

**THE POTENTIAL IMPACT OF A BOTANICAL GARDEN IN
THE KOREAN DEMILITARIZED ZONE**

by

Dongah Shin

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of the requirements for the degree of Master of Science in Public Horticulture

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THE KOREAN DEMILITARIZED ZONE**

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EPIGRAPH

For as the earth brings forth its sprouts, and
as a garden causes what is sown in it to
sprout up, so the Lord GOD will cause
righteousness and praise to sprout up before
all the nations.

Isaiah 61:11

땅이 싹을 내며 동산이 거기 뿌린 것을
움돋게 함 같이 주 여호와께서 공의와
찬송을 모든 나라 앞에 솟아나게 하시리라.
이사야 61:11

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ABSTRACT

The Korean Demilitarized Zone (DMZ) between North and South Korea came into fruition as a result of the 1953 Korean Armistice Agreement. No human disturbance for over 60 years yielded the *de facto* sanctuary. The DMZ, which extends 248 km (155 miles) long and 4 km (2.5 miles) wide, has become a nature sanctuary that contains more than 1,800 flora and fauna, including threatened and endangered species. Many researchers maintain that the DMZ must be preserved for the sake of biodiversity, and designating the DMZ as a peace park, a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site or a Biosphere Reserve is appropriate.

Botanic gardens have become environmental stewards that can play crucial roles in conservation, research, and education. Furthermore, botanic gardens illustrate the history and culture of the nation in which they reside. This research investigated the feasibility of developing a botanical garden in the DMZ utilizing surveys of the South Korean public and interviews conducted in South Korea with horticulture and government professionals. The public was supportive of the idea of establishing a botanical garden and agreed that the garden focuses on conservation efforts and educational programming. Upon further research, a similar government plan was found and included in the planning of a proposed DMZ Native Botanical Garden (DNBG). Another interview with an individual from North Carolina Botanical Garden was conducted as a possible model for the DNBG.

The results of the survey, interviews and the DNBG plan yielded the current state of affairs in the DMZ and Civilian Control Zone (CCZ), followed by examination of Wyse Jackson's viewpoints on the critical elements to consider when creating a botanic garden with research findings. The research then explores six potential roles and eight critical elements that the DNBG should consider in order to be successful as a core institution for DMZ and CCZ conservation. A SWOT Analysis (Strengths, Weaknesses, Opportunities and Threats) of the planning and the research results was used to develop strategies for the proposed DMZ botanic garden.

초 록

대한민국과 조선민주주의인민공화국 사이에 있는 비무장지대는 1953년에 맺은 한국전쟁 정전협정의 결과이다. 사람의 발길이 닿지 않은 60년의 시간은 사실상 비무장 지대를 자연의 안식처로 만들었다. 길이 248km 폭 4km의 비무장지대는 멸종 위기종을 포함한 1,800 이상의 식물 군과 동물 군을 포함하고 있다. 많은 연구자들은 지금껏 생물 다양성을 위해서 비무장지대를 평화공원이나 유네스코 세계문화유산, 또는 유네스코 생물권 보전구역으로 지정해야 한다고 주장해왔다.

식물원은 식물의 보존, 연구, 교육, 환경에 중요한 역할을 담당해왔다. 또한 역할의 범위를 확대하여 나라의 역사와 문화를 투영하는 기관으로 거듭나고 있기도 하다. 본 연구는 한국인을 대상으로 실시한 설문조사와 관련분야 전문가 인터뷰를 바탕으로 비무장지대의 식물원 조성 가능성에 대해 조사하였다. 일반 대중은 식물원 설립을 지지하였고 비무장지대의 식물원은 식물보존에 노력을 기울여야 한다고 응답했으며, 식물원의 프로그램을 통해 비무장지대의 환경과 보전을 교육하는 것이 매우 필요하다고 동의했다. 본 연구와 유사한 취지의 DMZ 자생 식물원 설립계획이 연구조사 중 논의되어 결과에 포함되었다. 미국의 노스 캐롤라이나 식물원이

DMZ 자생 식물원의 모델이 될 수 있을 것으로 사료되어 또 다른 전문가 인터뷰를 실시하였다.

설문 조사와 전문가 인터뷰, DMZ 자생식물원 설립 계획을 통하여 비무장지대와 민간인 통제 구역의 자연보전 현황을 진단하였고, 식물원을 설립할 때 고려해야 할 중요한 요소를 Wyse Jackson의 관점에서 검토하였다. 연구는 비무장지대 일원의 식물원이 지역 보존의 핵심 기관으로 가질 수 있는 여섯 가지 잠재적 역할과 식물 보존, 연구, 교육, 환경 나아가 역사, 문화기관으로 성공하기 위해 고려해야 할 여덟 가지 중요한 요소를 탐구하였다. DMZ 자생식물원 계획과 연구 결과는 SWOT 분석을 이용하여 비무장지대 일원의 식물원을 위한 전략을 개발하는 데 사용되었다.

Chapter 1

INTRODUCTION

With the International Year of Biodiversity in 2010, the United Nations declared the United Nations Decade on Biodiversity to support the implementation of The Convention on Biological Diversity (CBD) Strategic Plan for Biodiversity 2011-2020. The Plan, adopted at the 10th Conference of the Parties in Nagoya, Japan, outlined five strategic goals and 20 Aichi Targets for securing and enhancing biodiversity (CBD, 2013). The international community is paying attention to biodiversity on earth and trying to prevent extinction. In order to achieve the goal of conservation, the Plan recommends designating protected areas as a management tool because they are easily adaptable and cause one of the most diverse by simply protecting (Woodley et al, 2012).

In terms of conservation value, there is a unique place that deserves a closer attention: the region containing the Korean Demilitarized Zone (DMZ) and the Civilian Control Zone (CCZ). A buffer zone resulting from the separation of North and South Korea, it remains the only continuous natural preserve across the Korean peninsula (Brady, 2008) and unintentionally protects a horizontal ecosystem that contains one of the highest levels of biodiversity in Korea (Green Korea United, 2008). In addition to its biological diversity, the area can also be considered a museum

of war relics, as heavy fighting for 764 out of 1127 days of the Korean War took place where the DMZ is today (Lee, 2008).

The area gets attention from conservationists because it is the only such sanctuary in the Korean peninsula, much of which has been developed or destroyed from an environmental perspective (Kim, 1997; Brady, 2008). It contains a variety of ecosystems, from wetlands to mountainous highlands, and because of its ecological diversity, more than 1,800 flora and fauna species exist in the region, including those that are threatened and endangered species (Kim and Cho, 2005). Many researchers maintain that the DMZ must be preserved for the sake of biodiversity (Healy, 2007; Brady, 2008; Lee, 2008; Kim, 2009; Seo, 2010). It has been recommended to designate the entire DMZ and CCZ (or part of them) as a peace park, a UNESCO World Heritage Site, or UNESCO Biospheres Site (Kim, 1997; Lee, 2008).

This research proposes that a botanic garden in this region could actively serve conservation initiatives. Botanical gardens are recognized as environmental stewards since they have living plant collections, horticultural knowledge, resources to perform vegetation evaluation, introduction and restoration projects, and facilities to educate the public (Peck, 1978). Gardens have huge potential to “contribute to the conservation of both species and habitats” (Maunder, 1994). The wealth of plant resources in the region could provide an opportunity for a botanical garden to engage in horticultural research to better understand biodiversity and to share their findings with the general public. The development of a botanic garden could be a catalyst for bringing South and North Korea together in the pursuit of creating national heritage and preserving unique ecosystems.

The objective of this research is to discover the South Korean public's views on a proposed botanical garden, as well as investigate current conservation policies and activities in the Korean DMZ and CCZ. Although a plan already exists for such a botanic garden, as created by the Korea Forest Service, its main goal was to collect and research the plants of the region. Based on these findings and best practices for botanic garden planning, this thesis research will provide potential goals and objectives for development of a botanic garden that would serve as an administrative and interpretive center for nature preservation, history and culture.

Chapter 2

LITERATURE REVIEW

The Korean Demilitarized Zone and the Civilian Control Zone

A Demilitarized Zone is an area where military activity is not permitted according to a peace treaty, armistice, or other similar agreements. These areas are often less exposed to human disturbance, so they become unintentional wildlife preserves. The Korean DMZ, created by the United Nations in 1953 to support the Korean War cease-fire agreement, is a symbol of diplomatic failure; however, it is a great success from an environmental perspective (Brady, 2008). As heavy fighting for 764 out of 1127 days of the Korean War took place where the DMZ is today, the area can be considered a museum of war relics as well (Lee, 2008). The DMZ is a 248 km (155miles) long and 4 km (2.5 miles) wide strip crossing the Korean peninsula. It serves as a buffer zone from the Military Demarcation Line (MDL), moving outward in each direction to North and South Korea – approximately 2 km on both sides¹ (Figure 2.1). Ironically, the DMZ is the most intensely militarized border in the world because the armies of both Koreas face each other along the DMZ (Easen, 2003; Azios, 2008). Human access into the DMZ has been extremely limited for more than 60 years while it has become a free land to other living things.

¹ Due to securing military visibility, both southern and northern boundaries were adjusted likely towards each other.

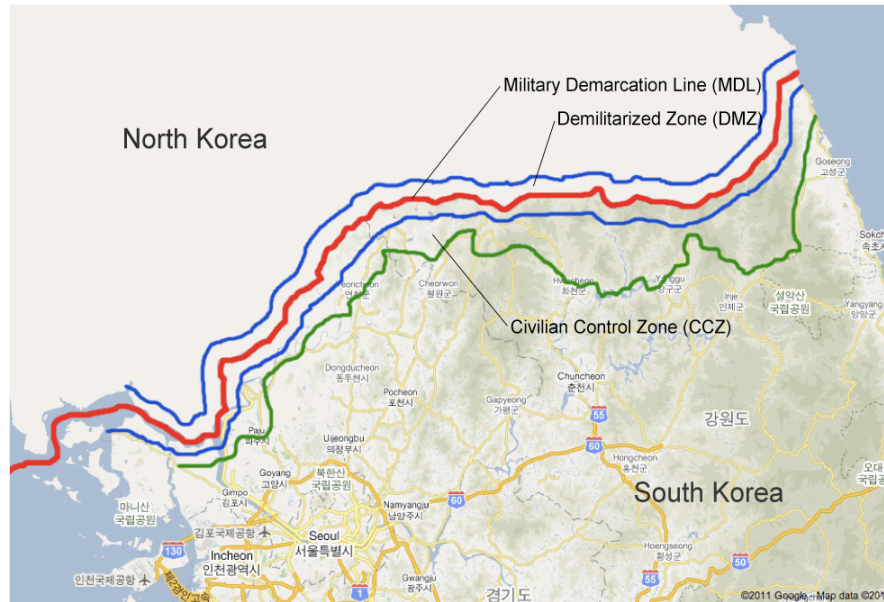


Figure 2.1 A map of the Korean DMZ (modified by author with Google Maps)

In the Republic of Korea, more commonly known as South Korea, there is the Civilian Control Zone (CCZ), whose width ranges from 5 to 20 km (3 – 13 miles), extending south from the DMZ. After creation of the DMZ in 1953, with the official authority of the 8th American Army commander in chief, a line was created to restrict the residences and farming inside of the line. After the authority for the area turned over to the South Korean military in 1958, it was named the Civilian Control Zone, which allowed farming by civilians, with permission. One hundred and twenty-one villages were built in the CCZ and only some of them permit residency (Green Korea United, 2008). There is also a similar zone adjoining the DMZ in the Democratic People’s Republic of Korea, more commonly known as North Korea (Healy 2007).

As a result of the limited intrusion onto the land within the DMZ, less harm has come to its existing ecosystem. “Within the forbidden zone, nature has staged a renaissance during the last fifty plus years” (Healy, 2007). The CCZ has also been protected from urbanization and industrial development for over a half century, leaving some parts preserved better than the DMZ, containing few climax forests while the DMZ has been burned intentionally to secure military visibility from both sides (Green Korea United, 2008).

Geographical and Biological Features in the DMZ and the CCZ

The DMZ forms a horizontal ecosystem line that represents the Peninsula’s topographic diversity well. The line is important because it meets the main mountain range, Paektudaegan, that is a vertical ecosystem stretching along the eastern coast, from north to south (Green Korea United, 2008). Although narrow, the DMZ and the CCZ represent Korean ecosystems; a number of different habitats can be found ranging from wetland to grassland, farmland, mountainous highlands, forest, and to coastal ecosystems (Kim and Cho, 2005; Brady, 2008). The DMZ together with the CCZ contain five major rivers. Two of them, Han and Nam Rivers, originate in this Zone (Shore, 2004; Green Korea United, 2008). These “first quality streams” and the diverse habitats have become an important refuge for diverse wildlife, including many globally endangered species (Healy, 2007).

The DMZ contains 1,597 plant species (34 percent of all plants of the nation), 106 fish species (12 percent of fish of the nation), 29 amphibian and reptile species (71 percent of amphibian and reptile species of the nation), 201 bird species

(51 percent of all birds of the nation), and 52 mammalian species (52 percent of all mammals of the nation) (Kim and Cho, 2005). The area can be divided into three ecological regions: western, central, and eastern. Rich wetland habitats in the western region attract high ecological valued birds like black-faced spoonbills (*Platalea minor*), including 11 endangered species and 13 nationally designated protected species (Kim, 2008). The central region, especially Cheorwon Plain, is a favored wintering site by rare red-crowned cranes (*Grus japonensis*) and white-naped cranes (*Grus vipio*), which are attracted to the Saemtong and rice fields. The Saemtong is a spring that maintains 15°C (59°F) degree during the winter, so offers fresh and warm water to cranes (Kim et al., 2011). The DMZ became “a unique link to the entire East Asia flyway system for migratory birds from Russia down to Australia” (Healy, 2007).

In the mountainous eastern region, only high moor in South Korea called Yongneup of Mt. Daeam exists in the midst of a deciduous broad-leaved forest (Kim, 2008). Composed of two bogs, Yongneup houses 252 species of plants, including *Clematis fusca* var. *coreana*, *Cypripedium macranthum*, *Disporum ovale*, *Drosera rotundifolia*, *Lobelia sessilifolia*, *Lychnis kiusiana*, and *Viola biflora*. Over 4,500 years old, Yongneup first appeared on the list of the Ramsar Convention of Wetlands in 1997. “The site exhibits high species diversity and supports numerous species of rare plants and many newly discovered species of animals” (RSIS, 2009).

Conservation Efforts

Many researchers maintain that these physical, biological and historical resources must be preserved for the sake of biodiversity and culture (Kim, 1997; Shore, 2004; Healy, 2007; Seo, 2007; Brady, 2008; Lee, 2008; Lee, 2010). South Korea's economy has grown rapidly since the Korean War, which results from pursuing modernization and ideological competition (Brady, 2008). The growth of industrialization, urbanization and agriculture has caused significant air, soil and water pollution, which led to losing the majority of its natural habitats (Easen, 2003; Shore, 2004; Brady, 2008). The DMZ is sacred land; it is a source of pristine water and air, the burial ground for soldiers and other victims of war (Shore, 2004), and a symbol of the past and future of both North and South Korea (Brady, 2008).

The German Green Belt (Grünes Band Deutschland) is a 1393 km strip of land (50 to 200 meter wide) that has a similar history to the Korean DMZ. It is the only existing national, habitat-connecting system in Germany, when it served as the inner border between the German Democratic Republic (GDR, East Germany) and the Federal Republic of Germany (FRG, West Germany) (Cho, 2007; Geidezis, 2011). It was saved with the prompt initiative of 400 conservationists from East and West Germany right after the fall of the Berlin Wall in 1989 (Cho, 2007; Paterson, 2009). The German Green Belt links 150 nature reserves of different habitats including the Schaalsee Biosphere Reserve designated in 2000 (BUND, 2013a). The Bund für Umwelt und Naturschutz Deutschland (BUND), which translates to Friends of the Earth Germany, has led the effort and is committed to the preservation of the Green Belt as "a living monument." BUND provides funding for actual protection of

valuable habitats, and creates the legal basis of the land (Cho, 2007). The BUND has surveyed and established inventory, managed restoration programs, and developed the Green Belt Experience, which is a visitor program assisted by The German Federal Agency for Nature Conservation (BFN) (BUND, 2013a). The Green Belt became a part of National Nature Heritage in 2005, which was a huge success; although agriculture, road construction and industrial complexes still threaten the area (Geidezis, 2011; BUND, 2013a). As a result, extending the German Green Belt to the European Green Belt was proposed to connect 12,500 km from the Barents Sea to the Black Sea, but is hinged on the participation of 23 countries (Paterson, 2009; BUND, 2013b). It has been agreed that the European Green Belt will be submitted for designation under the UNESCO Natural and Cultural Heritage as a backbone of the habitat network and a symbol of overcoming the historical tragedy known as the “Iron Curtain” to become a haven for nature (BUND, 2013b).

The Green Korea United (녹색연합), an environmental non-governmental organization (NGO), was founded in 1991 in South Korea. It has endorsed DMZ preservation and published their *2008 DMZ Area Environmental Survey* (translated) that includes ecological surveys and land usage by cities and counties of the DMZ and CCZ, with maps and pictures (Green Korea United, 2010). The Survey also contains the development plans that have already begun (or will start soon), and their predicted environmental impact. The Green Korea United has proposed to legally protect valuable forest areas in the CCZ and the Korea Forest Service named 20,819 hectare of seven different sites as Forest Genetic Resource Reserves in 2006 (Green Korea United, 2008; Seo, 2010).

Interest in the DMZ has increased because of heightened awareness of its value as a nature preserve, which spurred the creation of the DMZ Forum, an international NGO based in the U.S.A. Their mission is “to support conservation of the unique biological and cultural resources of Korea’s Demilitarized Zone, transforming it from a symbol of war and separation to a place of peace among humans and between humans and nature” (DMZ Forum, 2009). Dr. Ke Chung Kim, a co-founder of the DMZ Forum, said that the organization has been promoting the idea of preserving the Korean DMZ as a protected park since 1997 (Kim, 2009). Organizations and individuals like the Turner Foundation, the Korea Society, the Asia Society, Nelson Mandela, and Jimmy Carter endorse such an idea (DMZ Forum, 2009). In fact, Ted Turner, founder of CNN, visited Korea in 2005 to see the DMZ and speak to the importance of preserving its richness, and proposed designation of the DMZ as a UNESCO Heritage Site (Kim, 2009).

The DMZ can be designated a UNESCO Cultural and Natural World Heritage Site because it contains not only ecological treasures, but also historical evidence of the Korean War, especially the tunnels and trenches that the Communist Chinese army and North Korean army excavated during the War (Lee, 2008). Another idea to protect the DMZ and CCZ is as a Biosphere Reserve, a proposed government project since 2001 (Lee, 2008). Six hundred and ten Biosphere Reserves in 117 countries currently exist under UNESCO’s Man and Biosphere (MAB) Programme “to promote sustainable development based on local community efforts and sound science” (UNESCO, 2013a). The zoning schemes: core area, buffer zone and transition area, are the main features to achieve conservation, development and

logistical support (UNESCO, 2013b). In 2010, the Gwangneung Forest became the fourth site of Biosphere Reserves in South Korea, where the Korea National Arboretum is located and administers 24,465 hectare of the area (UNESCO, 2013c). In 2004, another example, the Kirstenbosch National Botanical Garden in South Africa, became the first garden included within a Natural World Heritage Site, specifically the Cape Floral Region Protected Area. Kirstenbosch is devoted to native flora, particularly in the Cape Floral Kingdom where the garden resides, along with Table Mountain National Park (SANBI, 2013).

Land Development and Threats

While there are strong interests in the conservative preservation of the DMZ and CCZ, the government, private industry, and residents in and near the DMZ and the CCZ show needs and a desire for land development. As relations between North and South Korea improved, the South Korean government has loosened restrictions within the CCZ (Green Korea United, 2008). With any expectations for reunification, comes an interest in buying land around the DMZ and CCZ, and land prices have escalated (Onishi, 2007). Since North Korea allows South Koreans to hold restricted guided tours into Mt. Geumgang, and to develop Gaeseong Industrial Complex in the city of Gaeseong, two train routes, which were disconnected due to the Korean War, are now restored (Green Korea United, 2008). More means of transportation between the North and South will be needed as more diplomatic connections are established (Kim and Wilson, 2002), however constructions of an underground tunnel ought to be considered (Seo, 2010).

Because the Korean Armistice Agreement was signed by the United Nations Command Delegation, the Delegation of the Korean People's Army, and the Chinese People's Volunteers, the authorization passing through the DMZ is under Military Armistice Commission; the civil administration of the south side of the DMZ is under the Commander-in-Chief, United Nations Command; and the civil administration of the north DMZ is under Supreme Commander of North Korea (Korean Armistice Agreement, 1953). Currently, the CCZ in South Korea is under the jurisdiction of the Ministry of National Defense within two provinces: the western part belongs to Gyeonggi-do and the eastern part, consisting mostly of mountains, belongs to Gangwon-do. As described, there are too many geopolitical issues involved in the de facto biodiversity haven and it seems they could be a threat to protect the area unless all parties are devoted to do so.

The CCZ in South Korea used to cover 1,528 km² (1,048km² in Gangwon, 480 km² in Gyeonggi), however, in 1997, the 5-20 km range of the CCZ was reduced to 5-15 km away from the DMZ because the civilians in the CCZ claimed to have land rights and wanted more farming land (Green Korea United, 2008). Illegal reclamation for farming has been a problem that is harmful for the environment, but no accurate cadastral maps in the CCZ exist, for military reasons (Cho, 2008). The CCZ was downsized to 5-10 km again in 2007, and cities and counties in both provinces have pushed ahead with plans to build parks and museums in or around the CCZ to attract tourists and promote their own interests. A unified habitat management plan, agreed upon by all departments of government that relates to the area's

conservation and development included both local governments, must be developed (Kim and Cho, 2005; Seo, 2010).

Definitions of Botanic Gardens

From dictionaries, encyclopedias, and textbooks, a garden is defined as a planned area where flowers, trees, shrubs, vegetables, and other forms of nature are arranged for display, cultivation, and recreation. There are numerous gardens that exist for various reasons and in general they can be divided into two types: a private garden and a public garden. A garden adjacent to a residential building created by the owner's desire and purpose can be called a private garden. On the other hand, a public garden is open to the general public for recreation and education through their displays and research. According to Rakow,

A public garden is a mission-based institution that maintains collections of plants for the purposes of education, research, conservation, and/or public display. It must have a system for maintaining plant records and professional staff. Further, it must be open to the public and provide accommodations for access to all people" (Rakow and Lee, 2011).

Several institutions meet the criteria above, including botanic gardens, arboreta, conservatories, display gardens, historic landscapes, zoos, college campuses, and nature centers (Rakow and Lee, 2011; APGA, 2013).

Table 2.1 Criteria that botanic gardens may partially or fully meet according to Botanic Gardens Conservation International (BGCI) and the American Public Gardens Association (APGA)

BGCI	APGA
A reasonable degree of permanence	The garden is open to the public on a least a part-time basis
An underlying scientific basis for the collections	The garden functions as an aesthetic display, educational display and or site research
Proper documentation of the collections, including wild origin	The garden maintains plant records
Monitoring of the plants in the collections	The garden has at least one professional staff member (paid or unpaid)
Adequate labeling of the plants	Garden visitors can identify plants through labels, guide maps or other interpretive materials
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	

The definition of a botanic garden in the International Agenda for Botanic Gardens Conservation is “[they are] institutions holding documented collections of living plants for the purposes of scientific research, conservation, display and education” (Wyse Jackson, 1999). ArbNet, sponsored and coordinated by The Morton Arboretum, in cooperation with APGA and BGCI, runs the Morton Register of Arboreta and the Arboretum Accreditation Program and defines an arboretum as, “a

specialized type of botanical garden that focuses on trees and other woody plants” (ArbNet, 2012). Because of their collections, botanic gardens and arboreta are often called “living museums” and Hohn’s modified definition in Curatorial Practices for Botanical Gardens demonstrates this:

A permanent institution for the purpose of acquiring, preserving, researching, and interpreting to the public for its instruction and enjoyment plants of cultural, scientific, historical, technological, and natural history value (Hohn, 2007).

Roles of Botanic Gardens

Throughout the history of botanic gardens, their functions and roles have evolved. Earlier botanic gardens were created as education tools for universities (Hill, 1915); on the other hand, botanic gardens today are considered to be educational institutions in and of themselves. Whereas botanic gardens in the eighteenth and early nineteenth centuries focused on collecting and displaying economic crops and tropical plants (Hill, 1915), they now lead plant conservation efforts because they have comprehensive collections (Thompson, 1972). Nowadays, not only are botanic gardens recreational sites to the public, but also community centers that reflect the culture and history of the region.

The botanic garden at the University of Pisa in Italy, established in 1543, is considered to be the first botanic garden in the modern era; three more Italian universities in Padua (1545), Florence (1545), and Bologna (1547) created gardens, as well (Watson, 1993; BGCI 2013). These physic gardens were created as the medical professions (doctors and apothecaries) settled in universities and displayed medicinal

herbs to study identification, origin and usage (Hill, 1915). This trend of university physic gardens continued in England with the founding of the Oxford Botanic Garden in 1621, the Chelsea Physic Garden in 1673, and the Physic or Exotic Garden at Kew, which became the base of the Royal Botanic Gardens (Hill, 1915; Royal Botanic Gardens, Kew, 2013).

As European countries progressed in colonial expansion, botanic gardens became warehouses of newly found exotic plants and productive crops such as citrus trees, palm, cocoa and tea (Watson, 1993; Heyd, 2006). The botanic gardens supported research focusing on evaluating those plants' usefulness and taxonomy study (Thompson, 1972). "Tropical botanic gardens were established for the introduction, assessment, propagation, and culture of plants that were of economic importance to the colonial powers but could not be grown in Europe (Watson, 1993)." The Palm House at Kew built in 1844-1848 was created specifically for the exotic palms being collected and introduced to Europe in early Victorian times (Royal Botanic Gardens, Kew, 2013).

As time passed, however, and, "the decline of botanic gardens [purpose] in the wide-spread imperial responsibility" became more evident, botanic gardens needed a transition. They sought to be different from public parks, private gardens, or similar institutions and avoid competing with others that offered similar or alternative displays (Thompson, 1972). Developing and documenting collections was the key and enabled gardens to display, educate, research, and conserve (Watson, 1993).

Well-labeled plants in aesthetic settings generate the general public's interest and appreciation. Displays of plant collections based on plant geography have been around for decades and can also be grouped on an ecological basis (e.g., alpine, desert, and aquatic) (Watson, 1993). For example, the display of the collections at Morton Arboretum consists of four groups: Geographic that includes Asian, European and North American; Taxonomic; and Special habitat, and Horticultural display collections (Morton Arboretum, 2013).

Since public education programs became popular in the twentieth century, botanic gardens were, "positioned to take the lead role in public education" (Watson, 1993). A botanic garden is an ideal place for participatory learning because basic ecological principles can be demonstrated in practical horticulture, and has great resources such as "a plant collection, a knowledgeable staff, and physical facilities for accommodating the public" (Peck, 1978). For example, education at Longwood Gardens covers a broad audience and offers extensive programs, including K-8, High School, Internships (College and International), Professional Gardeners, a collaborative Graduate Program, and Continuing Education programs. Providing 160 classes of Continuing Education such as plant identification classes, floral design, garden photography, botanical illustration, landscape classes, and many other plant-related short workshops reaches 4,000 people (McClintock, 2013).

Research facilities and enormous plant diversity at botanic gardens are essential for breeding, propagating and growing new plant cultivars (Hu and Zhang, 2008). These collections also became important research resources associated with universities (Heyd, 2006) where they were valued for studies in anatomy,

phytochemistry, genetic self-incompatibility, embryology, physiology, and plant pathology (Raven, 1979). While many research programs exist in university gardens, plant introduction is a major research focus in non-university gardens (Watson, 1993). Mt. Cuba Center in Delaware has focused on horticultural research and introduced many cultivars of native landscape plants, such as Purple Dome New England aster (*Symphyotrichum novae-angliae* ‘Purple Dome’) and Golden Fleece autumn goldenrod (*Solidago sphacelata* ‘Golden Fleece’). The evaluation and introduction continue with their Trial Garden research (Mt. Cuba Center, 2013).

Conservation became a primary goal of botanic gardens, who found it crucial, as living museums, to engage in plant conservation in the era of a biodiversity crisis (Goel, 2002; Rinker, 2002). Botanic Gardens Conservation International estimates that more than 104,000 plant species are in collections of botanic gardens worldwide, which is almost one third of known species of the world (Hardwick et al., 2011). Botanic gardens can contribute both *in situ* (on site) and *ex situ* (off site) conservation (Maunder, 1994), and are well suited to perform integrated conservation, the multidisciplinary approach (BGCI, 2012). North Carolina Botanical Garden (NCBG) is a good example of an institution devoted to conservation at every level of their works and programs. NCBG oversees 1,133 acres of satellite locations, including gardens, natural areas, conservation easements, propagation protocols for native plants, seed banking, reintroduction strategies, protection and restoration of nature areas, controlling invasive plants, and sustainable gardening. All of this information is subsequently shared with the public. Another example, Royal Botanic Garden of Jordan, was founded in 2005, with a site donated from the Ministry of Agriculture,

with a mission to rescue the rich botanical heritage from urbanization and poor land use (BGCI, 2013a). Their mission is “to conserve native biodiversity at the habitat level, establish a centre for scientific research and environmental education, serve as a demonstration site for sustainable development, and provide a unique ecotourism destination” (RBG of Jordan, 2013).

Rinker stated that “gardens went through a metamorphosis” from Medicinal, Colonial, Linnaean, Civic, Specialist to Sanctuary Gardens (Rinker, 2002). The ability that botanic gardens possess became crucial and effective to conservation efforts. Botanic gardens today play “major roles in botanical research, species recovery, ecosystem management and restoration, exploration and floristic surveys, reintroduction, development of sustainable use systems for wild plant resources, public education, conservation biology, management of living collections and other fields” (BGCI, 2013b). “Plants represent the basis of most life on the planet” (Rinker, 2002), therefore botanic gardens represent our culture.

Chapter 2

METHODOLOGY

Human Subjects Review Board (HSRB)

This research followed all research guidelines set down by the Human Subjects Review Board (HSRB). The researcher received Human Subjects in Research training in April 2010 and the research was exempted from HSRB review (Appendix A).

Survey of South Korean General Public

A survey was used to ascertain South Koreans' awareness of the Korean Demilitarized Zone (DMZ), perspectives on botanic gardens, and attitudes toward a proposed garden in the region. The survey was created, distributed, and analyzed through Qualtrics, an online survey tool. The researcher's Graduate Committee, Longwood Graduate Program students, and the Senior Research Consultant at the University of Delaware reviewed the survey prior to its administration.

The survey consisted of 32 questions and was developed in both English and Korean (Appendix B). It contained four sections: 1) awareness of the DMZ, 2) perspectives on public gardens, 3) opinions on the proposed garden, and 4) demographics. Both multiple choice and open-ended questions were included. Surveys completed by participants' ages 18 or younger were not included in the results.

Incomplete surveys were also excluded from analysis. Survey participants were prevented from taking the survey more than once.

The survey was administrated electronically from September 21 to November 11, 2010 through social media, specifically personal blogs and an online group with 14,935 members (as of September 21, 2010), whose interests are in plants, gardening and sharing seeds. The survey was also administered offline from October 15 to October 29, 2011 in South Korea. This paper version of the survey was distributed at three horticulture related symposia, as well as to college students in Horticulture, a group of museum volunteers, and through personal contacts. Due to the survey administration methods, there was a higher proportion of people with horticultural interests represented in the survey sample than in the public at large.

Interviews

Interviews were used to 1) investigate government policy related to the research topics, 2) determine whether and to what extent plans for botanic gardens in the region have already been developed, 3) identify current conservation efforts in the DMZ and Civilian Control Zone (CCZ), and 4) gain Korean professionals' opinion on the subject of botanic garden development in the DMZ and CCZ. Prior to the interview, interviewees received research background descriptions and consent requests electronically. All interviews were conducted in person, digitally recorded, and then transcribed.

Three experts were interviewed in Korea in October 2011: Jaechul Seo, Director of Eco-system Conservation at Green Korea United; Yong-Shik Kim, Ph.D.,

Professor of Landscape Architecture at Yeungnam University; and Hyeyoung Jin, Ph.D., Plant Conservation Researcher at the National Arboretum. The interviews uncovered a plan by the National Arboretum (a division of the Korea Forest Service) to develop the DMZ Native Botanical Garden (DNBG) in the east of the CCZ, Yanggu. The National Arboretum was notified that the DNBG plan was being used for this research (Appendix C). The DNBG vision, mission, design concept, and master plan are reported as data in the Results section.

For further perspective on the goals of the proposed Korean garden, an additional interview was held with James L. Ward, Director for Horticulture at North Carolina Botanical Garden (NCBG), a model “Conservation Garden.”

Data Analysis

Survey data were compiled and analyzed using descriptive statistics. Open-text responses were coded into categories; interview responses were summarized and also categorized. Interviews conducted in Korean were translated into English prior to analysis.

A word frequency analysis was chosen to compare the DNBG plan and the NCBG model. Content clouds or word clouds were chosen as a tool for exploratory qualitative data analysis because they quickly summarize and interpret contents in graphic format (Cidell, 2010). Word clouds were created using TagCrowd, an application that graphically depicts word frequencies in uploaded texts (Steinbock, 2006).

The key findings from the survey and interviews were incorporated into a Strengths, Weaknesses, Opportunities, and Threat (SWOT) Analysis, a strategic planning tool devised by Bensoussan and Fleisher (2008).

Also known as “situation analyses,” SWOT analyses are used by both for-profit and non-profit organizations to inform decision-making (Bensoussan and Fleisher, 2008); a sample feasibility study by Botanic Gardens Conservation International (BGCI) demonstrates that SWOT is a useful tool for evaluating internal and external factors and whether they are favorable or unfavorable (BGCI, 2010). According to Bensoussan and Fleisher (2008), Part A (Figure 3.1) of the procedure is the most frequently used; however, it is also important to undertake Part B (Figure 3.2), “to assist managers to make informed choices about what actions to take to maintain a company’s comparative advantage (that is, developing its strengths while minimizing its weaknesses) and increase its ability to achieve its goals and objective” (Bensoussan and Fleisher, 2008).

<p style="text-align: center;">Internal Strengths</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p>4. _____ etc</p>	<p style="text-align: center;">Internal Weaknesses</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p>4. _____ etc</p>
<p style="text-align: center;">External Opportunities</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p>4. _____ etc</p>	<p style="text-align: center;">External Threats</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p>4. _____ etc</p>

Figure 3.1 Part A of the SWOT technique: identifying, analyzing, and ranking strategic issues (Bensoussan and Fleisher, 2008)

		<i>Internal Factors</i>	
<i>External Factors</i>	<i>Opportunities</i>	<u>S</u> trengths	<u>W</u> eaknesses
		Internal Strengths Matched with External Opportunities: <i>SO Strategy</i> 1. 2. 3. 4.	Internal Weaknesses Matched with External Opportunities: <i>WO Strategy</i> 1. 2. 3. 4.
	<u>T</u> hreats	Internal Strengths Matched with External Threats: <i>ST Strategy</i> 1. 2. 3. 4.	Internal Weaknesses Matched with External Threats: <i>WT Strategy</i> 1. 2. 3. 4.



COMPETITIVE ADVANTAGE

Figure 3.2 Part B of the SWOT Matrix with variables and development of strategy to improve matches (Bensoussan and Fleisher, 2008)

Chapter 4

RESULTS

Survey of South Korean General Public

The survey was administrated electronically through social media, specifically personal blogs and an online group, and offline in South Korea. Not all questions are required to answer and there were 426 respondents who completed the survey. Of respondents, 34.4% were male and 65.6% were female (Fig.4.1).

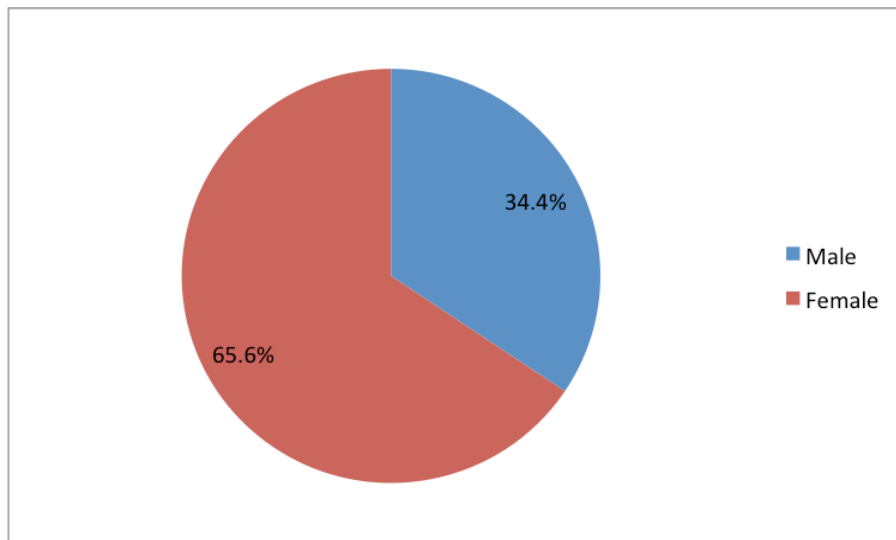


Figure 4.1 Gender representation of survey respondents from South Korea (n=424)

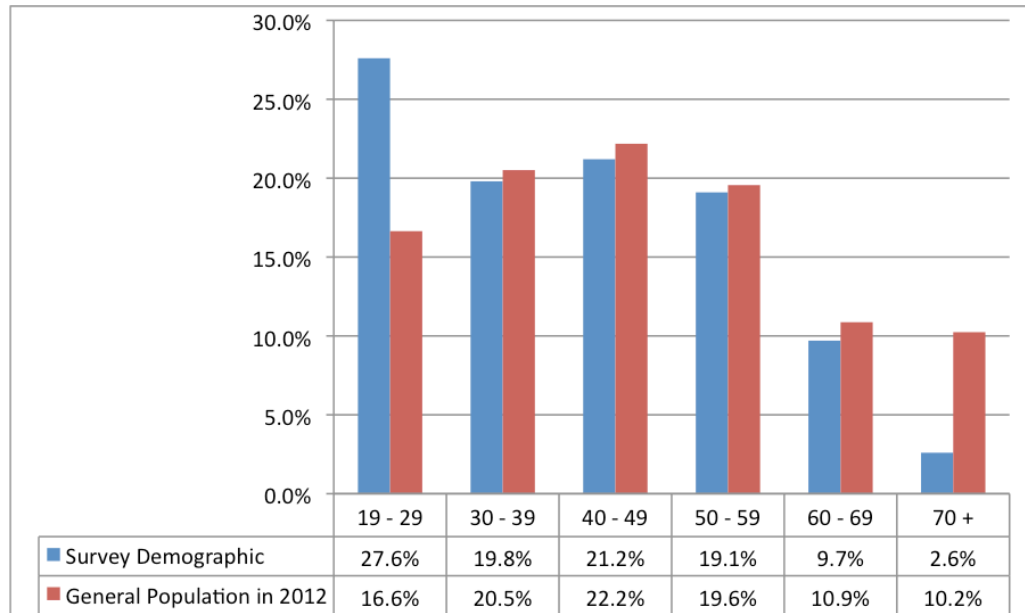


Figure 4.2 The Age distribution of survey respondents compared to entire South Korean general population (<http://rcps.egov.go.kr:8081>) (n=424)

Four age groups of respondents (30s: 19.8%, 40s: 21.2%, 50s: 19.1%, 60s: 9.7%) characterized their demographics while two groups (19-29: 27.6%, 70+: 2.6%) did not follow the trend of general population (Fig.4.2). The majority of participants live in Gyeonggi province (59.2%) and Seoul (82 or 19.2%). One hundred eighty three respondents (43.2%) answered that they had a four-year college education, 66 (15.6%) graduate school, and 124 (29.2%) high school; 45.3% of respondents are employed, 27.7% are homemakers, and 19.4% are students.

The survey indicated that 91.8% of respondents were aware of the Korean Demilitarized Zone (DMZ) (Fig.4.3), and 75% recognized the DMZ as a unique ecosystem in the nation (Fig.4.4).

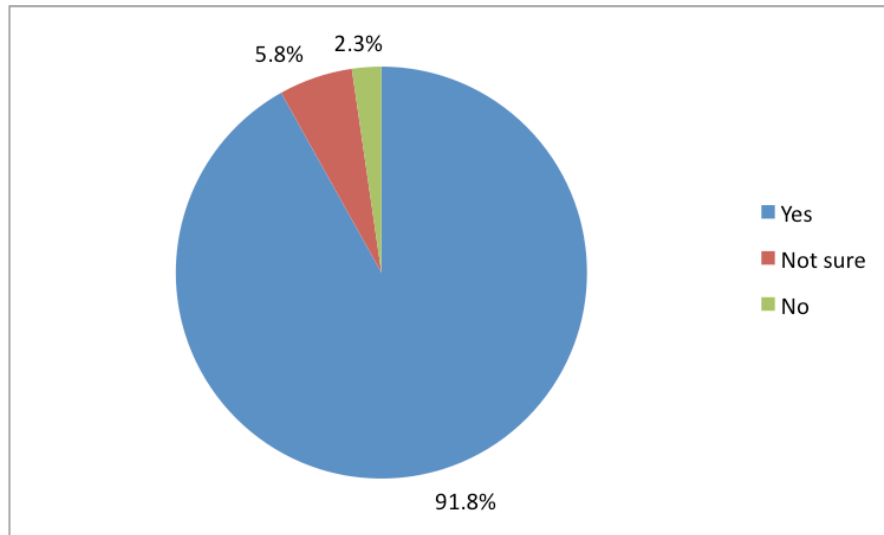


Figure 4.3 Awareness of the Korean Demilitarized Zone by survey respondents (n=428)

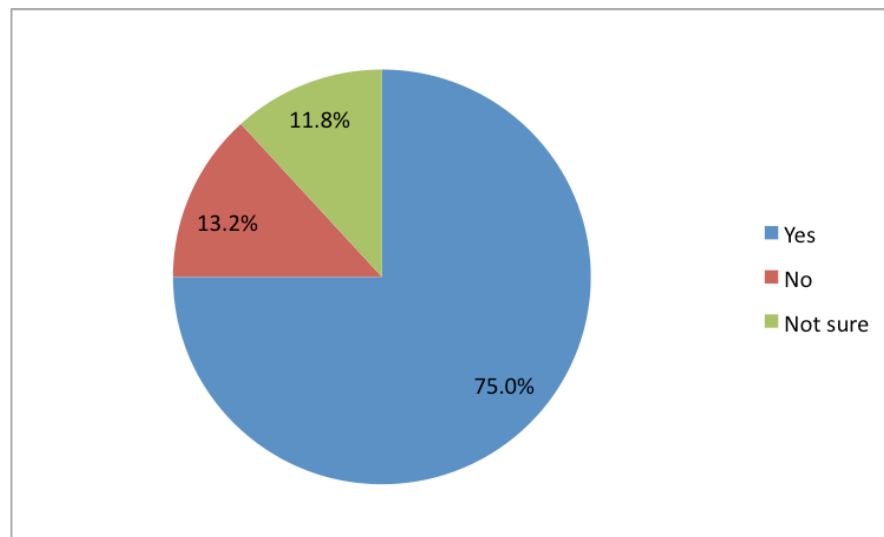


Figure 4.4 Awareness of the Korean Demilitarized Zone as a unique ecosystem in the Korean peninsula by survey respondents (n=424)

When asked if they have been to the DMZ and Civilian Control Zone (CCZ) regions, more than half replied yes (Fig.4.5), and 65% of the respondents have visited the nearby Unification Observatory, a popular vacation destination. Other destinations selected included Imjingak (57.3%), Panmunjom (37.7%), The Third Tunnel (33.2%), and Dorasan station (27.7%). Eleven respondents selected “Other” (40 or 18.2%) and indicated that they previously served in the military nearby the area or DMZ; five of them have been to Yanggu Punch Bowl where the DMZ Native Botanical Garden located, which will be discussed later in this chapter.

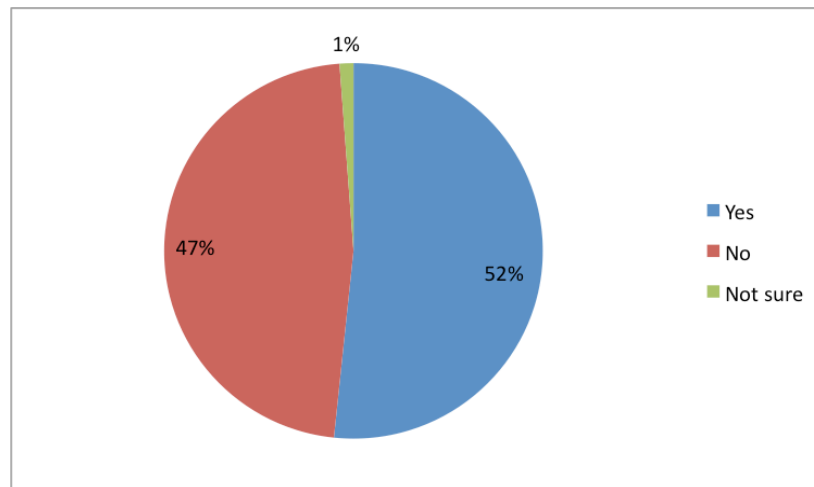


Figure 4.5 Respondents' answers to the survey question, "Have you been to the region of the Demilitarized Zone or Civilian Control Zone?" (n=424)

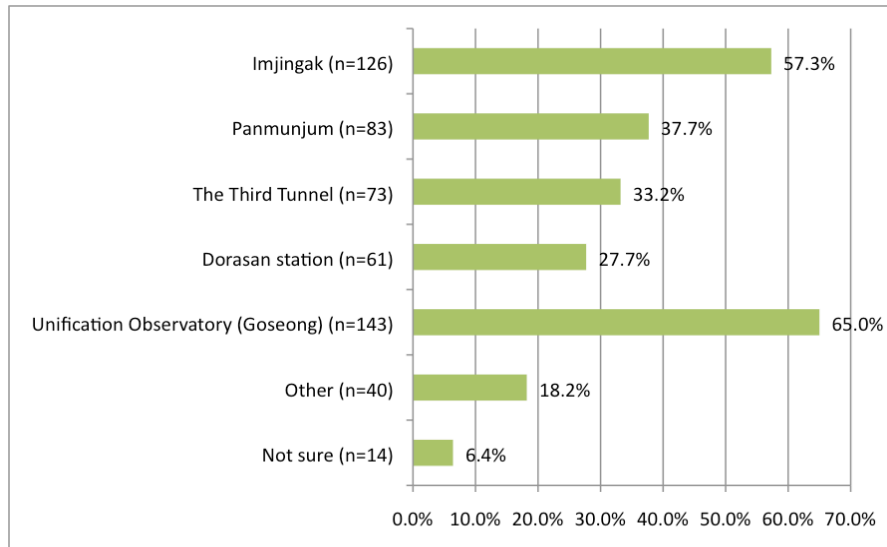


Figure 4.6 Respondents' answers to the survey question, "Which area of the DMZ or CCZ have you been to? (check all that apply)"

When asked if they have been to a public garden, 95.5% of the respondents answered affirmatively (Fig.4.7), including the most popular response the National Arboretum followed by Yeomiji Botanical Garden (Fig.4.8). The National Arboretum (55.5%), the Hantaek Botanic Garden (36.8%), the Garden of Morning Calm (42.8%), and the Pyunggang Botanical Garden (10.9%), which were chosen the most are all located in Gyeonggi province; Yeomiji Botanic Garden is located in Jeju Island and is known for tourism; Chollipo Arboretum (18.2%), Korea Botanic Garden (13.4%), and Key-chungsan Botanical Garden (4.7%) are located in South Chungcheong, Gangwon, North Gyeongbuk provinces. Other respondents indicated visiting Mulhyanggi Arboretum (23), Namsan Garden (9), Kohwun Garden (7), Daegu

Arboretum (4), Singu Botanic Garden (3), Gyeongsangnamdo Arboretum (5), and seven respondents have visited a public garden in other countries.

Most respondents visited public gardens once a year (41.7%) and twice a year (22.3%) (Fig.4.9). Fifty-eight (53.7%) of respondents who selected Other (108) indicated that they've visited public gardens irregularly. The majority visited public gardens for recreational (80.2%), spiritual (40.1%) and educational (18.6%) reasons (Fig.4.10).

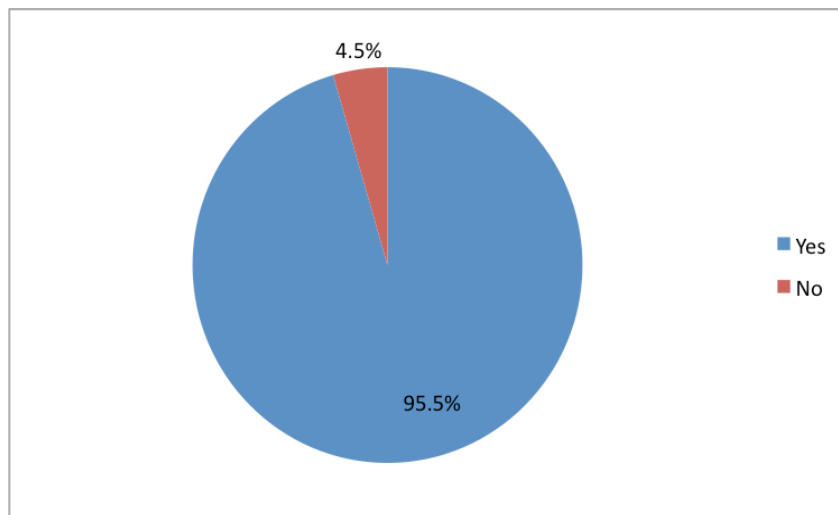


Figure 4.7 Respondents' answers to the survey question, "Have you been to a public garden?" (n=426)

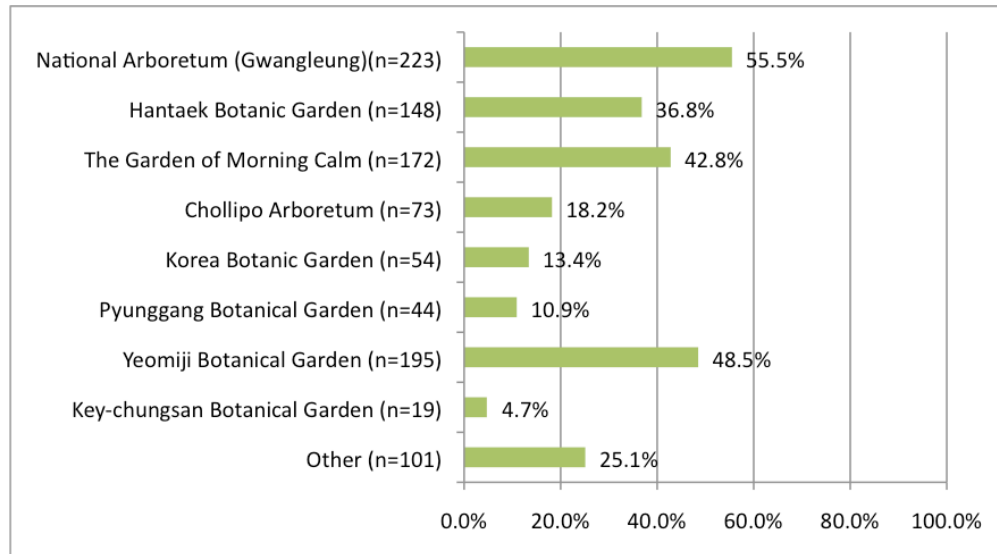


Figure 4.8 Respondents’ answers to the survey question, “Which public gardens have you been to? (check all that apply)”

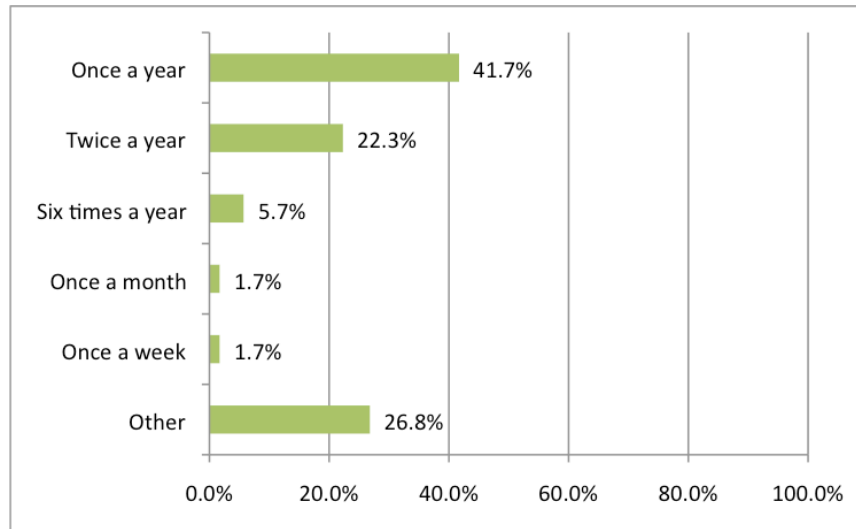


Figure 4.9 Respondents' answers to the survey question, "How often they visit public gardens?" (n=403)

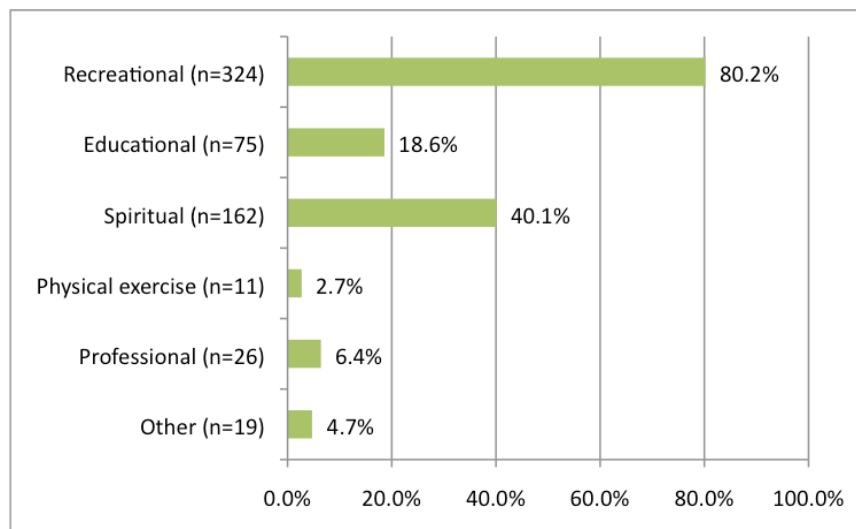


Figure 4.10 The reasons to visit public gardens answered by the survey respondents (check all that apply)

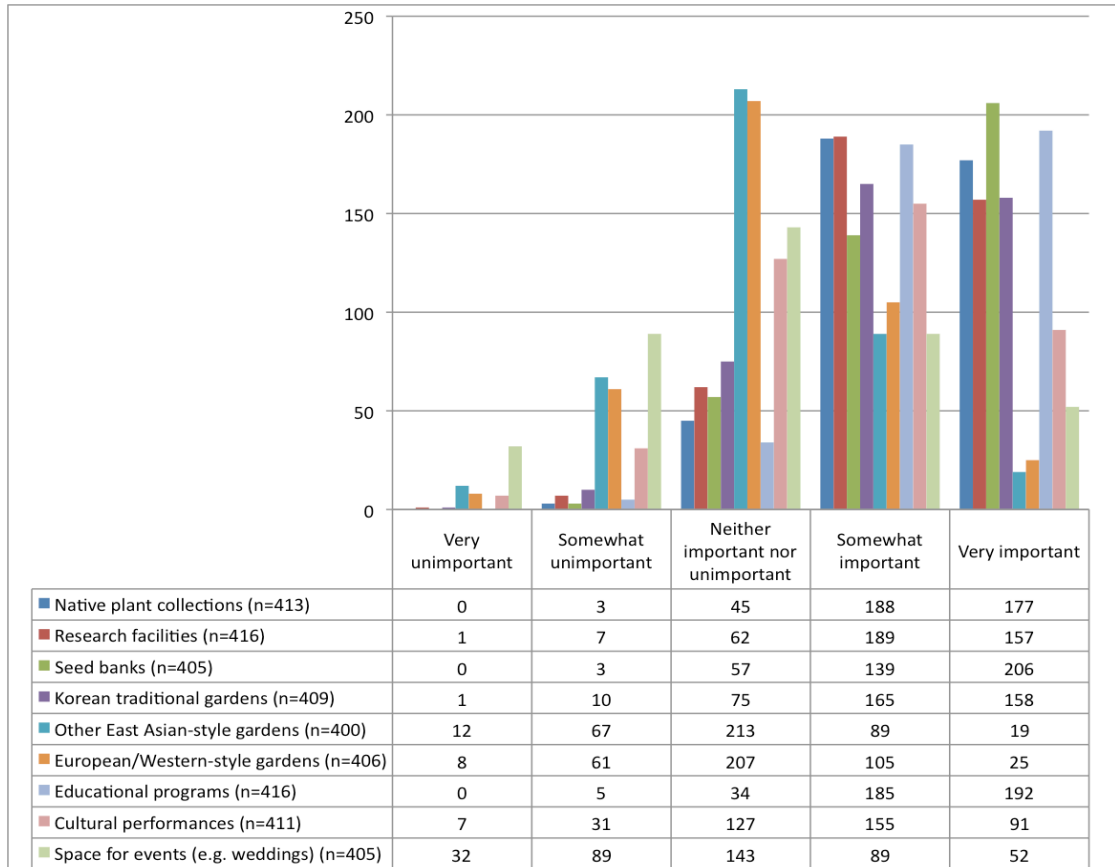


Figure 4.11 The respondents' indication of the importance of selected public gardens' elements (check all that apply)

To find out what Koreans thought a botanic garden could implement or offer, respondents were asked to indicate their opinion of each element listed from Very unimportant to Very important (Fig.4.11). By a large margin, they chose Educational programs (90.6%), followed by Seed banks (85.2%), Native plant collections (88.4%), Research facilities (83.2%), and Korean traditional gardens (79.0%), as Somewhat and Very important features of public gardens (Table 4.1).

Table 4.1 The mean, standard deviation, and subtotal of the combined responses for Somewhat important and Very important for selected public gardens' elements

Selected public gardens' elements	Mean	Standard Deviation	Subtotal of Somewhat important and Very important (n/%)
Native plant collections	4.30	0.69	365 / 88.4%
Research facilities	4.19	0.76	346 / 83.2%
Seed banks	4.34	0.75	345 / 85.2%
Korean traditional gardens	4.14	0.82	323 / 79.0%
Other East Asian-style gardens	3.09	0.83	108 / 27.0%
European / Western-style gardens	3.19	0.83	130 / 32.0%
Educational programs	4.35	0.68	377 / 90.6%
Cultural performances	3.71	0.95	246 / 59.9%
Space for events	3.09	1.12	141 / 34.8%

Many respondents also wanted to experience Cultural performances (59.9%) and they were neutral about East Asian-style gardens, European or Western-style gardens and Space for events.

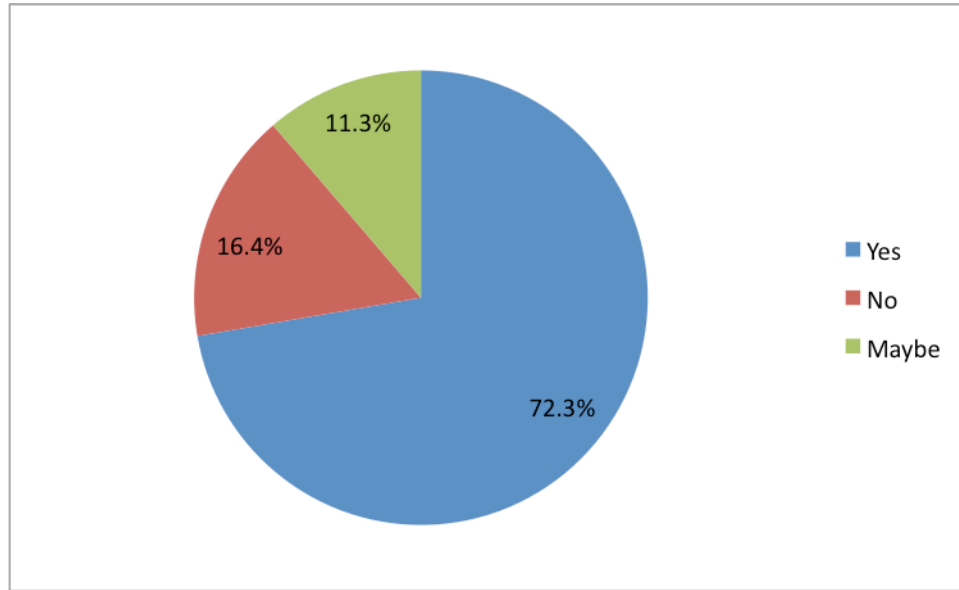


Figure 4.12 Respondents' answers to the survey question, "Would you support the idea of establishing a botanic garden in the region of the DMZ and CCZ?" (n=426)

When the respondents were asked if they would support having a botanic garden in the DMZ and CCZ region, 88.7% were positive (Yes and Maybe) and only 70 (16.4%) were negative (Fig.4.12). The reasons for supporting the idea are To preserve native species and ecosystems (83.3%), To promote horticultural and environmental research (51.5%), and To educate the public about conservation (47.3%) (Fig.4.13). Most respondents who chose Other (65.7%) explained why (Fig.4.14) and expressed their deep concern about taking risks to harm the region's ecosystems from garden construction and future visitor impact.

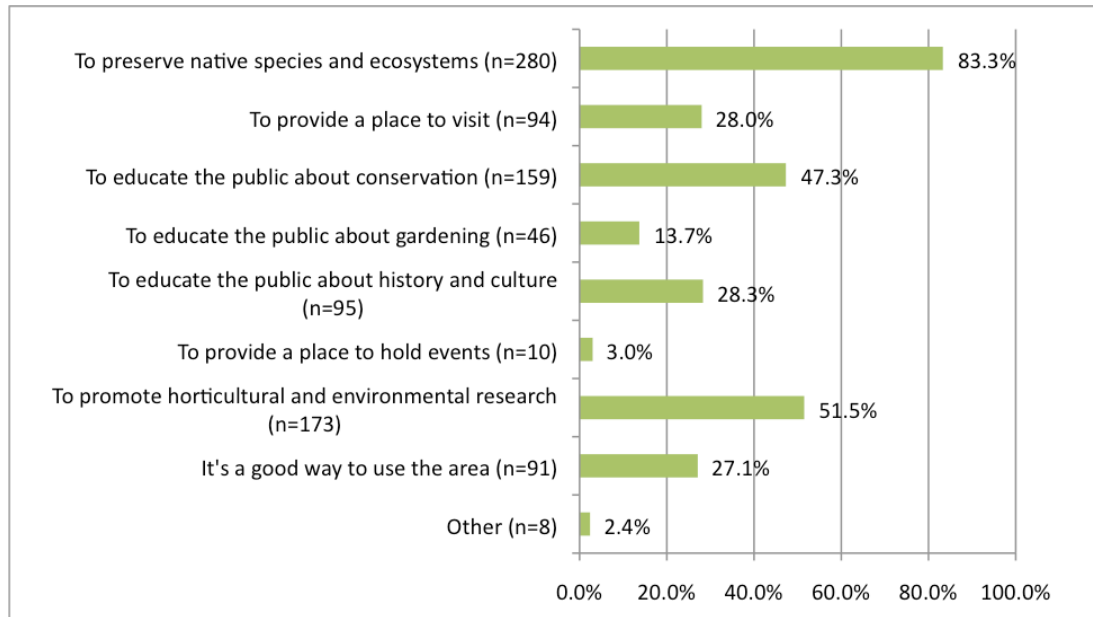


Figure 4.13 The reasons for supporting the idea of establishing a botanic garden in the region of the DMZ and CCZ (check all that apply)

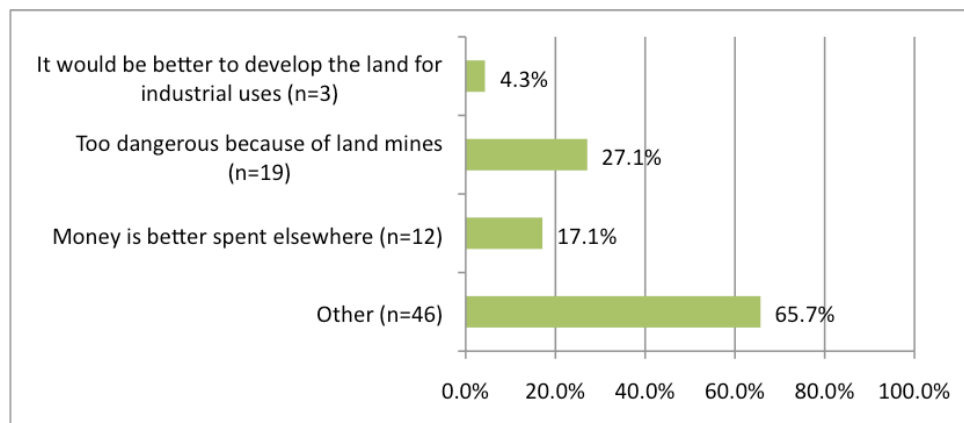


Figure 4.14 The reasons for not supporting the idea of establishing a botanic garden in the region of the DMZ and CCZ (check all that apply)

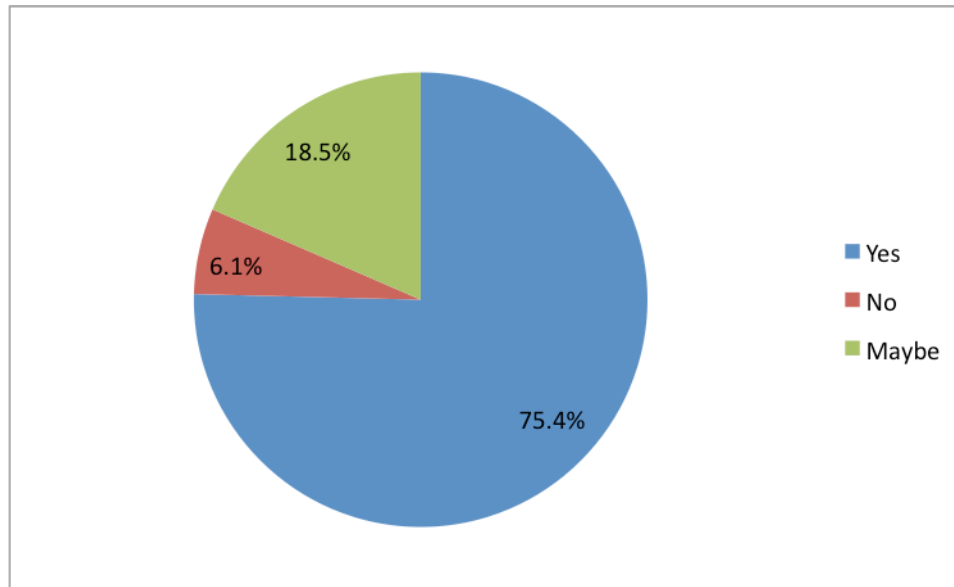


Figure 4.15 Respondents' answers to the survey question, "If there were a botanic garden in the region of the DMZ and CCZ, would you like to visit?" (n=426)

Three-quarter of respondents would visit the proposed botanic garden; while only 26 (6.1%) answered that they would not (Fig.4.15).

Interviews

The interviews with Mr. Jae-chul Seo, Director of Eco-system Conservation at Green Korea United, Dr. Yong-Shik Kim, Professor in Landscape Architecture at Yeungnam University, and Dr. Hyeyoung Jin, Researcher in the Plant Conservation Department at the Korea National Arboretum were recorded and transcribed in Korean. The research author translated the findings that are the most valuable and related to the objectives of this thesis. The interview with Mr. James L. Ward, Director for Horticulture at North Carolina Botanical Garden (NCBG) was recorded and transcribed in English and the findings were summarized.

During the interview with Dr. Hyeyoung Jin, a similar government plan for the DMZ Native Botanical Garden (DNBG) was provided. The introduction of the plan caused a shift in the discussion and a copy of the report was acquired from Dr. Jin. The summary of the document is included in this chapter and is comparable to the findings of the NCBG.

Per the recommendation of Mr. Seo, the author and he made a field trip to Punch Bowl², Yanggu on October, 21, 2010 (Figure 4.16). The primary focus of the visit was to survey the current environment around the town; a visit to one of the tour attractions in Yanggu, Elji Observatory was made (Figure 4.17).

² During the Korean War, the area in Haeon-myeon, Yanggu-gun was where the fiercest battles were fought. American correspondents called it Punch Bowl looking down the geography from plane overhead.



Figure 4.16 View of the Punch Bowl. The proposed site of the DMZ Native Botanical Garden is circled in red



Figure 4.17 Entrance to the Elji Observatory in the Civilian Control Zone. The Demilitarized Zone starts right beyond the building. This is the closest the public can get to see North Korea without crossing the border; taking pictures of the North Korea is prohibited without permission

Current Status of the Korean Demilitarized Zone and the Civilian Control Zone

Korean Demilitarized Zone (DMZ)

The DMZ is valued as one of the only Korean ecosystems in temperate regions that has remained undisturbed by humans for more than 50 years (Jae-chul Seo).

Green Korea United published the 2008 DMZ Area Environmental Survey, which compiled two years of investigations south of the DMZ

and north of the Civilian Control Zone line. Green Korea United staff and volunteers walked along the border to map natural resources, topography including forests, rivers and wetlands, and damaged areas; it was the first time an organization examined the entire area. An inventory of the regional flora should be conducted (Jae-chul Seo).

Civilian Control Zone (CCZ)

The size of the CCZ has decreased; as the 5-20 km range of the CCZ was reduced to 5-10 km away from the DMZ, some of the army bases were returned to local government (Jae-chul Seo).

Research shows that natural habitats in the CCZ are not well preserved and many areas are even damaged (Yong-Shik Kim).

Many sites of military training fields are abandoned. Landslides are frequent in the mountains in the CCZ (Figure 4.1) (Jae-chul Seo).

Rice crops are the most frequently cultivated crops in the CCZ, which still is a food resource for birds during the winter. But the paddy fields often transformed to upland fields for crops that have more economic values; illegal reclamation has been reported (Figure 4.19) (Jae-chul Seo).

Two government agencies, the Republic of Korea Army and Korea Forest Service have signed a memorandum of understanding (MOU) to restore areas damaged as a result of the impact of army bases. They have agreed allocating two million dollars every year (since 2008) (Jae-chul Seo).

Green Korea United wants to legally protect valuable forest areas in the CCZ. The Korea Forest Service has allocated more than 50,000 hectares of different areas as Forest Genetic Resource Reserves. The current policies prevent building anything like botanical gardens if the land falls in the CCZ or Forest Genetic Resource Reserves (Jae-chul Seo).



Figure 4.18 A view of the Punch Bowl village; part of the area in the view falls in the Civilian Control Zone (CCZ), landslides were observed along the ridge (red circle); Elji Observatory (yellow arrow). Photograph taken outside of CCZ



Figure 4.19 Farming fields expanded as much as possible; yellow plots are rice fields; blue plots are ginseng fields – because producing ginseng is more cost effective, recently many rice fields were converted to ginseng fields even though a 6 year of cultivation process is required (YTN, 2012); unsure if all of the farming plots are permitted

Landmines

The remnant landmines are everywhere, which pose immediate problems for visitation. Landmines need to be found and removed (Figure 4.20) (Jae-chul Seo).

Safety is a concern because of the landmines. Removing the landmines should be one of the long-term goals (Yong-Shik Kim).



Figure 4.20 Warning signs of landmines in the slope between roads (the road to the left from the sign was a local road); the square sign explains there are unidentified landmines and blind shells; the inverted triangle sign with barbed-wire fence says landmines which was observed often during the field trip

Government Plans

There are many interested parties such as government agencies that are developing projects for both the DMZ and the CCZ. The purpose and directions of the projects are not well defined because there is no central agency that oversees and consolidates each plan (Hyeyoung Jin).

The current government plans are hindrances to preservation as they are focused on tourism. Most of the government agencies are

developing DMZ projects without conducting prior site evaluation (Jae-chul Seo).

The current plans from government agencies and municipalities are gearing towards tourism or recreational purposes; creating golf courses and ski resorts are built in close proximity to the CCZ (Yong-Shik Kim).

Suggestions and Solutions

DMZ Preservation

The DMZ ecosystem must be preserved even after unification (Jae-chul Seo).

The DMZ as a nature sanctuary has been promoted enough in the international community; nevertheless, more emphasis towards citizen awareness and conservation education efforts specifically about the DMZ is needed (Jae-chul Seo).

Conservation work is not just collecting plants or seeds and bringing them into botanical gardens making available to look at. Being a proponent of having conservation efforts go to permit protection of natural areas that are representative of all the different types of plant communities across the DMZ and the CCZ (James L. Ward).

Overarching Plan

A unified habitat management plan, agreed upon by all departments of both governments that relate to the area's conservation and development must be established. The Ministry of Environment and Korea Forest Service should lead the planning (Jae-chul Seo).

The process of landscape projects such as planning a botanical garden in South Korea should be changed from the order of designing, constructing, and management planning to the order of management planning, designing, and constructing. The strategic planning should be introduced to aim solid goals and objectives (Yong-Shik Kim).

CCZ Restoration

A restoration plan should be considered for army bases when they are returned to local governments from the Ministry of National Defense (Yong-Shik Kim).

There should be a long-term land management plan before the transition because of impending development pressure. Farming in the CCZ should be continued and encouraged because it will play a role as a buffer between the DMZ and the urbanized towns outside of the CCZ. Rice paddy fields are strongly recommended rather than upland fields with other crops so that they can support bird populations and other wild life (Jae-chul Seo).

Invasive controlling is one of the keys to protect “the plant community zones” and having reintroduction and restoration programs would help the zone being ecologically balanced (James L. Ward).

A Botanic Garden

Botanical gardens are ideal place that both biodiversity and cultural diversity can be found (Yong-Shik Kim).

It is more than necessary to have an overarching management team, an administration plan and policies with the high level of conservation and sustainability emphasis. Restoration projects of the abandoned or damaged areas in the CCZ would be a good fit for a botanic garden (Jae-chul Seo).

The roles of a garden for the DMZ should be a symbol of the DMZ, a bridge of North and South Korea, and revival of the history and culture of the region. It is crucial to have these components rather than focusing on researching and displaying plants alone. It would be good if the garden represents and demonstrates the culture of the region as well as our nation (Yong-Shik Kim).

One of the long-term goals can be monitoring the DMZ and CCZ area; having the facilities of the garden could be useful if the DMZ and the CCZ becomes a site of UNESCO Biosphere Reserves (Hyeyoung Jin).

It is time to think about how to utilize botanic gardens and arboreta to support and promote biodiversity. The government has sufficient financial resources available. It is strongly recommended to set overall goals and objectives as well as short-term and long-term management plans (Yong-Shik Kim).

The proposed garden ought to take advantage of the sense of place, the uniqueness of the DMZ whether it is the plant communities, local community or the history, by incorporating them into the garden's programming and design (James L. Ward).

In general garden design and composition lacks in public horticulture settings in South Korea; the botanic gardens in South Korea are in general missing an important role: plant recording and curating of collections; in addition composing teams of skilled staff should be a priority (Yong-Shik Kim).

Traditional Korean gardening should be celebrated and resonate with the people (James L. Ward).

When creating gardens, important steps include reviewing historical land use, and incorporating the characteristics of the town and surrounding community. Including regional characteristics into gardens' display would stimulate public's interests as if the western part of the DMZ and the CCZ contains wetlands and rice fields (Jae-chul Seo).

Developing education programs that really well reflect the greater community in both natural areas and traditional Korean gardening would be recommended (James L. Ward).

Raising public awareness on the value of preserving the DMZ and the CCZ can be done on site if landmine-free trails or gardens are developed (Jae-chul Seo).

A Similar Plan: The DMZ Native Botanical Garden

The DMZ Native Botanical Garden plan was done by Nexus Design Corporation³ and presented to the Korean National Arboretum. This research used the government planning of the DMZ Native Botanical Garden (DNBG) as a platform to define the potential impact in a pragmatic way. The Korea National Arboretum was notified (Appendix C) and the majority of the document was translated. The Table 4.2 shows the subtitles of the document, selected sections are presented as following:

³ Nexus Design Corporation, an environmental landscape design company (Address: 376-2 Yangjae2-dong, Seocho-gu, Seoul, South Korea) presented the report to the Korea National Arboretum in 2009.

Table 4.2 Overview of the DMZ Native Botanical Garden Plan

List of Contents	
1. Introduction of the project	Background and Purposes
	Report Boundaries
	Methodology
2. Survey, Evaluation and Analysis	Location
	Ecological Background
	Ecological Survey on Flora and Fauna
	Infrastructure
	Expected Visitors
	Government Regulations and Similar Plans
	Case Studies
	Evaluation on Preserving Natural Resources in the area
	Analysis and Results
3. Basic Plan	Vision and Goals
	Principals
	Concepts
4. Preliminary Plan	Land Use
	Flow Line
	Planting
	Structures/Facilities
	Paving
	Building
	Display Areas
	Long-term Goals
	Master Plan
5. Implementing Plan	Timeline
	Operation and Organizational Structure
	Programs

Background

The natural resources have been preserved very well in and near the DMZ.

There is a need of a preservation and management plan for the forest ecosystem in the DMZ and CCZ. Army bases have become menaces to the natural areas.

Purposes of the Project

In order to 1) preserve rare and native plants in the DMZ, 2) research on propagating native plants and display them, 3) develop system to preserve the forests and wetland habitats, a plan for the DMZ Native Botanical Garden is necessary.

Also, these objectives are presented: 4) develop measures of preserving and using forest ecological resources in sustainable ways, 5) survey and administration of plant resources through forest ecological resources research for climate changes, 6) become an international research center for forest ecosystem.

Report Boundaries

- Ecological survey
- Evaluation of the site
- Basic plan
- Preliminary plan
 - DMZ Native plant display area
 - DMZ Native plant research area
 - DMZ forests and ecosystems hiking area
 - DMZ native plant preserving and propagating area
 - Visitor service area
- Implementing plan

Location

The site address is Mandae-ri, Hae-an-myeon, Yanggu-gun, Gangwon-do; 18 hectares of a garden site adjacent to 134 hectares of mountain areas.

Ecological Background

The climate shows a wide daily temperature range, and the area is suitable for high altitude farming. The area contains plants 1) suited for a colder climate.

The site is located in the south of the “Punch Bowl,” which is a circular basin with a 10-kilometer diameter.

Daeamsan and Daeusan Natural Reserve, which was designated as Natural Monuments 246 in 1973, is located in the south of the site.

Ecological Survey on Flora

From literature review, 199 plant species along the DMZ and the CCZ were found; 95 plant species were found in Yanggu, Gangwon-do where the site of DNBG is in; and 17 of them (18%) are in Asteraceae.

The vegetation field survey took place three times in 2009 and the findings are:

- One hundred sixty five plant species were found including herbaceous plant communities such as *Lilium tsingtauense*, *Caltha palustris* var. *palustris*, *Veratrum oxysepalum*, *Pseudostellaria heterophylla*, *Anemone narcissiflora*, *Erythronium japonicum*.
- Birch forests and oak forests that are indicators of climax vegetation, were observed.
- The site has a slope of 3 to 7 degrees and contains 60 to 80 % of canopy, 30 to 60 % of understorey, 40 to 80 % of shrubs, and 30 to 40 % of herbaceous plants.
- The well-developed vegetation should be preserved as research areas and should be limited to visitors.

Infrastructure

There are many cultural and tour resources such as eight views of Yanggu: Dutayeon, Punch Bowl, Samyeongsan, Gwangchi Stream, Paseotang, Paroho, Hugok Spring, Eco-Botanic Garden, as well as the 4th tunnel, Eulji Observatory, the Species Restoration Center of Gorals.

DNBG has potential being a research institute on native plant propagation and an eco-tourism site.

Expected Visitors

In 2017, the visitation would be 300,000 a year; maximum number of visitors a day would be 2,752.

Government Regulations and Similar plans

Two provinces, Gyeonggi-do and Gangwon-do are planning to build DMZ Ecological Peace Parks that would eventually turn into UNESCO Biosphere Reserves and contribute to local community development.

All the cities and provinces adjacent to the DMZ and the CCZ have started the Peace Tourism Belt Development Planning.

Fourteen regulations with six different government department including Korea Forest Service, Ministry of Environment, Ministry of Land Transport and Maritime Affairs, Ministry of National Defense, Cultural Heritage Administration, Ministry of Public Administration and Security, were checked.

Case Studies

It is necessary for the garden to be characterized, to have experts and equipment, and to develop education programs by looking at these case study sites: Korea Botanic Garden in South Korea, Hantaek Botanic Garden in South Korea, Eden Project in United Kingdom, Le Jardin des Plantes (a botanic garden in Paris) in France, Friends of Hullet in Canada, Royal Botanic Garden, Edinburgh in Scotland, Otari Native Botanic Garden and Wilton's Bush Reserve in New Zealand

Vision

DMZ Research & Development Belt of Green Forest

Mission

Observe and research on native flora in the DMZ to good use

Propagate, research, and display native plants that can benefit local community development

Survey and manage plant resources through forest ecological resources research for climate changes

Research forests and wetlands habitats and promote the output with international community or organizations

Planning of the site

Build a botanical garden to display extensive range of native plants from the DMZ

Develop a center for collecting and preserving plants from colder climates especially from North Korea

Demonstrate the flora through protecting the site

Secure pathway that separates research and public areas

Land Use

The garden should have two separate areas: Research and Display.

Table 4.3 Areas and concepts of the land use plan of the DMZ Native Botanical Garden

Areas		Concepts
Research area (10.5 hectares)	International Research Center & Dormitory	Facilities
	Habitat Preserve	Preserving and restoring forested wetlands in the DMZ and CCZ
	Natural areas and Nursery	Exploring, propagating and experimenting native plants in the DMZ area
Display area (7.5 hectares)	Alpine Garden	Reproduce alpine habitats such as rock garden and meadow
	Northern Garden	Display plants in the northern climate
	Forested Wetlands	Display plants from mountain valleys
	Low-Lying Wetland	Display plants from low-lying wetland in the western part of the DMZ
	Visitor Center	Offering information and facilities

Planting plan

When planting, the following should be considered: 1) uniqueness of the site, 2) preserving and propagating the forest habitat and resources, 3) efficiency of the spaces, 4) sustainability in ecology.

Trees that are suitable for the site and demonstrate uniqueness of the DMZ should be introduced; trees that are native to the DMZ region should be used as much as possible.

Alpine plants collected domestically and internationally should be planted in a space to demonstrate the diversity.

Researching plant communities in the region and displaying native plants in the colder climates are recommended.

Structure and Facilities Plan

For structures and signage eco-friendly materials such as woods and rocks should be used.

Signage includes garden maps, plant labels, directions, and descriptions of gardens' display; convenient facilities include pergolas and benches; water features including streams, wetlands, ponds, and artificial falls.

Building Plan

All buildings should be built with eco-friendly, natural materials and low stories.

The International Research Center would contain offices as well as laboratories where research and development will take place, additionally symposia and seminars would be held there.

A dormitory will be built to accommodate researchers and their families.

A visitor center would represent symbolic meaning of the garden, hold cultural activities, and offer information, classrooms and garden shop.

A shed would be needed for storing equipment and other materials.

Long-term Plan

- **Developing:** Build the DMZ Native Botanical Garden
- **Growing:** Create eco-trails to the Basin
- **Thriving:** Connect to Forest Genetic Resource Reserves

Timeline

- 2009 – 2013 (\$ 11 million)
 - Infrastructure
 - Buildings: international research center, dormitory, and visitor center
- 2013 – 2015 (\$ 9.8 million)

- Building: Shed
- Creating display gardens
- 2015 – 2017 (\$ 8 million)
 - Creating Eco-trail and connecting to surrounding forest
 - Research on developing forest monitoring system

Organizational Structure

About 30 members of staff are recommended:

- Director (1)
- Administration (4)
- Habitat Survey and Monitoring Team (6)
- Resource Preservation and Propagation Team (8)
- Display Team (8)
- International Co-operation Team (3)

Programs

The following programs are recommended:

- Wild Flower Festival
 - Crafting with wild flowers
 - Walk to the DMZ wild flower garden
 - Photography
- Edible Plants Festival
 - Farmers' Market for edible plants
- Regional Special Products Festival
 - Farmers' Market for regional products
- Get-to-know Northern plants
 - Experience making pressed-flower
- Punch Bowl Drawing Contest
 - Drawing and essay writing contests

- World Wetland Day
 - Educating wetland preservation and biodiversity
- World Environmental Day
 - Symposium on Environmental issues
- International Day for Biological Diversity
 - Walk to trails



Figure 4.21 A word cloud generated from TagCrowd.com to demonstrate the frequency of words used in the summary of the DMZ Native Botanical Garden planning document

To demonstrate the focus of the DNBG plan, a word cloud was generated with web-based application, TagCrowd. The Figure 4.21 shows frequency of words

that were used in the summary of DNBG plan (1,320 words) and the key words are dmz, garden, research, native, plants, forest, wetland, and etc.

A Possible Model: North Carolina Botanical Garden

The North Carolina Botanical Garden (NCBG) is affiliated with University of North Carolina at Chapel Hill (UNC). The Garden focuses on native plants in the state of North Carolina (especially in the Piedmont region where the NCBG is located) through propagation, seed banking, invasive control, protection, restoration and many other related conservation programs that “A Conservation Garden” became their by-line. The source of the summary below is from the interview with Mr. James L. Ward.

Mission

The mission of NCBG is to inspire understanding, appreciation, and conservation of plants in gardens and natural areas and to advance a sustainable relationship between people and nature

Vision

Through our displays, programs, research, and lands, people value the ways that plants, gardens, and natural areas sustain, nurture, and enrich our lives and gain and apply a deeper understanding of the importance of sustainable gardening and conserving biological diversity, thereby the Garden has a profound influence on how people value and interact with the environment and the biologically diverse world.

Goals

To be a model conservation garden.

To be a leading source of information on taxonomy, conservation, and horticulture of plants of North Carolina and the southeastern United States.

To display, in beautiful gardens, the most comprehensive collection of the plants of the southeastern United States and other plants appropriate to the conservation and educational programs of the Garden.

To conserve in natural areas, biodiversity and restored ecosystems of the Southeastern United States.

To provide diverse audiences with a wide variety of programs that instruct and inspire people to develop a greater understanding and appreciation about the importance of plants and nature, and of their value in our lives.

To foster learning, research, and collaboration within the University of North Carolina.

To build community among those who practice conservation, research, education, and horticulture.

To develop all the resources and relationships to meet and sustain our goals.

Location

The gardens and the majority of nature areas of NCBG are in Chapel Hill and Durham, but also the Garden manages areas throughout the state of North Carolina (Table 4.4). The total acreage of NCBG has responsibility is about 1,133 square miles.

The ownership of the areas belongs to NCBG, UNC, both NCBG and UNC, or the federal government.

Table 4.4 The gardens and natural areas that North Carolina Botanical Garden manages (NCBG, 2013)

Responsibility	Gardens and Natural Areas
Areas managed by North Carolina Botanical Garden (NCBG)	Display Gardens <ul style="list-style-type: none"> • Native Plant Border • Native Water Gardens • Carnivorous Plant Collection • Garden of Flowering Plant Families • Horticultural Therapy Demonstration Garden • The Mercer Reeves Hubbard Herb Garden • Coastal Plain and Sandhills Habitat Gardens • Piedmont Habitat Garden • Mountain Habitat Garden & Paul Green Cabin • Fern Collection • Totten Center Landscape
	Coker Arboretum
	Piedmont Nature Trails
	Forest Theatre
	Battle Park
	Carolina Campus Community Garden
	Mason Farm Biological Reserve (MFBR)
	Stillhouse Bottom Preserve
	The Rocks
Other Natural Areas Managed by NCBG	Coker Pinetum
	Gordon Butler Nature Preserve
	Hackberry-Warbler Trail
	Penny's bend Nature Preserve
Other Natural Areas Managed by NCBG (not open to the public)	Edwards Mountain Preserve
	Laurel Hill Nature Preserve
	Wilmilam Lanier Hunt Arboretum

Horticultural Management

Horticultural practices in the natural areas include creating plant inventory, researching how the areas change over time and identifying invasive exotic plants.

These natural areas are available for other researchers who are affiliated with the University; 25-years of surveys of migrating songbirds have been conducted in a natural area of NCBG.

The management activities in the natural areas range from intensive control burning, to trail maintaining, to passive observing. The main goal is to maintain or restore the ecological balance of the areas.

When researching natural areas, many actions are required beyond collecting seeds. For example, when NCBG was asked to investigate the potential site planned from the department of transportation's building, the process entails researching the plant habitat characteristic, relocating them to adjacent areas where the habitat is suitable; bringing them to NCBG to propagate, then re-establishing in other areas closer to where they came from; and planting some of the propagation at display to share the story with the public.

To fulfill the mission, NCBG has focused on increasing the knowledge of how to propagate native plants and recently published a book, *Paul Green's Plant Book*. It celebrates wildflowers and the culture of North Carolina.

NCBG has a facility to store seeds and collect seeds whenever it is appropriate. The reasons to collect, restore and propagate the seeds are to share them with NCBG members. Thus making the rare, valued native plants available at the garden shop and to fulfill the Millennium Seed Bank project.

Organizational Structure

About 24 full-time staff and 10 part-time; 15 to 20 students and interns as seasonal would be added during the summer; 100 to 150 volunteers work at NCBG.

- Director (0.5)
- Administration (1.5)
- Development (2.5)
- Horticulture (10)
- Conservation (3.5)
- Education (6)
- Herbarium (1)

Visitors

The estimated (due to no admission is charged) number of visitors is 100,000 a year.

Facilities

The Education Center newly added to NCBG followed the guidelines of Leadership in Energy and Environmental Design (LEED). The US Green Building Council is an organization that certifies LEED buildings and the certification level is Certified, Silver, Gold, and Platinum. The purpose is not only use eco-friendly natural materials or recycled materials. The building would also be sustainable in environmental sense like generating its own electricity, and installing and using collected rainwater.

There is no need for every botanical garden to have a LEED certified building; however, it was a mission-based decision for NCBG pursued the Platinum LEED Certified Education Center. Tours of the building have been regularly offered and the Education Center has brought more visitors.

The UNC Herbarium that houses 750,000 specimens became a part of NCBG in 2000. The new herbarium will be constructed next to the Education Center making it more readily available to the public.

Garden Displays

NCBG displays the iconic North Carolina plants that are representative of the three physiographic provinces: the Mountains, the Piedmont and the Coastal Plains. These small recreations of the regions were created in a naturalistic style so that visitors get a sense of what it feels like to walk through the each area.

Native plants of the Piedmont region where NCBG situated were used to create and celebrate the sense of place from the Parking lot to the entrance of the Education Center.

Interpretations

NCBG uses interpretation to describe plant origins, to explain why plants are rare and to explain how visitors can help rescue plants from extinction.

Advocacy

Botanical gardens can be strong advocates for trees, natural habitats, or nature that surround us. NCBG advocates on behalf of the University for land use, defending natural areas from potential transportation corridors proposed by the state of North Carolina.

Education Programs

“Botanic gardens have to be more active in the role of education”
(Ward, 2011)

Botanic gardens have provided a place for solitude and enjoyment, but also have the opportunity to educate people about enjoying horticulture in their home, wise use of water and irrigation, how to avoid herbicides and pesticides, how to reduce environmental impact, and how to live healthier way.

Botanic gardens are wonderful backdrop for all sorts of activities; NCBG has offered programs such as “Yoga at the Garden”, “Tai chi at the Garden”, and “Sculpture in the Garden”.

NCBG provides on-site education programs for schools children and teachers; also focuses on training programs for teachers like native plant gardening, how to use outdoor as a classroom, and identifying local flora.

Developing intergenerational programs and collections that work well with families as a unit or family members as individuals would be recommended.

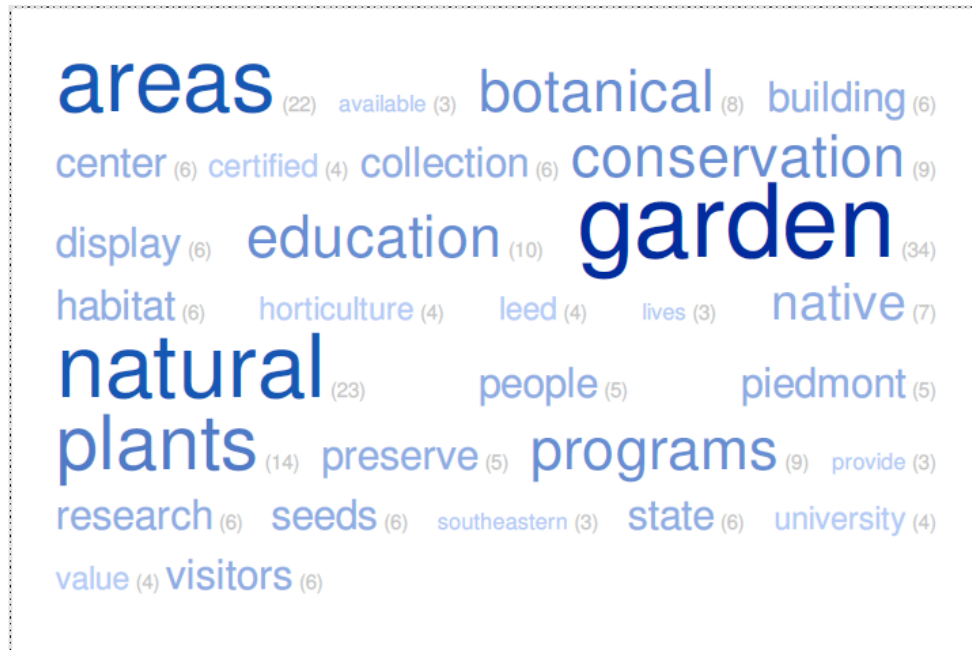


Figure 4.22 A word cloud generated from TagCrowd.com to demonstrate the frequency of words used in the summary of the findings from the interview with James L. Ward at the North Carolina Botanical Garden

A word cloud of the NCBG summary (1,208 words) was also generated with TagCrowd created to compare to the DNBG. The Figure 4.22 shows frequency of words that were used and the key words are garden, natural areas, plants, education, programs and etc.

Chapter 5

DISCUSSION AND CONCLUSION

This research explores the potential impact of establishing a botanic garden in the area of the Korean Demilitarized Zone (DMZ) and the Civilian Control Zone (CCZ). Upon acquiring and analyzing the similar government plan, the DMZ Native Botanical Garden (DNBG), the site and background information of DNBG are used as a template. Key findings from the literature review and current research challenge the DNBG to look beyond what is proposed in the existing plan and play a larger role as an research, educational, cultural, historical, and environmental institution (Thompson, 1972; Watson, 1993; Rinker, 2002; Wyse Jackson, 2003; Hohn, 2007).

The Current State of Affairs for the DMZ and CCZ

This research indicates that there is a desire among civilians to develop the adjoining CCZ is present. In 1997, the size of the CCZ was reduced when civilians claimed rights to some areas due to historical and agricultural land use. Because farming in the region relies pesticides, polluted runoff poses an additional challenge. Some of the former military bases have been returned to municipal uses, but many fields are abandoned, and damaged (Kim, 2010; Seo, 2010). Landslides are frequent in the eastern parts of the CCZ and this research confirmed they happen near the proposed site of the DNBG (Fig.4.18).

Since the National Defense Committee passed a law to downsize the CCZ in 2007, many development programs have been planned. Although some call for the creation of peace parks, eco trails and war museums (Green Korea United, 2008; Seo, 2010), most are geared towards recreational purposes such as golf courses and ski resorts (Onish, 2007; Kim, 2010). These unsustainable development plans fail to consider neither the area's countless environmental treasures nor the potential dangers from landmines (Fig. 4.21) (Kim, 2010; Seo, 2010). Because there is no lead planning agency, many plans overlap and have not reached the implementation stage (Nexus, 2009; Jin, 2010; Kim, 2010; Seo, 2010).

The capital city of Seoul is about 40 km (25 miles) south of the Military Demarcation Line MDL between North and South Korea. Seoul's population has been overflowing, and to cope with this problem there has been intensive development in the neighboring province of Gyeonggi-do. The development has almost reached the DMZ on the west coast, and there are currently no environmental protection or zoning regulations to restrict further expansion (Green Korea United, 2008; Seo, 2010).

The DMZ is an invaluable asset from environmental, historical and cultural perspectives that has arisen from the tragedy of war. With a diverse ecosystems ranging from wetlands to mountainous highlands (Seo, 2010), it is the only ecological sanctuary in the Korean peninsula, much of which has been "modernized" and thus destroyed from an environmental perspective. The survey results indicated that the Korean public were aware of the DMZ as an ecological treasure (Fig. 4.4) and affirmatively expressed the desire to preserve the DMZ and the CCZ (Fig. 4.13 and 4.14).

In terms of current conservations efforts, the results indicated that Korea Forest Service has made a few inroads (Seo, 2010). The majority of both the DMZ and CCZ contain mountainous areas, some of which in the CCZ have been allocated as Forest Genetic Resource Reserves by Korea Forest Service.

Although unlikely that comprehensive planning for the development of the DMZ and CCZ could be achieved in the near future for ideological and political reasons, it is expected that a regional land usage will become a subject of national debate, with development of the CCZ and DMZ as a passionate issue (Onish, 2007). The Koreas' eventual unification would necessitate a long-term plan for the DMZ since it is geopolitically in the middle. Research results confirmed that constructive and sustainable planning programs are required for the Korean DMZ and an ecological survey should be performed prior to developing any other plans (Seo, 2010; Kim, 2010).

Establishment of a botanic garden could mitigate some of the issues surrounding development of the DMZ and the CCZ. This research highlighted the huge potential of botanic gardens to 1) contribute to conservation of species and natural habitats; 2) perform horticultural research that supports propagation, restoration, and display; 3) provide substantial education programs; and 4) promote awareness of culture and history through interpretation. Findings from the survey indicated a high level of support for a botanic garden in the region (Fig. 4.12) as well a strong desire to preserve ecosystems and educate the public about conservation (Fig 4.13).

What a Botanic Garden Can Do for the Area?

Botanical gardens are ideal places for both biodiversity and cultural diversity to be showcased (Kim, 2010). The DNBG site is in the town of Punch Bowl, Yanggu (Fig. 4.16). Mt. Daeam and Mt. Daeu Natural Reserve as well as The High Moor, Yongneup of Mt. Daeam (listed as a Wetlands of International Importance by the Ramsar Convention) are located in the south of the DNBG site (RSIS, 2009). Considering our data showed that there are many natural, cultural and tourist resources near Punch Bowl (Nexus, 2009), the regional ecological values in addition to the climate, makes the site a suitable location to develop the DNBG. This part of discussion identifies potential roles for the DNBG to fulfill.

In-situ Conservation

Ecological Exploration and Survey

Several ecological surveys have been conducted; however, a complete inventory of the regional flora and evaluation of wildlife habitat is still needed (Seo, 2010) and will be essential to developing a large-scale conservation plan. One of the focuses in the DNBG plan was to identify plant communities in the region, in addition to managing plant resources through forest ecological research related to climate changes. Identifying native and invasive plants in the region as well as monitoring habitat change over time supports the development of long-term plans for habitat protection and restoration (Kiew and Chan, 1998).

Habitat Protection and Restoration

The data confirmed that the CCZ needs a significant amount of restoration work, and a botanic garden would be well suited to take on projects in abandoned or damaged areas (Dixon and Sharrock, 2009; Hardwick et al., 2011). Reintroduction and restoration programs would help the zone become ecologically balanced (Ward, 2011). Habitat restoration requires a long-term land management plan (Seo, 2010), but controlling invasive plants is one of the keys to protecting the area. A botanic garden containing a unique natural heritage ecosystem and taking charge of restoration works inherently would support the biodiversity strategy and prevent further degradation (Kiew and Chan, 1998).

Natural Area Management

Conservation work is beyond collecting plants or seeds for the purpose of displaying them at botanic gardens. The first step of conservation is implementing strategic conservation efforts to secure and protect natural areas that are representative of all the different types of plant communities across the DMZ and the CCZ (Ward, 2011). The primary goal of natural area management at NCBG is to maintain and restore the ecological balance of the areas. The management activities in the natural areas range from intensive control burning, selective removals, planting to trail maintaining, to passive observing, which can be applicable to manage natural areas in the DMZ and CCZ.

Ex-situ Conservation

Ex-situ conservation is an effort to preserve and promote biodiversity outside of natural plant habitats. It includes a cultivation of living plants collection in botanic gardens, seed banking, cryopreservation, and tissue culture (Toppila, 2012). It is not easy to maintain a living plant collection because *ex-situ* conservation demands financial resources, in addition to a variety of facilities and skills (Rae, 1995). Also, capturing full genetic diversity of a population in an *ex-situ* collection is difficult, if not impossible. The survey data indicated that participants ranked having native plant collections and seed banks as one of the top elements for botanic gardens (Table 4.2). Once established, the DNBG should consider a seed banking facility as a high priority, in addition to its regular living plant collections.

Collecting and storing seeds are one way to practice *ex-situ* conservation, but also another way to share the story of plants and the seeds with visitors (Ward, 2011). Living plant collections in botanic gardens “becomes showcases for conservation education” (Oikawa, 1998).

Horticultural Research

Horticultural research assists conservation work through maintaining the living collection, protecting the collection from diseases, finding proper *in vitro* techniques for propagation, and supporting plant introduction (Rakow and Lee, 2011). The word frequency analysis indicated that the DNBG plan emphasized the importance of researching native flora in the CCZ (Fig.4.16). Survey findings indicated that research facilities are seen as essential for botanic gardens (Table 4.2) and respondents supported building a botanic garden in the region of CCZ to promote

horticultural and environmental research (Fig. 4.13). Because its location is in colder climate, within a protected basin and surrounded by a unique habitat similar to a forested wetland, the DNBG's is well suited for a range of horticultural research projects.

Education

The role of botanic gardens in education has been highlighted because it offers a more meaningful place to visit while still providing aesthetic and recreational enjoyment and solitude (Peck, 1978; Watson, 1993; Ward, 2011). Botanic gardens are taking leadership roles in horticultural and environmental education, as demonstrated by NCBG's focuses on education programming (Fig. 4.16), ranging from plant identification to botanical arts to exercise in nature for all ages. Survey participants affirmatively stated that education programs in botanic gardens are absolutely imperative and they had a desire to learn about conservation; thus plant collections, research facilities, and staff at DNBG will be a great resource to accommodate public's desire to learn about native plants and conservation.

Interpretation

Interpretation is "a mission-based communication process that forges emotional and intellectual connections between the interests of the audience and the meanings inherent in the resource" (NAI, 2013). Sharing the purpose and function of the garden is an effective way to demonstrate conservation message (Brochu and Merriman, 2008); NCBG use of interpretative signs helps explain need for conservation of threatened species and how visitors can help rescue plants from

extinction. Also, tours of their newly added Education Center, which has directly increased visitation, have been regularly offered to demonstrate sustainable environmental practices. Providing a guided tour is an excellent way to share the value of DNBG, and could enhance the visitor experience in addition to the current plan of placing signage of garden map, plant labels, and descriptions of garden display.

Botanic gardens are a wonderful backdrop for all kinds of activities because they are living museums (Ward, 2011). DNBG has a unique opportunity to share the story of Korean War with an exhibition of war relics found in the region, photos of the other parts of the DMZ and CCZ, and hidden cultural heritage.

Advocacy of the DMZ and CCZ

Botanical gardens can be strong advocates for trees, natural habitats, or nature that surround us (Ward, 2011). For example, NCBG advocates defending natural areas from potential transportation corridors proposed by the state of North Carolina, at the same time ensuring the protection of plant communities by relocating them to suitable sites (Ward, 2011). A botanic garden could likewise increase advocacy for the DMZ and CCZ, improving the chances to preserve the unique ecosystems. Having DNBG and its facilities in the region of the DMZ and CCZ means it will potentially serve as an administrative institution if the area becomes a site of UNESCO Biosphere Reserves or UNESCO World Heritage (Jin, 2010), a role that would enhance its environmental advocacy.

What the Garden Needs

The research findings indicate that there are critical elements that a botanic garden would need to fulfill its roles in in-situ and ex-situ conservation, horticultural research, education and interpretation, and advocacy: 1) Strong statement of mission, vision, and goals, 2) strategic short-term and long-term management plans, 3) collections building and curating, 4) education programs, 5) a unique garden design representing the region and the nation, 6) skilled staff and organizational structure, 7) facilities, and 8) local community support.

Strong Statement of Mission, Vision, and Goals

As a non-profit organization, it is critical for a botanic garden to define its mission, vision and goals (Wyse Jackson, 2003; Gagliardi, 2009; Kim, 2010). The mission of the organization answers the question of why the botanic garden exists; the vision states what the botanic garden imagines itself to be, and the goals steer the botanic garden to try to achieve the mission and vision. The research findings indicate that the botanic garden in the region should be a symbol of the DMZ, a bridge of North and South Korea, and revival of the history and culture of the region and nation (Kim, 2010). For example, focusing on flora native to a colder climate region in the Korean Peninsula demonstrates the uniqueness of the region in both a historical and cultural context (Nexus, 2009).

Short-term, Mid-term and Long-term Management Plan

The current plan for DNBG included three short, mid and long-term goals: 1) **Developing**: Build the DMZ Native Botanical Garden, 2) **Growing**: Create eco-

trails leading to the Punch Bowl, 3) **Thriving:** Connect DNBG to Forest Genetic Resource Reserves (Nexus, 2009).

In order for the DNBG to develop eco-trails and expand its natural area management role to meet goals for larger scale conservation, one critical problem must be solved: landmines (Kim, 2010; Seo, 2010). This is truly a threat to both DNBG staff and visitors if landmine removal is not completed prior to conducting ecological surveys and developing eco-trails. About 5% of survey participants deemed landmines a significant hindrance to creating a botanic garden in the region (Fig.4.14).

Consistent with literature describing best practices for public garden management (Gagliardi, 2009; Rakow and Lee, 2011), this research recommends DNBG to have detailed short-term, mid-term, and long-term management plans after identifying mission, vision, and goals statements.

Building and Curating Collections

Developing and documenting plant collections enables gardens to display, educate, research, and conserve (Watson, 1993). In general, botanic gardens and arboreta in Korea are lacking an emphasis on plant collection curation (Kim, 2010). A methodology to enhance plant collections and curation can be achieved through appropriate plant record and mapping software such as geographic information system (GIS), computer aided design (CAD), as well as trained staff for the programs (Hohn, 2007). Because the DNBG will be a subset organization of a government agency, financial resources can be easily secured to find qualified staff with an expertise on

curation. DNBG has the potential to be a model for curation best practices within South Korea.

Unique Garden Design Representing the Region and the Nation

The research findings confirmed that a botanic garden in the DMZ and CCZ should take advantage of the sense of place, the uniqueness of the plant communities, the local community and the history. Survey results showed that the participants would like to see Korean traditional gardens (Table 4.2); the interview indicates that traditional Korean gardens should be celebrated and would resonate with the Korean people (Ward, 2011). Traditionally, Korean gardens were located where beautiful scenery and water features abounded, and the DMZ area would be the ideal place to revive the Korean garden aesthetic.

The DMBG has a plan to display an extensive range of native plants from the DMZ (Nexus, 2009). It would stimulate public's interests if the displays reflect the DMZ's topography, historical land use, CCZ's town characteristics and surrounding communities (Seo, 2010). For example, NCBG displays iconic plants that represent the three physiographic provinces of North Carolina state: the Mountains, the Piedmont and the Coastal Plains. It is a useful tool to increase visitors' attention and appreciation of native ecosystems, as these displays were created in a naturalistic style.

Education Programs

Developing education programs that reflect the greater community in both natural areas and traditional Korean gardening are highly recommended (Ward, 2011).

Developing intergenerational programs that bring all family members' attention and excitement may result in subsequent visits to DNBG (Ward, 2011). The followings are examples that are suggested for DNBG to offer:

- Providing visitors Education programs with conservation messages, including what are native and invasive plants from the region, how to propagate native plants, how to remove invasive plants, how to reduce environmental impact, how to use water wisely, how to recycle, and why protecting natural habitats is important.
- Internship programs in horticulture, conservation, habitat management and research
- Training programs for schoolteachers such as native plant gardening, how to use outdoor as a classroom, and identifying local flora, are additional ways to efficiently distribute the message of conservation.

Skilled Staff and Organizational Structure

In order to play larger roles that have been proposed in this chapter, the research findings indicate that the DNBG should change its organizational structure and engage more subject matter experts. As the current plan focuses on horticultural research, the proposed department positions and teams are: director, administration, habitat survey and monitoring team, resource preservation and propagation team, display team, and international co-operation team. This research proposes adjusted organizational components: director, administration, horticultural research, conservation, education and display.

Facilities

The current DNBG plan for future facilities is to use eco-friendly and natural materials; this is consistent with the movement for botanic gardens in the United States to showcase sustainability in their facilities. For example, NCBG's new Education Center has earned the designation of Platinum LEED Certified building by The US Green Building Council. The purpose of the program is not only to use eco-friendly natural materials or recycled materials, but also the building would also be sustainable in environmental sense in ways such as generating its own electricity, collecting and using rainwater.

Local Community Support

The attitude of the local residents in the CCZ towards the conservation values of the area primarily depend on whether it is helpful for their agricultural production and financially beneficial, and they tend to oppose any conservation policies that restrict their agricultural works although they appreciate the importance of biodiversity conservation (Kim, 2008). The research indicated that reclamation of CCZ and DMZ land for farming are frequent actions whether it is legal or not (Fig. 4.19).

Some examples for the DNBG to contribute to ameliorating the problem include educating the local residents about organic farming and researching crops that could be beneficial to both environment and local communities (Seo, 2010). Residents also desire to be involved in the planning process to ensure their opinions are heard and accurately reflected (Kim, 2008), which could result in support for projects. The

DNBG has planned to research native plant propagation that can benefit local community (Nexus, 2009).

Strengths, Weaknesses, Opportunities, and Threats (SWOT)

The roles and critical elements discussed above were evaluated through a SWOT Analysis to determine how important they are for the sake of DMZ and CCZ conservation and how frequently these items are mentioned in the research findings (Table 5.1). The list of Strengths represents the role that the DNBG could play as soon as it is built. The components under Weaknesses are challenges to DNBG development. The Opportunities list highlights potential goals and objectives that the DNBG could implement. The elements of Threats are factors that are currently a hindrance for the DMZ and CCZ conservation although they are not permanent.

Table 5.1 Identified roles and critical elements that the DMZ Native Botanical Garden feasibly adapt or overcome in the format of Strengths, Weaknesses, Opportunities and Threats

Positive	Internal Factors		Negative
	Strengths (S)	Weaknesses (W)	
	1. In-situ Conservation: ecological survey, habitat restoration, natural area management 2. Horticultural Research: native plant research, propagation, plant introduction	1. Mission, vision and goals statements 2. Management plan 3. Interpretation 4. Education programs 5. Curation of plant collections 6. Staff and organizational structure	
	External Factors		
	Opportunities (O)	Threats (T)	
	1. Ex-situ Conservation 2. Unique designs of display 3. Education on conservation 4. Interpretation on history and culture 5. Eco-trails 6. Advocacy 7. Collaboration	1. Landmines 2. No overarching plan for the entire DMZ and CCZ 3. Army bases 4. Current development plans 5. Local community	

Bensoussan and Fleisher, the authors of *Analysis Without Paralysis* suggested to move one step further after mapping the SWOT elements: Identifying the strategic fit by matching internal Strengths and external Opportunities (SO Strategies), internal Weaknesses and external Opportunities (WO Strategies), Strengths and external Threats (ST Strategies), and Weaknesses and external Threats (WT Strategies) (Table 5.2). This exercise, using a version of Bensoussan and Fleisher'

SWOT Matrix modified to fit a non-profit organization, demonstrates the potentials that DNBG possesses as a research, cultural, educational, and administrative institution.

Table 5.2 SWOT Matrix reveals the DMZ Native Botanical Gardens potentials

		Internal Factors	
External Factors	<u>Opportunities</u>	<u>Strengths</u>	<u>Weaknesses</u>
		<i>Strengths matched with Opportunities: SO Strategy</i> An active conservation-based botanical garden (S1, S2, O1, O3, O5) A unique living museum on national and international levels (S1, S2, O2, O4, O6, O7)	<i>Weaknesses matched with Opportunities: WO Strategy</i> Lead institution on conservation education (W3, W4, O1, O2, O3, O6)
	<u>Threats</u>	<i>Strengths matched with Threats: ST Strategy</i> An administrative institution for DMZ and CCZ conservation (S1, S2, T2, T3, T4, T5)	<i>Weaknesses matched with Threats: WT Strategy</i> Need for solid strategic management plan for DMZ and CCZ conservation (W1, W2, T1, T2, T3)

This research modified Bensoussan and Fleisher' SWOT Matrix, which focuses on the view from profit organization. For example, ST Strategies are strategies that leverage the internal strengths to avoid external threats; WT Strategies are strategies that minimize the internal weaknesses and avoid external threats. The model was applicable to portions of this research under current conditions. The full

application of this modified analysis that transforms Threats to Opportunities can be realized when the two Korea's unification comes.

Conclusion

The most heavily fortified area in the Korean peninsula—ironically named the “Demilitarized Zone,”—has transformed itself from a tragedy of the Korean War into a nature haven due to the lack of human disturbance. This one remaining nature sanctuary in the peninsula must be preserved as a living museum, and a botanic garden is well suited to play this essential environmental and cultural function. This research addressed the current state of affairs in the region of the DMZ and CCZ, potential roles and goals that a garden may fulfill for DMZ and CCZ conservation, and critical elements of the garden to flourish. In addition, the research analyzed the categorized components through SWOT Analysis and identified the potential mission and vision.

The DMZ Native Botanical Garden (DNBG) can play a larger role in conservation, education, and administration for the DMZ and the CCZ than currently planned, most significantly as research institution. The establishment of a botanic garden in close proximity to Korean DMZ can effectively promote ecological surveying and scientific research, in turn leading to conservation of the DMZ region's rich biodiversity. Interpretation, native plant collections, research, habitat restoration, and unique regional displays, as well as education programs on environmental issues and conservation efforts will be appreciated by public and support environmental and cultural goals.

Perhaps just as importantly, DNBG possesses great potential in the form of its unique historical and cultural resources, a living museum for collecting, curating, and displaying war relics and other cultural treasures in a nature setting. It can be a catalyst in uniting the two Koreas by creating national heritage and preserving their unique shared ecosystems. The botanic garden is poised to become one of the core institutions that leads the overarching plan for development as it preserves the pristine land, heals the damaged areas, and interprets a nation's beauty for the national and international community.

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Appendix A
HUMAN SUBJECTS REVIEW BOARD

Certification of HSRB Training

Certification of Human Subjects Training

The University of Delaware certifies that Dongah Shin
(Name of researcher)

attended an institutional training session on the use of human subjects in research on

February 16, 2010.
(Date)

The session included the following topics:

- The Belmont Report
- Federal regulations for using humans in research (45 CFR 46)
- The University's Federalwide Assurance
- Informed consent
- Institutional procedures
- Sources for additional information.



Elizabeth Duggins Peloso
Director of Compliance

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Exempt Letter



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DATE:	September 8, 2010
TO:	Dong Ah Shin
FROM:	University of Delaware IRB
STUDY TITLE:	[188661-2] Using a Botanic Garden to Promote Biodiversity in the region of the Korean Demilitarized Zone and Civilian Control Zone
IRB REFERENCE #:	
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF EXEMPT STATUS
DECISION DATE:	
REVIEW CATEGORY:	Exemption category # 2

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will put a copy of this correspondence on file in our office. Please remember to notify us if you make any substantial changes to the project.

If you have any questions, please contact Elizabeth Peloso at 302-831-8619 or epeloso@udel.edu. Please include your study title and reference number in all correspondence with this office.

Appendix B
SURVEY QUESTIONNAIRE

Korean Version

안녕하세요.

본 연구는 델라웨어 대학의 룡우드 대학원 프로그램 로버트 라이언즈 박사의 지도아래 "연구원 신동아"에 의해 실시되고 있습니다.

설문조사를 통해 한국의 비무장 지대와 민간인 통제 구역 내에 식물원 설립에 대한 귀하의 의견을 연구에 반영하고자 실시하게 되었습니다. 설문조사는 약 5 - 10 분정도 소요되며 설문의 응답자는 만 19세 이상의 성인을 대상으로 합니다. 설문조사는 전적으로 귀하의 자발적 참여로 이루어지며 귀하께서 응해주신 답변은 제한된 연구팀에 의해 연구, 분석됩니다.

연구에 관한 모든 문의, 관련사항은 dshin@udel.edu (연구원 신동아)로 문의하시기 바랍니다.

연구주제에 관한 귀하의 권리, 인권에 관한 문의는 델라웨어 대학의 인권검토위원회 1-302-831-2137에 문의하시기 바랍니다.

참여해주셔서 감사합니다.

한국 비무장 지대는 UN이 1953년 한국전쟁을 중단하기 위해 설정한 지역입니다. 비무장 지대는 군사분계선 기준 북쪽 2 km, 남쪽 2 km, 총 폭 4 km (2.5 마일), 길이 248 km (155 마일)의 한반도를 가로지르는 북한과 남한의 완충지대입니다.

1. 귀하는 북한과 남한 사이의 비무장 지대를 알고 계십니까?

- ☐ 그렇다
- ☐ 그렇지 않다
- ☐ 확실하지 않다

※ 귀하의 답변이 ‘그렇다’ 또는 ‘확실하지 않다’ 면 다음 페이지에서 설문을 시작하여 주십시오.

※ 귀하의 답변이 ‘그렇지 않다’ 라면, 8번문항 (페이지 5)에서 설문을 시작하여 주십시오.

대한민국 (남한)에는 비무장지대를 기준으로 남쪽 5-20km(3 - 13 마일) 민간인 통제 구역이 있습니다. 군사 기지가 있는 민간인 통제 구역의 출입은 제한되며 거주 의 허가를 받은 농민들이 구역 내에 살고 있습니다.

2. 귀하는 비무장 지대 또는 민간인 통제 구역에 방문하신 적이 있습니까?

- ☐ 민간인 통제구역에 살고 있다
- ☐ 방문한 적이 있다
- ☐ 방문한 적이 없다
- ☐ 잘 모르겠다

2-1. 방문하신 적이 있으시다면, 어느 지역에 방문하셨습니까? (방문한 지역을 모두 선택해주십시오)

- ☐ 임진각 ☐ 판문점 ☐ 제 3터널 ☐ 도라산역 ☐ 통일 전망대 (고성군)
- ☐ 기타 _____
- ☐ 기억이 나지 않음

3. 귀하는 비무장 지대와 민간인 통제구역을 한반도에서 독특한 생태계로 인식하고 계십니까?

- ☐ 그렇다
- ☐ 그렇지 않다
- ☐ 확실하지 않다

식물원과 수목원은 살아있는 식물을 수집, 재배, 연구하는 기관으로, 대중에게 식물의 과학적지식을 전달하고, 정원을 통해 아름다움을 전시하여 즐거움을 선사하는 문화공간입니다.

4. 귀하는 식물원/수목원에 방문하신 적이 있습니까?

☐ 있다

☐ 없다

4-1. 방문하신 적이 있으시다면, 어느 식물원/수목원에 가보셨습니까? (가보신 식물원/수목원을 모두 선택해주시오)

☐ 국립수목원 (광릉)

☐ 한택식물원

☐ 아침고요수목원

☐ 천리포수목원

☐ 한국자생식물원

☐ 평강식물원

☐ 여미지식물원

☐ 기청산식물원

☐ 기타 _____

4-2. 평균적으로 귀하는 식물원/수목원을 얼마나 자주 방문하십니까?

☐ 일년에 한번

☐ 일년에 두번

☐ 두달에 한번

☐ 한달에 한번

☐ 일주일에 한번

☐ 기타 _____

4-3. 방문하신 목적은 무엇입니까? (모두 선택하여주시오)

☐ 휴식 및 나들이 ☐ 지식의 습득 ☐ 자연의 감상

☐ 운동

☐ 일 때문에

☐ 기타 _____

식물원과 수목원은 살아있는 식물을 수집, 재배, 연구하는 기관으로, 대중에게 식물의 과학적지식을 전달하고, 정원을 통해 아름다움을 전시하여 즐거움을 선사하는 문화공간입니다.

5. 아래에 제시 된 식물원/수목원의 역할 및 기능의 중요도를 선택하여주십시오.

	전혀 중요하지 않다	중요하지 않다	보통	중요하다	매우 중요하다	잘모르겠 다
자생식물전시	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
연구시설	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
종자은행	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
한국전통정원 전시	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
중국식 또는 일본식 정원 전시	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
서양식 정원 전시	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
식물, 생태 관련 교육 프로그램	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
문화공연 (예: 한국 전통 음악, 무용, 그림 등)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
이벤트를 위한 공간 (예: 결혼식, 연회)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
기타	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

한반도를 끊임이 없이 동서로 가르는 비무장지대는 자연 그대로의 산악지대, 숲, 초원, 습지와 같은 한반도의 지형의 특징을 잘 보여줍니다. 동해안을 따라 남북으로 형성된 백두대간과 만나는 비무장 지대에는 1,597종의 식물, 106종의 물고기, 양서류와 파충류 29종, 조류 201종, 포유류 52 등의 다양한 생물이 서식하고 있습니다.

6. 비무장 지대 또는 민간인 통제구역의 지역의 생태계 보전을 위한 식물원을 설립제안을 지지하십니까?

- ☐ 지지한다 (→ 6-1문항에 응답하여 주십시오)
- ☐ 지지하지 않는다 (→ 6-2문항에 응답하여 주십시오)
- ☐ 잘 모르겠다

6-1. 지지하신다면, 어떤 이유에서 지지하십니까? (지지하는 이유를 모두 선택하여 주십시오)

- ☐ 자생식물과 생태계를 보존하기 위해
- ☐ 방문해보고 싶어서
- ☐ 환경보호에 대하여 대중을 교육하기 위해
- ☐ 원예, 가드닝에 대하여 대중을 교육하기 위해
- ☐ 그 지역의 역사와 문화에 대하여 대중을 교육하기 위해
- ☐ 이벤트를 개최할 수 있는 장소를 제공하기 위해
- ☐ 원예 및 생태, 환경에 관한 연구를 추진하기 위해
- ☐ 그 지역을 이용하는 좋은 방법이기 때문에
- ☐ 기타_____

6-2. 지지하지 않으신다면, 그 이유는 무엇입니까? (지지하지 않는 모든 이유를 선택해주십시오)

- ☐ 그 지역을 산업적으로 이용하면 좋을 것 같아서
- ☐ 지뢰때문에 위험하므로
- ☐ 예산에 비해 가치가 떨어지므로
- ☐ 기타_____

7. 비무장지대 또는 민간인 통제 구역 내에 식물원이 있다면 방문 하시겠습니까?

- ☐ 그렇다
- ☐ 그렇지 않다
- ☐ 확실하지 않다

8. 귀하의 국적은?

- ☐ 대한민국 ☐ 미국 ☐ 중국 ☐ 일본 ☐ 기타_____

9. 귀하의 성별은?

- ☐ 남성 ☐ 여성

10. 귀하의 나이는?

- ☐ 만19세 미만 ☐ 만19-29세 ☐ 만 30-39세 ☐ 만 40-49세
- ☐ 만 50-59세 ☐ 만 60-69세 ☐ 만 70세이상

11. 귀하는 어느지역에 살고 계십니까?

- ☐ 서울 ☐ 인천 ☐ 부산 ☐ 대전 ☐ 대구 ☐ 울산
☐ 광주
☐ 경기도 ☐ 강원도 ☐ 충청북도 ☐ 충청남도 ☐ 전라북도 ☐ 전라남도
☐ 경상북도 ☐ 경상남도 ☐ 제주도 ☐ 대한민국에 거주하지 않는다

12. 귀하의 최종학력은?

- ☐ 초등학교 졸업 ☐ 중학교 졸업 ☐ 고등학교 졸업
☐ 전문대 졸업 ☐ 대학교 졸업 ☐ 대학원 졸업 이상

13. 현재 귀하의 고용상태는?

- ☐ 고용 ☐ 학생 ☐ 주부 ☐ 은퇴 ☐ 실업/취업준비중

14. 귀하께서 회원으로 가입하고 계시는 협회가 있습니까? (모두 선택하여 주십시오)

- ☐ 한국원예학회 ☐ 한국산림학회 ☐ 한국식물원수목원협회
☐ 한국조경학회 ☐ 한국전통조경학회 ☐ 한국환경생태학회
☐ 한국생태학회 ☐ 환경복원기술학회

15. 본 연구에 관심이 있으시면 아래 입력란에 귀하의 이름과 이메일 주소를 기입하여 주십시오. 연구와 관련하여 연락받으실 수 있습니다.

이름: _____ 이메일: _____

16. 본 설문조사 주제에 대한 다른 의견이 있으시면 아래에 입력하여 주십시오.

귀하의 소중한 시간에 설문조사에 응해주셔서 진심으로 감사드립니다!
연구와 관련하여 질문이 있으면 dshin@udel.edu로 문의하시기 바랍니다.

English Version

Greetings, I would like to know your opinion about **creating a botanic garden in the region of the Korean Demilitarized Zone and Civilian Control Zone.**

This study is being conducted by Dongah Shin, Longwood Graduate Program Fellow at the University of Delaware, under the advisement of Dr. Robert Lyons, Program Director.

This brief questionnaire will take you 10 minutes or less to complete.

Individual responses will be collected on a secure web server. Data will remain confidential and will be viewed only by the four members of the research team.

Your participation is entirely voluntary. You can close the web browser at any time to leave this study before you press the final submission button at the end of the survey. Any responses you previously made will not be saved.

If you have any questions concerning the study, please contact the principal investigator, Dongah Shin, at dshin@udel.edu. For questions about your rights as a subject or about any issues concerning the use of human subjects in research, please contact the chair of the Human Subjects Review Board at the University of Delaware at 1-302-831-2137.

By continuing with this survey, you are indicating that you are 19 or older. If you are under 19, please close the browser to leave this survey. Thank you for participating and please share the survey link with others to help enhance the results. Please press the ">>" button to continue.

The Korean Demilitarized Zone (DMZ) was created by the United Nations in 1953 to support the Korean War cease-fire agreement. The DMZ is a 248 km (155 mile) by 4 km (2.5 miles) strip crossing the Korean peninsula, which serves as a buffer zone from the Military Demarcation Line (MDL), moving outward 2 km (1.25 miles) in each direction into North and South Korea.

1. Are you aware of the Korean Demilitarized Zone between North and South Korea?
☐ Yes

- ☐ No
- ☐ Not sure

- ☐ If your answer is “Yes” or “Not Sure,” please go to Q2.
- ☐ If your answer is “no,” please go to Q8.

In the Republic of Korea, there is the Civilian Control Zone (CCZ), a 5 to 20 km (3 - 13 mile) area extending south from the DMZ. Entrance into the CCZ is controlled; many military bases are located within and only a few civilian farmers were allowed to move into the area.

2. Have you been to the region of the Demilitarized Zone or Civilian Control Zone?

- ☐ I live in the Civilian Control Zone
- ☐ Yes, but I do not live in the Civilian Control Zone
- ☐ No
- ☐ Not sure

2-1. Which areas have you been to? (check all that apply)

- ☐ Imjingak ☐ Panmunjum ☐ The Third Tunnel
- ☐ Dorasan station ☐ Unification Observatory (Goseong)
- ☐ Other _____
- ☐ Not sure

3. Are you aware of the DMZ as a unique ecosystem in the Korean peninsula?

- ☐ Yes
- ☐ No
- ☐ Not sure

Public gardens are places where living plant collections are cultivated for public education and enjoyment through scientific, ornamental and cultural displays (e.g. botanical gardens, arboreta).

4. Have you ever been to a public garden?

- ☐ Yes
- ☐ No

4-1. Which public gardens have you been to? (check all that apply)

- ☐ National Arboretum (Gwangleung) ☐ Hantaek Botanic Garden
- ☐ The Garden of Morning Calm ☐ Chollipo Arboretum
- ☐ Korea Botanic Garden ☐ Pyunggang Botanical Garden

- ☐ Yeomiji Botanical Garden
 ☐ Key-chungsan Botanical Garden
☐ Other _____

4-2. On average, how often do you visit public gardens?

- ☐ Once a year ☐ Twice a year ☐ Six times a year
☐ Once a month ☐ Once a week ☐ Other _____

4-3. For what reasons do you go to public gardens? (check all that apply)

- ☐ Recreational ☐ Educational ☐ Spiritual
☐ Physical exercise ☐ Professional ☐ Other _____

Public gardens are places where living plant collections are cultivated for public education and enjoyment through scientific, ornamental and cultural displays (e.g. botanical gardens, arboreta).

5. Please indicate how important the following public garden elements are to you.

	Very unimportant	Somewhat unimportant	Neither important nor unimportant	Somewhat important	Very important	Not sure
Native plant collections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research facilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Seed banks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Korean traditional gardens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other East Asian-style gardens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
European or Western-style gardens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Educational programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cultural performances	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Space for events (e.g. weddings, parties)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

By forming an uninterrupted corridor across the Korean Peninsula, the DMZ represents the de facto preservation of the region's diverse ecosystems, ranging from wetlands to grasslands and mountainous highlands. Biodiversity in the DMZ is enhanced by its intersection with the Paektudaegan mountain range, which runs the length of the peninsula from north to south. The DMZ contains 1,597 plant species, 106 fish species, 29 amphibian and reptile species, 201 bird species, and 52 mammalian species.

6. Would you support the idea of establishing a botanic garden in the region of the Korean Demilitarized Zone and Civilian Control Zone?

- ☐ Yes (→ please go to Q 6-1)
- ☐ No (→ please go to Q 6-2)
- ☐ Maybe

6-1. Why would you support the idea? (check all the reasons that apply)

- ☐ To preserve native species and ecosystems
- ☐ To provide a place to visit
- ☐ To educate the public about conservation
- ☐ To educate the public about gardening,
- ☐ To educate the public about history and culture
- ☐ To provide a place to hold events
- ☐ To promote horticultural and environmental research
- ☐ It's a good way to use the area
- ☐ Other _____

6-2. Why wouldn't you support the idea? (check all the reasons that apply)

- ☐ It would be better to develop the land for industrial uses
- ☐ Too dangerous because of land mines
- ☐ Money is better spent elsewhere
- ☐ Other _____

7. If there was a botanic garden in the region of the DMZ and CCZ, would you like to visit?

- ☐ Yes
- ☐ No
- ☐ Not sure

8. What is your nationality?

- ☐ Korean ☐ American ☐ Chinese ☐ Japanese
☐ Other _____

9. What is your gender?

- ☐ Male ☐ Female

10. What is your age?

- ☐ 18 or under ☐ 19-29 ☐ 30-39 ☐ 40-49
☐ 50-59 ☐ 60-69 ☐ 70+

11. Which area do you live in?

- ☐ Seoul ☐ Incheon ☐ Busan
☐ Daejeon ☐ Daegu ☐ Ulsan
☐ Gwangju ☐ Gyeonggi-do ☐ Gangwon-do
☐ Chungcheongbuk-do ☐ Chungcheongnam-do
☐ Jeollabuk-do ☐ Jeollanam-do ☐ Gyeongsangbuk-do
☐ Gyeongsangnam-do ☐ Jeju-do ☐ I do not live in Korea

12. What is the highest level of education you have completed?

- ☐ Elementary school ☐ Middle school ☐ High school
☐ Two-year college ☐ Four-year college ☐ Graduate school

13. How would you describe your current employment status?

- ☐ Employed ☐ Student ☐ Homemaker ☐ Retired
☐ Unemployed/ Looking for work

14. Are you a member of any of these organizations? (check all that apply)

- ☐ Korean Society for Horticultural Science
☐ Korean Forest Society
☐ Korean Association of Botanical Gardens and Arboreta
☐ The Korean Institute of Landscape Architecture
☐ Korean Institute of Traditional Landscape Architecture
☐ Korean Institute of Traditional Landscape Architecture
☐ The Ecological Society of Korea
☐ The Korean Society of Environmental Restoration Technology

15. If you would be interested in hearing more about the results of the research, please provide your name and email address in the box below.

Name (optional): _____ Email
address: _____

16. Do you have any other comments about the topics covered in this survey? If so, please type them here.

Appendix C
NOTIFICATION LETTER

December 17, 2010

Longwood Graduate Program
126 Townsend Hall
University of Delaware
Newark, DE 19716
1-302-831-2517

Korea National Arboretum
832 Soomokwon-ro, Soheul-Eup
Pocheon-si, Gyeonggi-do
487-821 Republic of Korea

To Whom It May Concern:

My name is Dongah Shin, a Graduate Fellow in the Longwood Graduate Program in Public Horticulture at the University of Delaware (U.S.A). I'm conducting M.S. thesis research entitled, "Using a Botanical Garden to Promote Biodiversity in the Region of the Korean Demilitarized Zone (DMZ) and Civilian Control Zone (CCZ)."

The study focuses on the feasibility of building a new botanical garden in the Korean DMZ and CCZ regions and how a botanical garden can contribute to conservation of these areas. Recently, I visited Korea to interview stakeholders and professionals in the field, where I met Hye-Young Jin at the Korea National Arboretum. We talked about the plan of the Korean DMZ Native Botanical Garden in Yanggu and I have received a copy of the plan as designed by Nexus Design Corp, which is similar to my research.

I am interested in analyzing some of the aspects of the current plan using SWOT Analysis (Strength, Weakness, Opportunity, Threats) as a part of my research and hope to get a permission to do so. With these results and a case study of a botanical

garden dedicated to conservation efforts, I will develop recommendations for developing goals and objectives for the garden. I would be happy to share a copy of my thesis with you once it is done.

Please feel free to contact me at dshin@udel.edu if you have any questions or concerns. Thanks for your consideration.

Dongah Shin
Longwood Graduate Fellow
Longwood Gardens & The University of Delaware