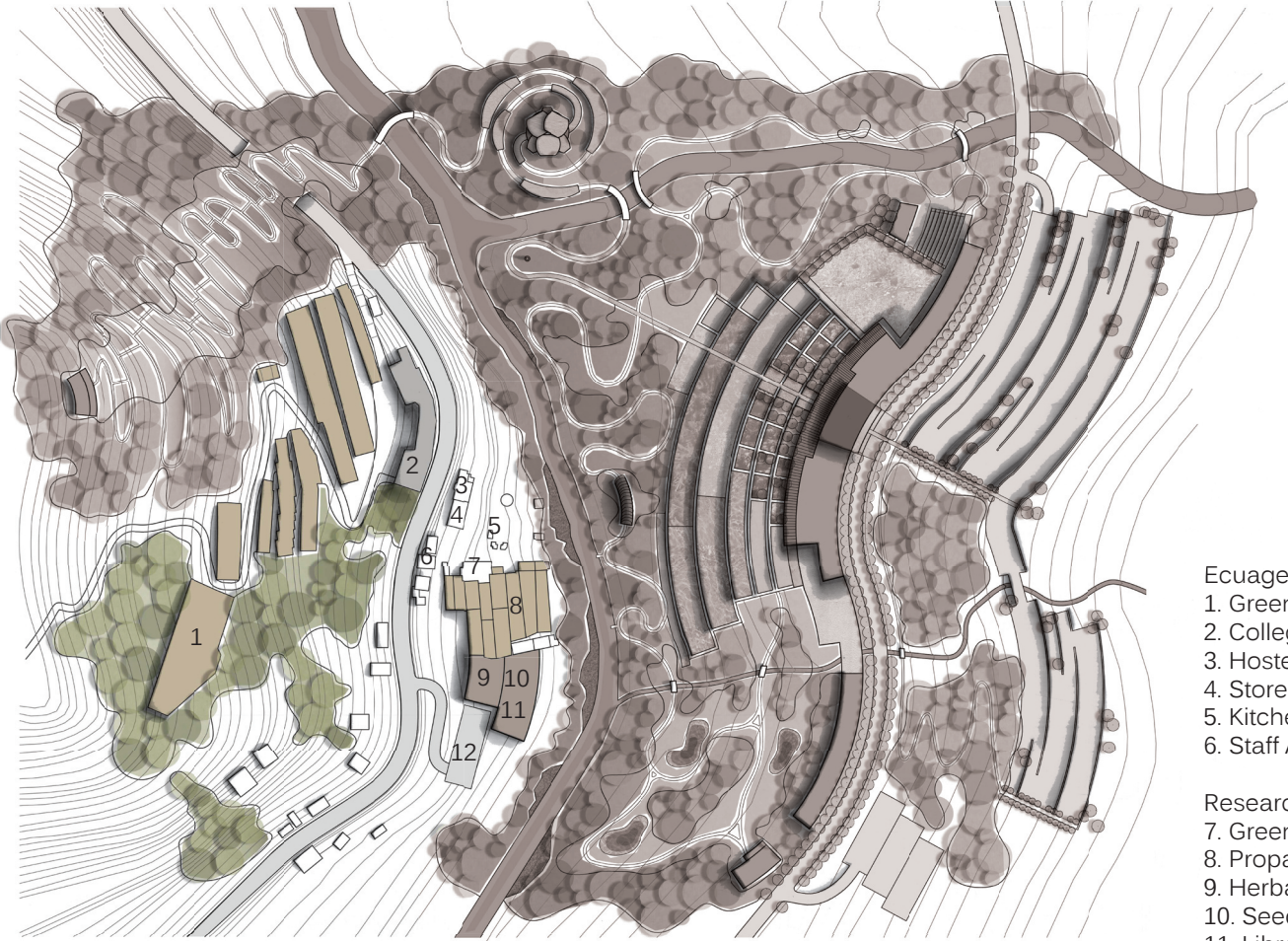
The EBG will specialize in Andean orchid species and function as a centre for research, education, and conservation. The EBG will set itself apart from the Quito Botanical Garden in northern Ecuador in that it will focus almost exclusively on Andean orchid species and feature Ecuadorian habitats as whole ecosystems

rather than groups of taxonomic displays. The EBG will also offer a simulated cloud forest experience. The location of the EBG near Cuenca, a UNESCO World Heritage site, will attract visitors already traveling the southern loop of Ecuador to Gualaceo, Sis Sig, and Chordeleg, and down to the Loja region. Ecuagenera, already established in this area, will provide the EBG with a firm grounding in research, education, and conservation of endemic orchid species. Furthermore, the topography of the site creates micro-climates which lend themselves to a variety of growing conditions in which to situate the different garden collections. Garden collections were selected according to the suitability of microclimates and growing conditions located on site from the site inventory and analysis.

One of the main goals of the EBG is to help shift the attitudes of visitors to and residents of Ecuador in relation to the loss of biodiversity and loss of primary forest. This is achieved by engaging the visiting public through interactive displays and 'green' infrastructure and practices. The design of the EBG sets an example of sustainable living and stewardship of the environment. Practices such as waste treatment and removal as well as water management and the LEED system are key aspects of the garden design. The EBG will make use of the land as an opportunity to challenge and change the beliefs and practices currently in Ecuador. The relationship between people and plants is emphasized in the EBG.

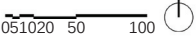
Program elements were determined through the case study analyses and exploration of the history of botanic gardens found in Chapters Two and Three. Special attention was given to the site's unique topography and microclimates when selecting locations of specific program elements. Program elements were divided into private and public functions. Together these two functions comprise a total footprint of 34 hectares. Out of the 34 hectares the Garden's public spaces total approximately 18 hectares with the remainder devoted to private functions of the Garden (16 hectares).

Private Functions

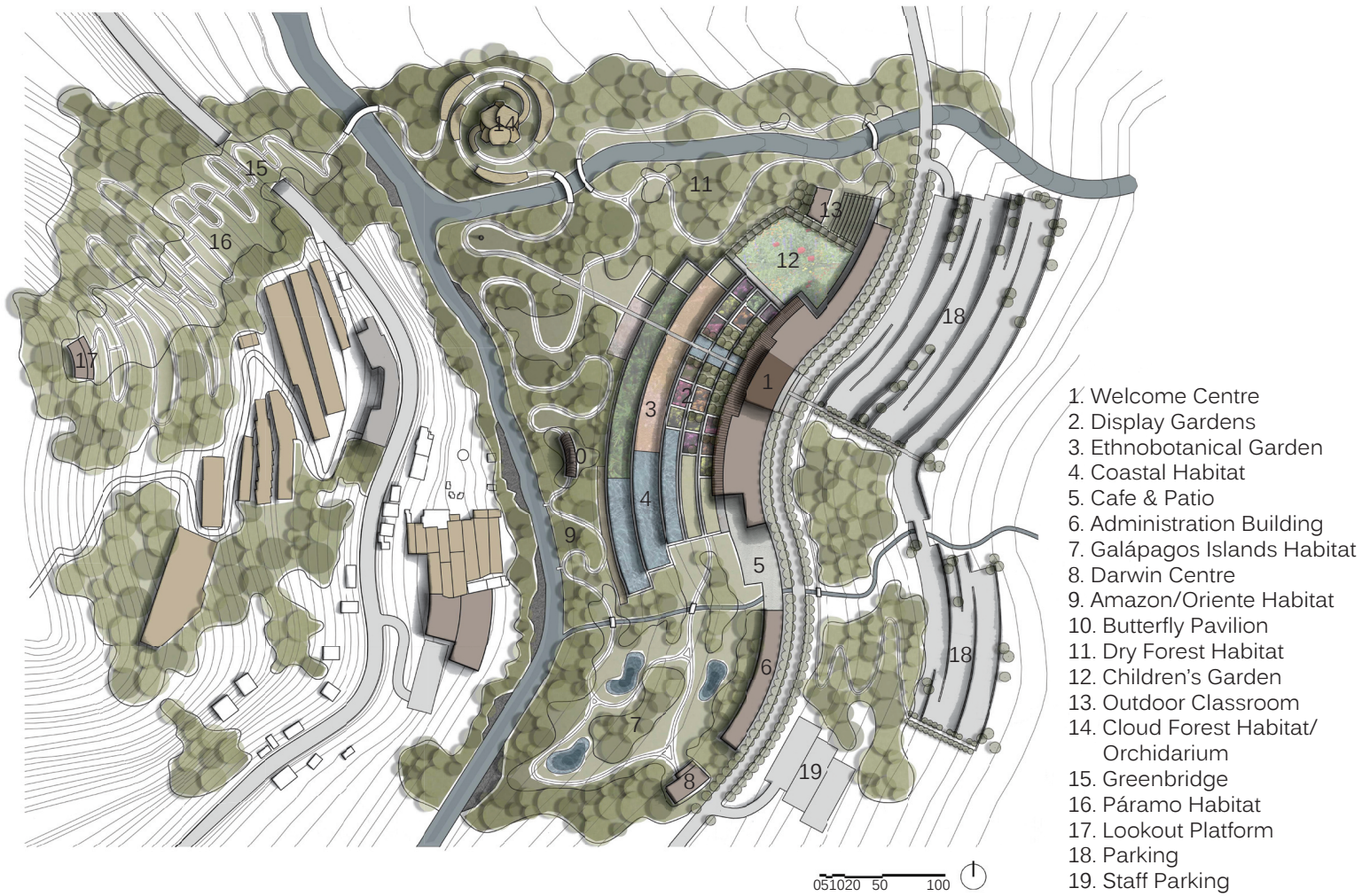


- Ecuagenera:
- 1. Greenhouses
 - 2. Collegio Nuveo Mundo
 - 3. Hosteria
 - 4. Store Front
 - 5. Kitchen Garden
 - 6. Staff Accommodations

- Research Centre:
- 7. Greenhouses
 - 8. Propagation Laboratory
 - 9. Herbarium
 - 10. Seedbank
 - 11. Library
 - 12. Staff Parking



Public Functions



Throughout the Garden rest stops are provided at key points. Lookout towers also offer the visitor with a reward or a chance to 'pop up' from the Garden and take in the spectacular views. The Garden sections are functioning systems, not exhibits frozen in time. They are changing, living landscapes – a source of beauty, education, and inspiration.

Master Plan

The master plan concept for the EBG consists of three interrelated themes – research, education, and conservation. Together these themes form a cohesive whole, communicating the ultimate message of conservation and preservation of Andean orchid species and Ecuadorian habitats. Plant collections of the EBG also include display and demonstration gardens, all linking back to the Garden's main message and mission. This message is delivered through landscape immersion and a choreography of pathways that connect the plant collections and entice the visitor to explore and discover the Garden. The pathways offer choice, creating discovery, mystery, and intrigue. Universal accessibility is made possible by long, winding ramps that run along the Garden's contours. Key views and rest stops along these pathways direct the visitor's focus to the surrounding hillside and across the river to Ecuagenera and the research taking place there. The Garden tells a story of discovery, loss, and recovery that is inspired by the stories of orchid hunters of the 18th and 19th centuries.

- (Discovery) As you move through the Garden the pathways offer choice and entice the visitor to explore and discover the wonder of orchids and Ecuadorian habitats.
- (Loss) Throughout the Garden rest stops interpret the Garden collections and the landscape beyond the Garden. The message is transferred into the surrounding landscape.
- (Recovery) As people leave the Garden they are more aware of conservation efforts and hopefully have faith that recovery is possible.

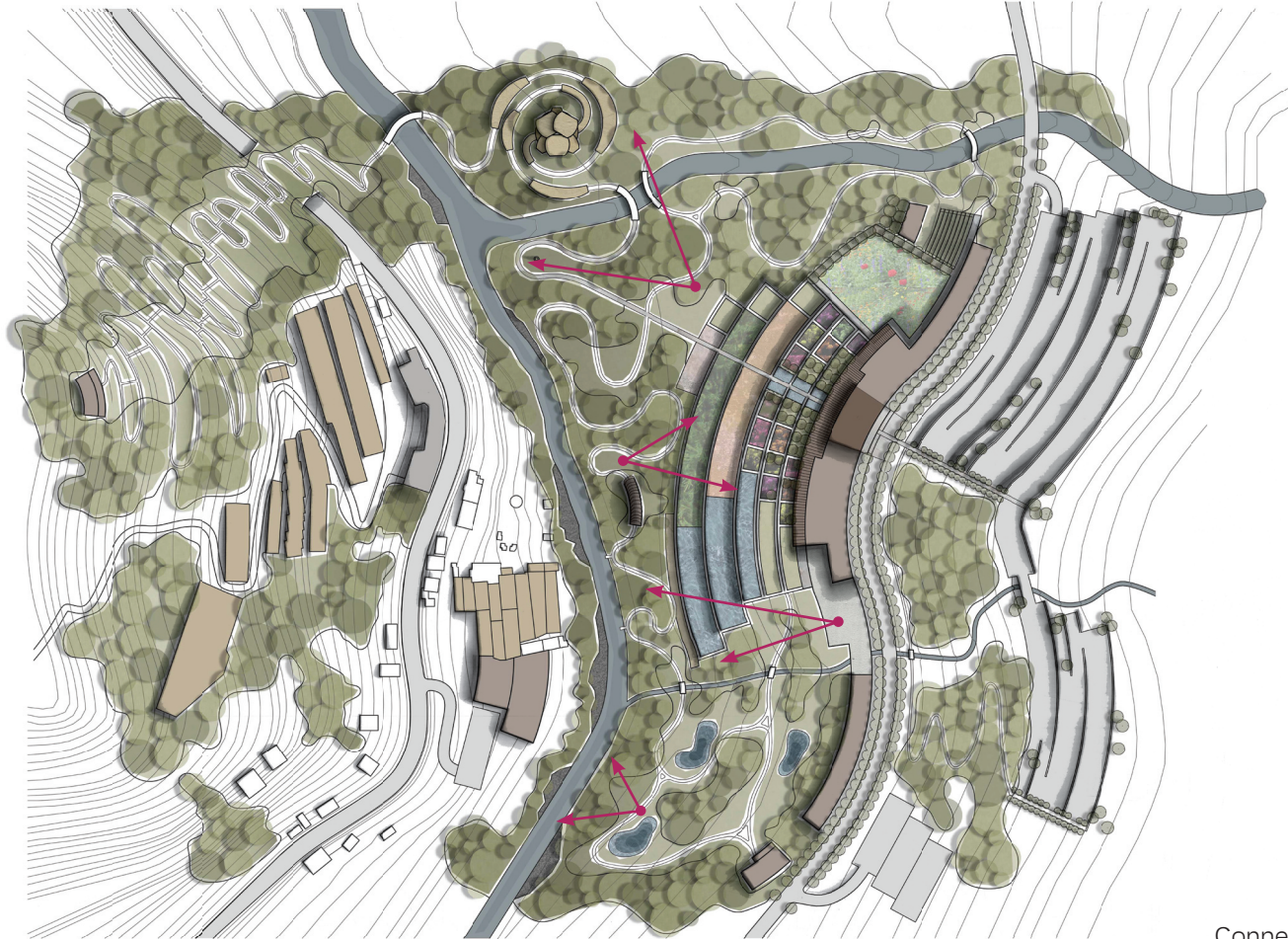
Demonstration gardens, interpretive signage and information, and Garden practices all are done in a manner that fosters the stewardship of the land.

Forms for the Garden were generated by following the natural contours already existing on the site. Working with the topography by building up rather than out maximizes space on the site and creates the illusion of a grander space. Terraces also maximize space while gesturing to the Incan terraces used thousands of years ago. Additional growing surfaces are provided by the implementation of terraces as epiphytes and other plants will grow on the stone faces of the terrace walls. The stone will also help to heat the earth and create microclimates within the site. A main axis was determined by connecting the Welcome Centre to the Orchidarium, providing a direct path to it. Arrangements of pathways were determined on the basis of views within and out of the site.

Connections are made within the site to important areas such as the Ecuagenera greenhouses, school, and research areas. Connections are made to views of the surrounding hillside, capturing the beauty of the landscape. Quiet areas throughout the Garden invite wildlife, such as hummingbirds and butterflies. Furthermore, the stream that runs down through the Garden to the Rio Gualaceo provides an opportunity for bio-remediation, slowing the flow of run-off and filtering it at the same time.

During the evening the Garden comes alive. The lighting of the Garden creates mystery and intrigue, providing a backdrop for special events and functions. The Garden glows at night and provides an experience not had during the day. Subtle lighting gives the feeling of awe and highlights the Garden's collections. The Orchidarium also becomes a glowing creature with the Garden at night, enticing visitors to come and explore its walkways and mystique.

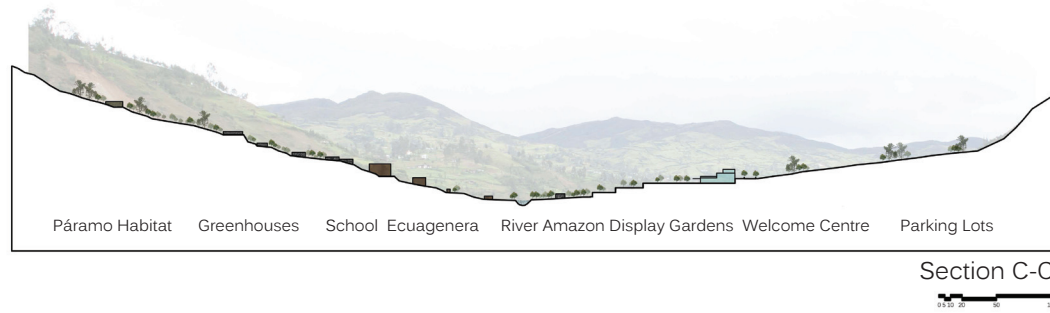
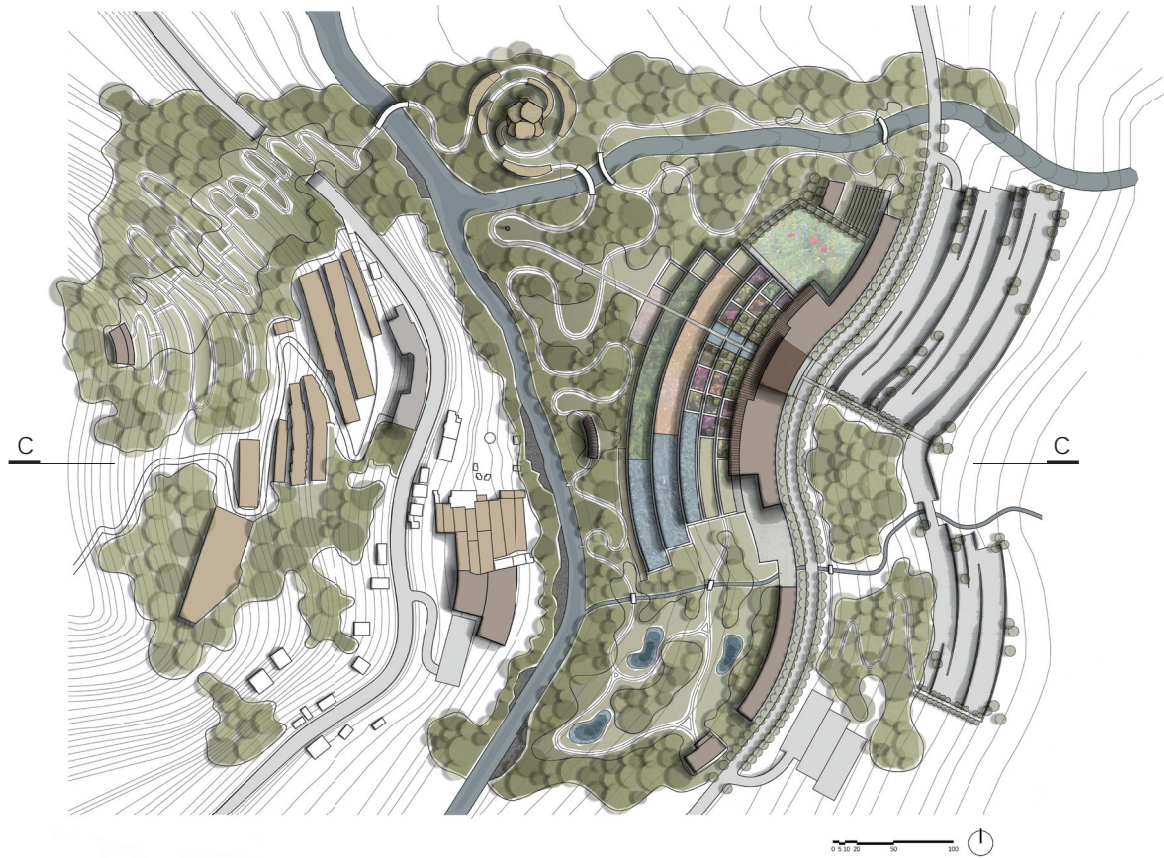
The master plan design connects to larger systems in the region such as hydrology, transportation, and education. The Garden reaches out and grows into the



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Connections are made within the site to important areas and views



Masterplan of the EBG and an elevational view of the site looking north

surrounding area, spreading the message of conservation and stewardship of the land.

Ecuagenera's Reserves provide a connection to larger systems. As mentioned in Chapter Five, Ecuagenera owns approximately 300 hectares of primary forest located about a three-hour drive away. The EBG offers an experience similar to hiking in the Reserves, thus reducing the pressure on the natural habitat. Small tours to the Reserves could be a possibility in the future as the EBG expands. The Reserves could offer a place of research and serve as a learning tool, supplementing the EBG as a 'satellite' garden.

Design Elements

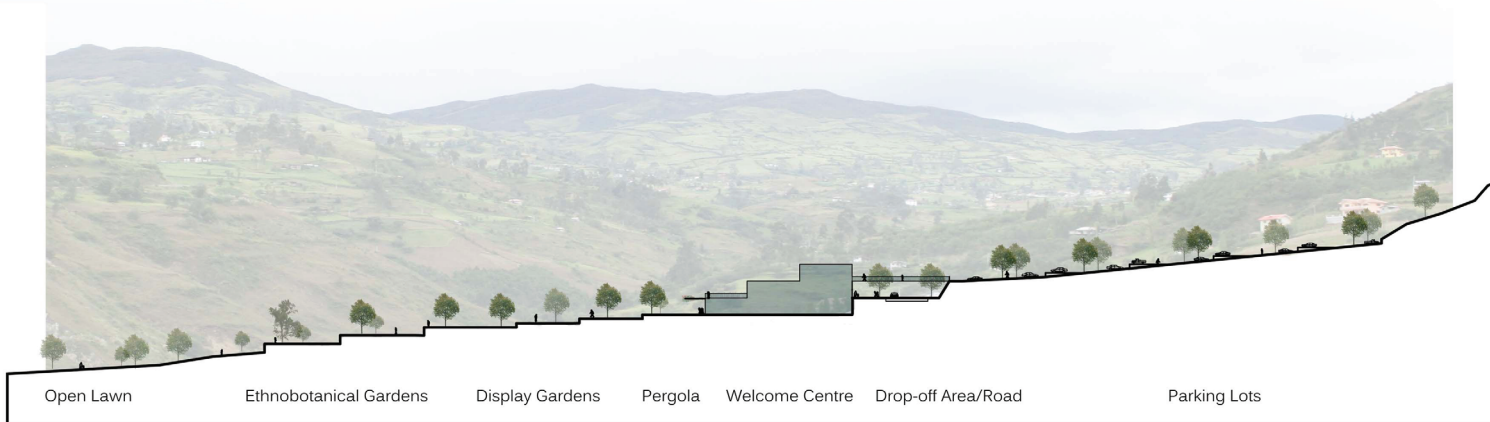
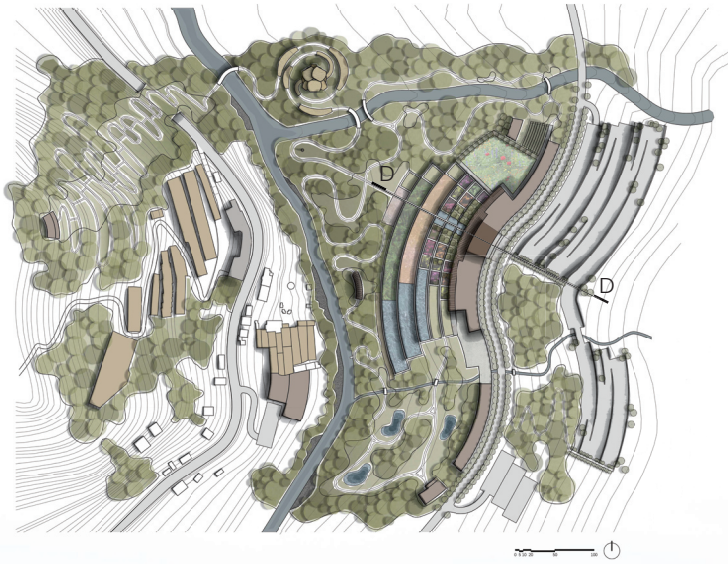
Final Design

The Garden is defined in the landscape as a dense oasis of vegetation in stark contrast to the cultivated hills of the Andean Mountains that surround it. The formal geometry found in the centre of the Garden breaks down as you move towards the Garden's boundaries. A return to the primary state of Ecuador is sought as the Garden grows into the surrounding landscape, becoming part of it.

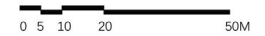
Welcome Centre

The Welcome Centre includes many of the EBG's indoor facilities and functions. Included in the Welcome Centre are areas for ticketing, an information centre, display area for artwork or exhibitions, restrooms, a gift shop, an indoor restaurant, and conference and rental facilities. Located to the south is the Garden's administration area for staff of the Garden.

The Welcome Centre



Section D-D



The Welcome Centre forms the backbone of the garden much like the Andean Mountain range forms the backbone of South America. The Welcome Centre snakes along the road to the east and sinks into the existing topography of the site. A corridor of trees separates the Welcome Centre from the parking lot, creating an allee of trees that greets the visitor and signals to drivers that they are entering the Garden's area. Pedestrian bridges span the road, and traffic is unencumbered. Entering the Centre from the parking area, one is brought into the second level. Here the visitor can look out on the viewing deck into the Garden and surrounding hillside or move downstairs and out into the Garden. A large drop-off area located on the main level also accommodates tour groups and the disabled. The building overlooks the entire Garden giving the visitor a glimpse of what is to come. The Display and Demonstration Garden overlaps into the Welcome Centre creating a grand entrance to the Garden and the feeling of emerging into a unique and special place. A semi-protected walkway, or pergola, along the Welcome Centre offers multiple entry points into the Garden and creates a space to stroll or sit and take in the view. Areas for displaying botanical drawings, art, or information panels are provided for along the walk. The Cafe and outdoor patio provide a break in the Welcome Centre, separating the administration building located on the south side from the public. On the north end of the Welcome Centre are the conference and rental facilities that provide a view onto the Children's Garden and Outdoor Classroom. Here, lectures, conferences, and meetings can be held in the Garden as well as weddings and special events. The transparency of the entire building is achieved with floor-to-ceiling glass walls, removing the boundaries between indoor and outdoor spaces.

Garden Collections

The Garden collections re-create the feeling and qualities of being in different Ecuadorian habitats. They are not actual re-creations of those habitats, but instead

representations of those places. These garden collections read as different “outdoor rooms” that are unique from each other but are tied together in a similar design language with materials, details, and site furniture. Materials such as glass, concrete, stone, and brushed metal provide a minimalist backdrop that presents the Garden’s plant collections as ‘centre stage’. Each garden collection expresses the character and feelings experienced while in that particular habitat.

Display Gardens

The Display Gardens are the gateway to the EBG. Here ideas are expressed and experimented with. Sustainable methods and techniques in gardening can be found here. A feeling of emergence is emphasized in this garden. Water pools border the Garden’s main axis which points to the convergence of the two rivers and leads the visitor down towards the Orchidarium, the heart of the EBG. The Children’s Garden and Outdoor Classroom are located to the north east of this area.

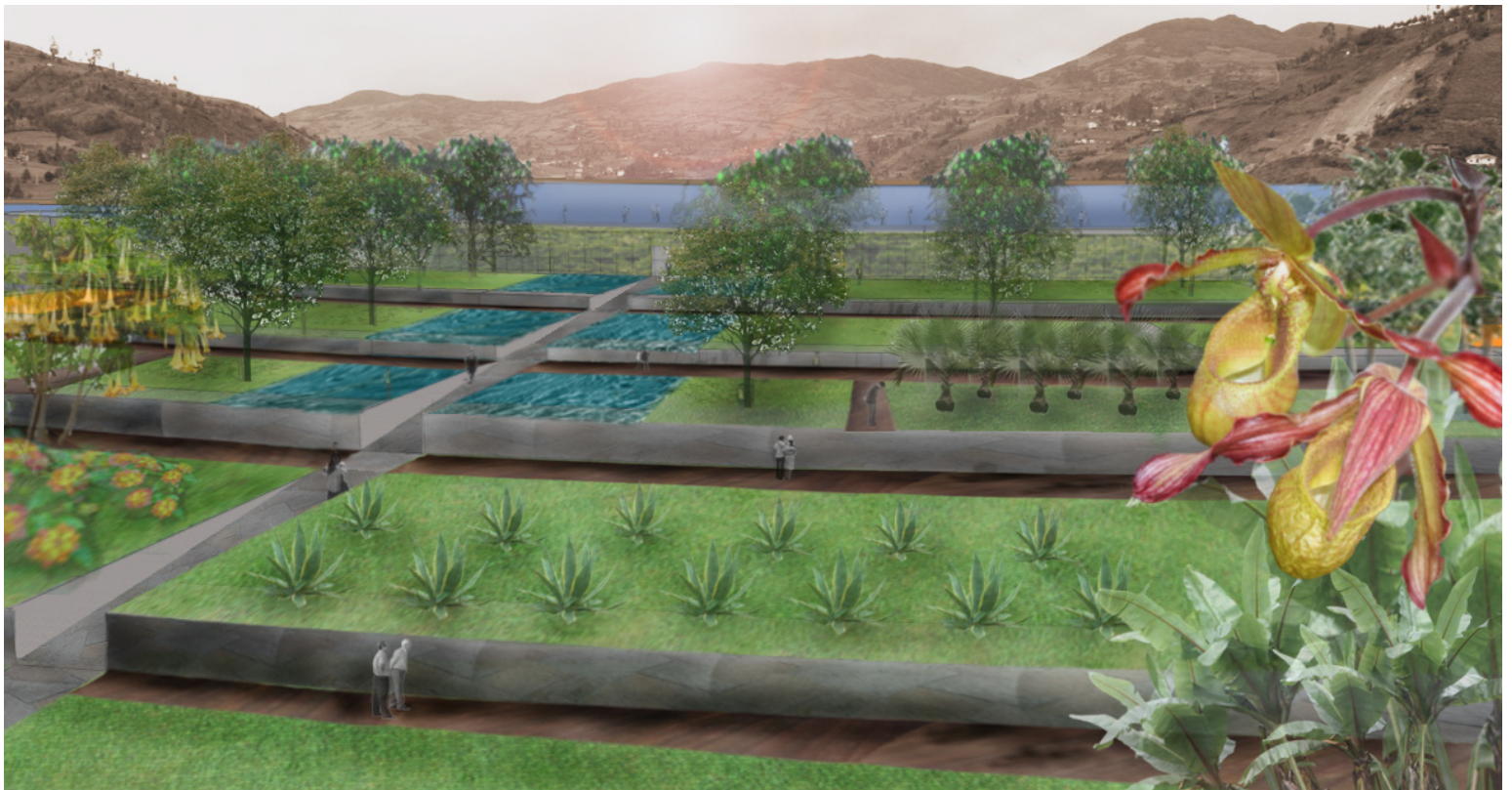
Ethnobotanical Garden

This area is geometrically laid out and contained, delineating the different plant collections within this area such as economic plants, plants used for food and medicine, textiles, traditional plants, and plants used for healing. The connection between plants, people, and culture is emphasized here. The main walkway from the Welcome Centre and Display Gardens lead directly to the Orchidarium and divide the collection in half. Contrast is emphasized in the arrangement of plantings, delineating between different plant uses.

Children’s Garden

The Children’s Garden is a place of discovery, play, and education. Oversized orchid flowers encourage children to play and explore the various pollination

Display Gardens & Ethnobotanical Garden



Children's Garden & Outdoor Classroom



mechanisms orchids employ. The periphery of this garden provides an area for guardians to supervise and relax.

Outdoor Classroom

This area is connected to the Children's Garden and provides amphitheatre style seating and a stage area for teaching. Education is the main focus of this area.

Costal Habitat

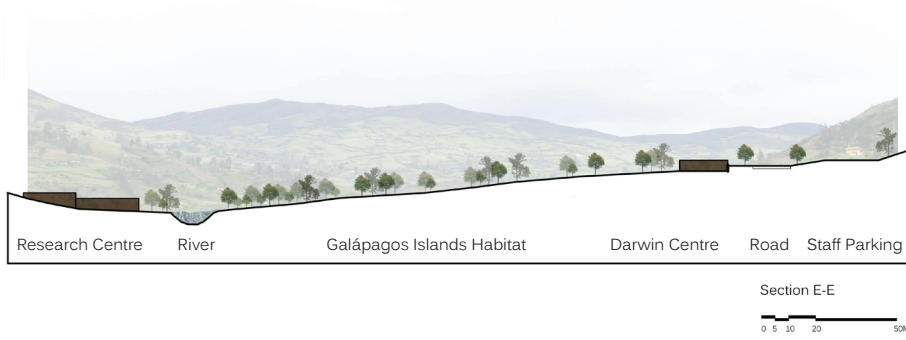
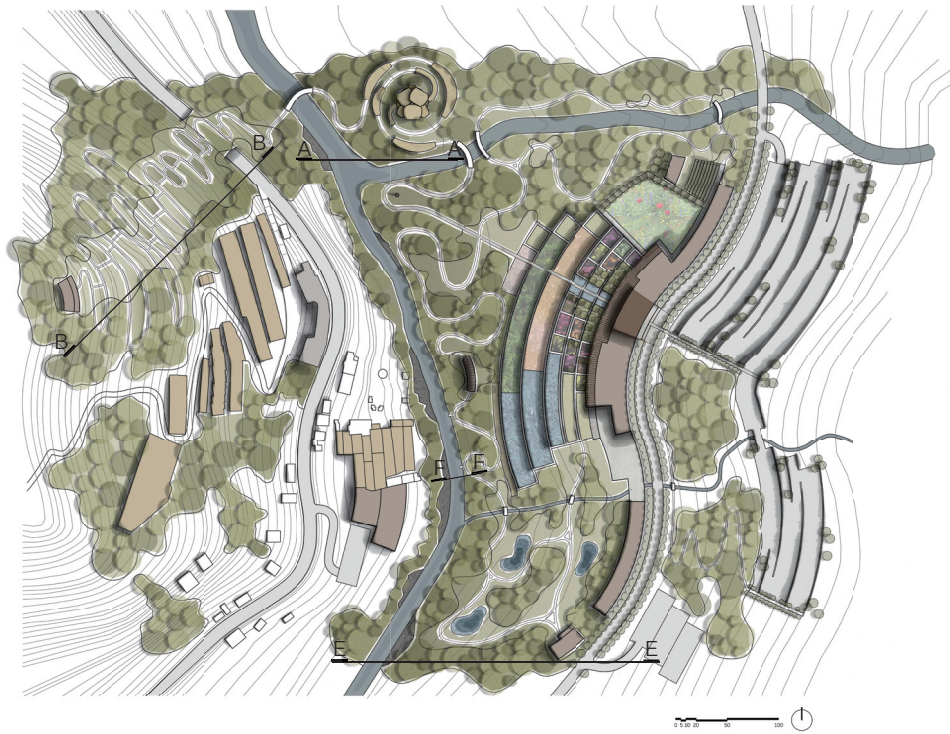
A series of cascades run down from the terraces creating a sense of drama in the landscape and openness to the sky. Boardwalks lead the visitor along the cascades, and plant collections are shown in contrast to water. The mountains to the east tower over this garden section, much like the Andean mountains can be seen off in the distance from the coast. Running water is circulated through the terraces providing supplemental irrigation to the rest of the Garden. The water also creates a comfortable microclimate, cooling the visitor in the mid afternoon sun. Feelings of expanse are created here.

Galápagos Islands Habitat

Here the visitor is encouraged to explore and discover this garden. "Harbour-like" areas created with vegetation focus the visitor's view outward and across the river to Ecuagenera's greenhouses and research centre. Glimpses of the Orchidarium are provided throughout this area. The area is a return to Ecuador's primary state as plantings become more naturalized. The sloped hillside incorporates three large pools representing the three major zones in the Galápagos Islands. Glimpses of the pools draw the visitor through this area. A small building is dedicated to Darwin and his travels in the Galápagos Islands. Exploration is emphasized in this section.

Coastal Habitat & Coastal Cascades





Top: Master Plan with section cutlines.
 Bottom: Gently sloped hillside of the Galápagos Islands Habitat

Amazon/Oriente Habitat

A narrow entrance from the Galápagos Islands Habitat creates a threshold that informs the visitor that they are entering a different space. A feeling of sinking down into the Amazon jungle is emphasized by the terraced area to the north (coastal cascades). Areas of little open space emphasize the feeling of being immersed in the Oriente. Contrast and colour of specimen plants provide interest throughout the landscape. Set pathways offer choice and glimpses of rays of sunlight pull the visitor into the garden. A butterfly pavilion is located in the garden where visitors can experience the wonder of the blue morpho butterfly of the Amazon. Enclosure opens up to an expanse of lawn near the Orchidarium for picnicking, resting, and leisure. Platforms located at key points along the river allow the visitor to engage with the river and are a place to stop and rest. Feelings of enclosure are created here.

Dry Forest Habitat

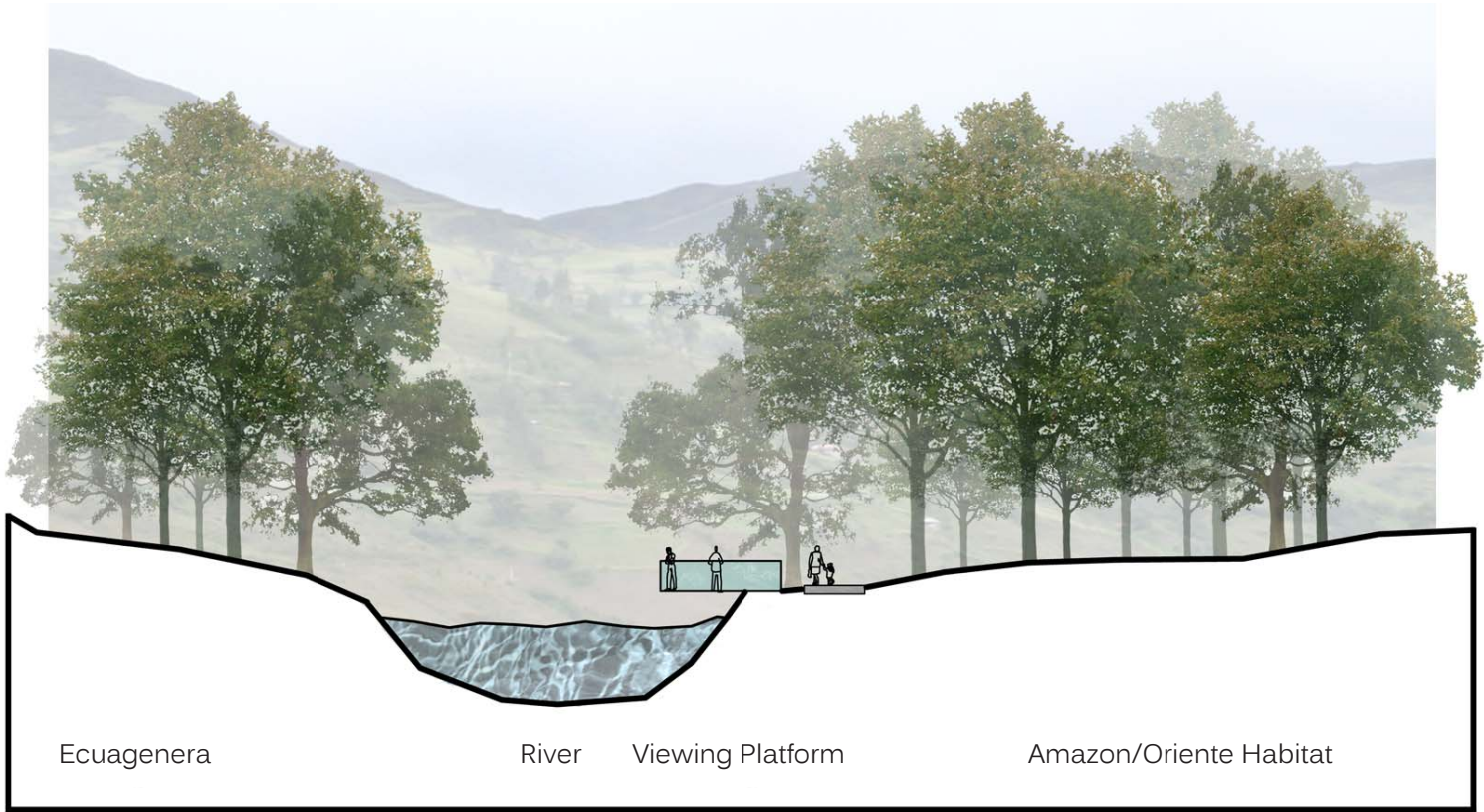
This area is heavily forested with existing trees and new plantings. Clearings provide areas to “pop up” from the forest and look out to the rest of the Garden. The feeling of mystery is created in this area with dense forest and winding pathways.

Cloud Forest Habitat/Orchidarium

This area is a quiet, mysterious, magical place. Ephemeral qualities of clouds are emphasized with fog/mist produced in the garden. Walkways bring the visitor up to the tree canopy and close to the Garden's main feature – orchids. Qualities of magic and wonder are emphasized here through the display of Andean orchids and their habitat.

Amazon/Oriente Habitat



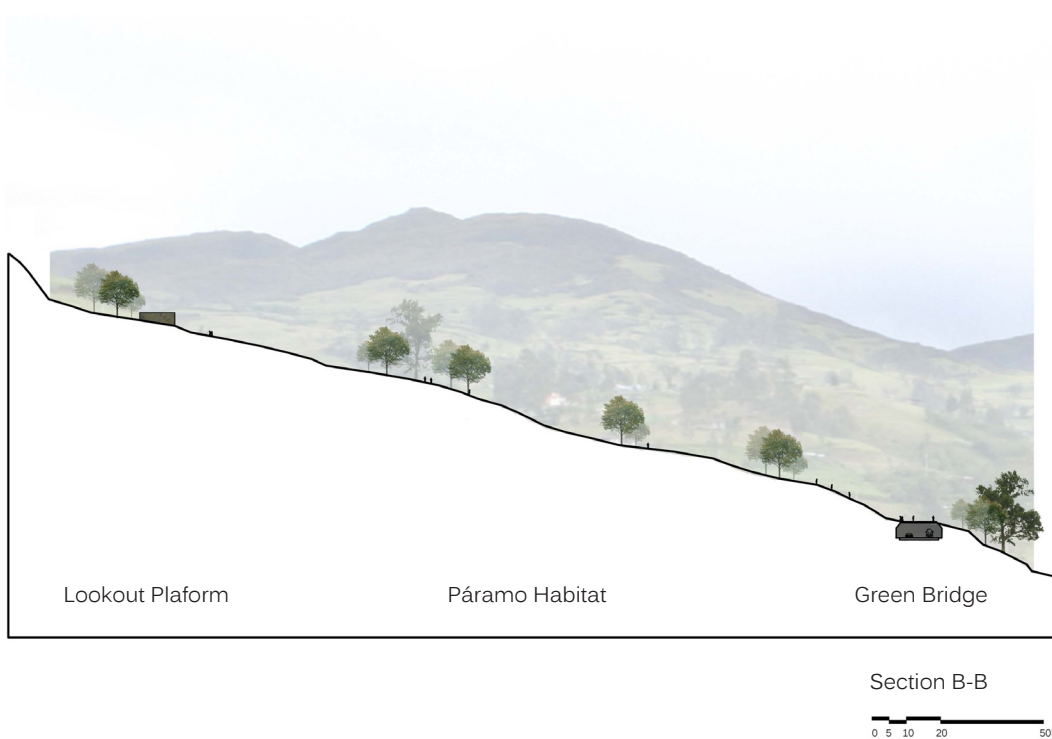


Section F-F



Páramo Habitat

A green bridge connects the Páramo Habitat to the Orchidarium and Cloud Forest Habitat. The Páramo habitat, or high grasslands of the Andes, focuses the visitor's view out towards the surrounding landscape. The Páramo Habitat is perched at the highest point in the garden bringing the visitor closer to the sky. The pathway winds its way in and out of the Garden's boundary of dense forest, emphasizing the expanse and openness of the this habitat. After a long ascent to the top, the visitor is rewarded with 360-degree views from the lookout platform. Qualities of the sky are emphasized here.



Opposite Page: Viewing Platform
in the Amazon/Oriente Habitat

This Page: Greenbridge
connecting the Orchidarium to
the Páramo Habitat.

The Orchidarium

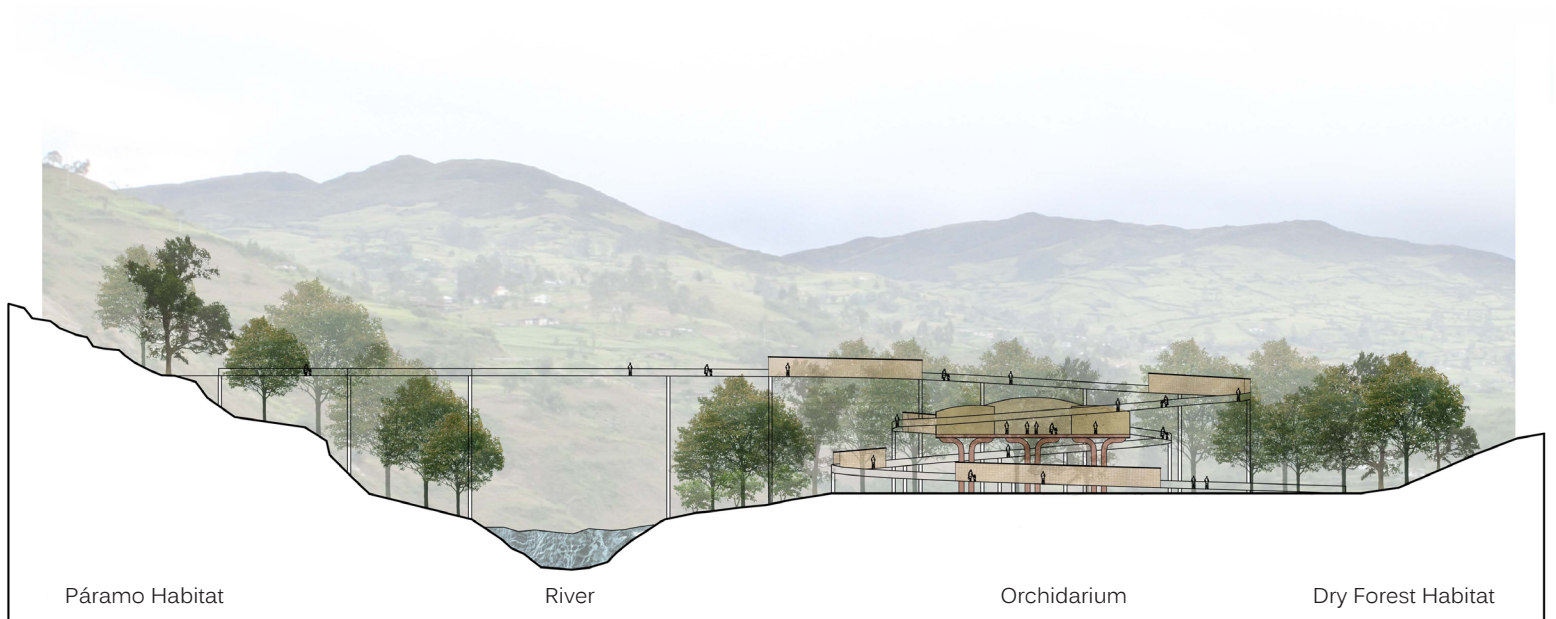
The Orchidarium, sited at the convergence of the two rivers, is the main attraction of the EBG. A semi-enclosed area creates a unique space within the Garden where a microclimate is created, providing the cultural requirements needed to grow orchids specific to a cloud forest. The Orchidarium simulates cloud forest habitat, alleviating the pressure on orchid populations *in situ* and allowing people, not otherwise able to travel to a cloud forest, to experience it here.

Areas of exposed rock face provide a growing medium for the orchids, while trees comprise the skeleton of the area and provide the main growing medium for the orchid species. Walkways bring visitors closer to the orchids, and treetop walks bring them to the upper canopy where most would have to climb *in situ*. Tensile structures provide shade and protection from the elements such as wind and heavy rainfall. These structures also collect rainwater and provide irrigation to the orchids. The “dance” of the afternoon clouds inspired the design of the Orchidarium.

The concept for the Orchidarium is that of the orchid and its pollinator – one of seduction and deception. Orchids are mysterious: they seduce, they deceive, they intrigue. An orchid can resemble its pollinator or it can emit the sweetest of fragrances to the most vile of odours in order to attract its pollinator. It seems even orchids have evolved and adapted to attract humans. Applying this to the garden the visitor is seduced by the Orchidarium and lured into the garden. The visitor leaves with the message of conservation, much like a pollinator would leave with pollen on its back to pollinate another orchid.

As the visitor enters this part of the garden, there is a slight change in level and then an ascent up to the treetops. People move along the winding pathway, continually presented with changing views as the pathway winds up to the Orchidarium's centre. The Orchidarium Interpretive Centre features botanical drawings, displays,

The Orchidarium



Section A-A
0 2 5 10 15M



Inside the Orchidarium Interpretive Centre

and information on the conservation of orchids. It tells the stories of orchid hunters past and present and the current loss of primary forest in Ecuador. The centre of the Orchidarium in plan replicates the basic structure of an orchid with the labellum acting as the entrance to the Orchidarium, drawing visitors in. The Orchidarium entices visitors to enter and draws them into its centre. Here they are encouraged to explore and discover the world of the cloud forest and enjoy the beauty of orchids. The pathway spirals up to the Orchidarium's Centre in a clockwise motion. As the visitor exits the Centre they leave in a counter-clockwise motion – a shift in perception and attitude regarding the conservation of these plants. The Orchidarium becomes a creature of its own, glowing within at night, becoming a mysterious presence in the garden.

Creating a feeling of awe and beauty is achieved by pumping fog or “cloud” into the Orchidarium at key points. Along the walkway, “tunnels” of billowing shade cloth are spaced intermittently, offering a feeling of enclosure. Fog is pumped into these areas providing increased humidity levels for the orchids. This creates the feeling of being in an actual cloud forest and increases the mystery and intrigue experienced there. The clouds rise and sink, dancing throughout the area. These choreographed dances create an attraction for visitors to the garden. Visitors are brought up close to the beauty of an orchid and are immersed in the landscape of the cloud forest. As the visitor ascends to the tree canopy they learn about the increasing number of orchid species the higher they climb. A movement from dark to light becomes a metaphor for the loss and recovery of orchid species.

The experience and qualities of a cloud forest are re-created in the Orchidarium. It is a place of silent beauty, a quiet, mysterious, magical place. Ephemeral qualities of clouds are emphasized with the production of fog and mist in the garden. Qualities of sight (lush, the colours green and dark blue, clouds, light from above), sound (trickling water, stillness), smell (organic matter, damp, wet), taste (humid, thick air), touch (soft, damp organic matter) are emphasized with the design of the Orchidarium making the visitor more aware of their senses. These qualities

Opposite Page: View of the walkways throughout the Orchidarium



enhance the visitor experience and cause them to look a bit closer and differently at their surroundings. People ascend and move towards the light like orchids do. Time seems to stop as the “dance of the clouds” captivates and awes the visitor.

Materials for the area include the use of stainless steel supports, glass, and stone. Walkways are “light and airy” and seemingly blend into their surroundings.

Satellite Garden – The Reserves

As mentioned previously, Ecuagenera’s Reserves could in time become an extension of the EBG. As part of the EBG’s education, research, and conservation mandate the Reserves could serve as a learning tool for the re-introduction of orchid species back into the wild. Small tours could be accommodated in the Reserves and be a special place that not many people get the chance to travel to. Somewhat inaccessible, the trip to the Reserves becomes more of a journey with the reward of the experience of cloud forest in its primary state.

Conclusion

As the visitor leaves the Ecuagenera Botanic Garden, the message of conservation leaves with them. The Garden displays collections of plants indigenous to Ecuador, promotes research of these species and continues to further Ecuagenera’s conservation efforts. The Ecuagenera Botanic Garden’s main goal is to promote the conservation of Andean orchid species and their habitats. Through the use of plant collections, research efforts, and education the Garden offers a place of beauty and conservation. Keeping accurate records of these plants is important to their preservation. Ultimately through the design of the garden this message is communicated.

Opposite Page: Cloud forest at
Ecuagenera’s Reserves





Chapter 7
Conclusions

Concluding Thoughts

"It is sometimes good to understand what's been lost, what is irrecoverable, what is valuable to us, and what we would like to repair"

-Maya Lin

The purpose of this Practicum has been to explore the design of a botanic garden focused on the delight and wonder of orchids and their conservation, situated in Ecuador.

The site chosen for this design is a unique place high in the Andes where Ecuagenera is located. Here, people from all over the world visit for science and pleasure. There is an incredible life and energy that surrounds this place, a place that is dear to me. Working and living there, I was able to immerse myself in the culture and rhythms of the place. The conservation efforts that Ecuagenera employs are commendable, and the presence of a botanic garden would help to further those efforts and promote them to a larger audience. There are no plans for this design to be implemented, however I felt it important to 'dream big'. Pepe Portilla, together with his brothers Mario Portilla and Ivan Portilla, was determined 18 years ago to build a business that would promote the conservation of Andean orchid species. From a small patch of land to a large scale, international business, Ecuagenera has grown with the generosity of others who share a common interest in conserving these species. The proposal for a botanic garden may in time be realized at Ecuagenera as so many other projects have come to be.

Another place that is dear to me is that of the cloud forest habitat found in Ecuador. Thanks to the generosity of Ecuagenera I have been able to travel and explore many cloud forest habitats in Ecuador. These experiences have influenced my Practicum greatly as it has been a leading inspiration in the design of a botanic garden focused on orchids. These places of mystery and intrigue, the cloud forests,

Previous Page: *Masdevallia veitchiana*

are home to thousands of orchid species and are also at risk. The design of a botanic garden that promotes the conservation of these habitats and educates the public is an important goal of this Practicum.

Botanic gardens have continually adapted in response to the changing needs. Their development has reflected advances in science as well as wider social and cultural changes in society. As society faces the issues of sustainable development, poverty, overpopulation, climate change, and loss of biodiversity, botanic gardens are emerging at the forefront of this research. These gardens are places of change, playing a vital role in the conservation of plant species. Delivering the message of conservation, research, and education is crucial to changing the way people interact with their environments. Presenting this message in a way that is also inspirational, enjoyable, and delightful is essential to educating the public on these issues.

This Practicum has helped me to look outside my immediate surroundings and apply the education I have gained in the Master of Landscape Architecture program. I have learned the value of applying the transferable skill set of the landscape architect while respecting the natural and cultural values of the places I have visited and will work. This Practicum has given me the opportunity to see life through different eyes and experience a landscape that is absolutely beautiful and awe-inspiring. The knowledge I have gained through my education in landscape architecture, and through this Practicum, has helped me to become a more capable designer, explore new possibilities, and 'dream big'. I have also learned to love the landscape that I come from. The Prairies have always been my home, but I had to leave it to love it.

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Chapter 6 & 7

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