

BOTANICAL GARDENS: DRIVING PLANT CONSERVATION LAW

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I. INTRODUCTION

The international botanical garden community is the largest plant conservation network in existence.¹ Botanical gardens around the world collect endangered plants, save their genetic materials, and share germplasms, which are collections of organisms' genetic resources.² In order to preserve endangered, threatened, and rare plants, botanical gardens must be able to collect wild plant materials and transfer them across international borders.³ Federal and state laws in the United States and international regimes, such as the Convention on Biological Diversity (CBD), affect the actions that botanical gardens can take.⁴ Botanical gardens in the United States and around the world have enthusiastically adopted the CBD's principles of Access and Benefits Sharing (ABS), with many American botanical gardens creating their own ABS policies in the absence of the United States' ratification of the CBD.⁵ Botanical gardens have also played a role in crafting global conservation policy, drafting the Global Strategy for Plant Conservation (GSPC) in 2002.⁶ The GSPC was the first specific conservation strategy developed under the CBD.⁷ In addition, botanical gardens helped revise the GSPC in 2010.⁸ While, the CBD has made it more difficult for botanical gardens to collect and share

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¹ *The history of BGCI*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/global/history/> (last visited Sept. 23, 2012).

² Michael Sean Dosmann, *Research in the Garden: Averting the Collections Crisis*, 72 BOTANICAL REV. 207, 210 (2006).

³ *Id.* at 212.

⁴ *Background and Consultations*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/gspc/background.shtml> (last visited Oct. 7, 2012).

⁵ *Access to Plant Genetic Resources*, NAT'L TROPICAL BOTANICAL GARDENS, <http://ntbg.org/resources/geneticsharing.php> (last visited Nov. 8, 2012).

⁶ GLOBAL STRATEGY FOR PLANT CONSERVATION, A GUIDE TO THE GSPC: ALL THE TARGETS, OBJECTIVES, AND FACTS (2012), available at http://www.plants2020.net/files/Plants2020/popular_guide/englishguide.pdf.

⁷ *Id.*

⁸ *Id.*

wild plant materials,⁹ the botanical garden community is actively involved in attempts to revise the CBD to facilitate scientific and conservation efforts that do not bring commercial gain.¹⁰

II. PLANTS UNDER THREAT AND BOTANICAL GARDENS

Plants make their own food using solar energy – no animal can accomplish this feat.¹¹ Consequently, plants are regarded as the foundation of all animal life.¹² All animals depend on plants for energy.¹³ About 270,000 species of plants live on our planet.¹⁴ Botanic Gardens Conservation International (BGCI) estimates that one in eight plants are threatened with extinction.¹⁵ Threats to plants include habitat loss and degradation, competition with introduced invasive species, overexploitation, and climate change.¹⁶ Losses of individual species can dramatically alter the composition of ecosystems, affecting animals and other plants that live in the ecosystem.¹⁷ As of October 2012, the United States Fish and Wildlife Service listed 800 plants and lichens as endangered or threatened in the U.S.¹⁸ The International Union for Conservation of Nature (ICUN) Red List included 14,582 plants assessed at “vulnerable” or worse.¹⁹

Protecting and monitoring those plants is a massive undertaking. Botanical gardens are doing what they can, growing plants in living collections and sharing information with one another to ensure that some rare and endangered plant taxa continue to exist as their wild habitats disappear.²⁰ Botanical gardens are also actively involved in the formulation

⁹ ROYAL HORTICULTURE SOCIETY, CONSERVATION AND ENVIRONMENT GUIDELINES: BRINGING PLANTS IN FROM ABROAD 4 (2002), available at http://www.rhs.org.uk/Gardening/Sustainable-gardening/pdfs/c_and_e_abroad.

¹⁰ *The Targets: 2011-2020*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/gspc/targets.shtml> (last visited Nov. 8, 2012).

¹¹ *Food Chain*, NAT'L GEOGRAPHIC, http://education.nationalgeographic.com/education/encyclopedia/food-chain/?ar_a=1 (last visited Nov. 6, 2012).

¹² *Id.*

¹³ *Habitat Loss*, NAT'L WILDLIFE FED'N, <http://www.nwf.org/Wildlife/Wildlife-Conservation/Threats-to-Wildlife/Habitat-Loss.aspx> (last visited Nov. 6, 2012).

¹⁴ *Major Threats to Plant Diversity*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/global/threats/> (last visited Oct. 7, 2012).

¹⁵ *Id.*

¹⁶ *Id.*

¹⁷ *Habitat Loss*, *supra* note 13.

¹⁸ *Summary of Listed Species Listed Populations and Recovery Plans*, U.S. FISH & WILDLIFE SERVICE, http://ecos.fws.gov/tess_public/pub/boxScore.jsp (last visited Oct. 7, 2012).

¹⁹ INT'L UNION FOR CONSERVATION OF NATURE, RED LIST OF THREATENED SPECIES at tbl. 3b (2012), available at http://www.iucnredlist.org/documents/summarystatistics/2012_1_RL_Stats_Table_3b_c.pdf.

²⁰ *Preventing plant extinctions*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/ourwork/projects/> (last visited Nov. 3, 2012).

and application of national and international laws that regulate the collection and conservation of plants.²¹

A. What are Botanical Gardens?

Botanical gardens are museums of plant life, collections-based institutions similar to natural history museums, zoos, and aquariums.²² While most botanical gardens function as public parks and pleasure gardens,²³ they are distinguished from those institutions by their scientific, research, and conservation missions.²⁴ There are approximately 2,500 botanical gardens around the world, including over 350 in North America, over 500 in Europe, and over 200 in southeast Asia, mostly in China and India.²⁵

BGCI lists several criteria that most botanic gardens meet in whole or in part:²⁶

1. some degree of permanence;
2. a scientific basis for collections;
3. scientific documentation and labeling of collections, including information about origins, if wild;
4. monitoring plants in collections;
5. exchanging seeds, plant materials, and information with other institutions;
6. engaging in scientific or horticultural research on plants in collections and in herbaria; and
7. open to the public and providing information to visitors.

Botanical gardens contain “living collections”, groups of plants grown for particular purposes. Common organizing principles for collections include geography, taxonomy, ecology, and conservation status.²⁷ Other botanical gardens are organized by themes such as medicinal plants, crops, butterfly gardens, or carnivorous plants.²⁸ Collections can be

²¹ KATE DAVIS, A CBD MANUAL FOR BOTANIC GARDENS 26 (2008), available at http://www.bgci.org/files/cbd_manual.pdf.

²² *Definition of a Botanic Garden*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/resources/1528/> (last visited Oct. 7, 2012).

²³ Dosmann, *supra* note 2, at 209.

²⁴ *Id.*

²⁵ *Id.*

²⁶ *Id.*

²⁷ *Living Collections*, BGCI: PLANTS FOR THE PLANET, http://www.bgci.org/resources/Living_collections/ (last visited Nov. 7, 2012).

²⁸ Dosmann, *supra* note 2 at 209; see also *Living Collections*, *supra* note 27.

permanent or temporary and can be used both to showcase plant diversity and for specific research or educational purposes.²⁹

Botanical gardens have a history of combined roles as scientific institutions and tourist destinations. The first botanical garden, built in Padua in 1545, was originally used for scientific and medical research on plant-based medicines.³⁰ In the 17th and 18th centuries, people began visiting private gardens owned by the wealthy; visiting botanical gardens was a leisure activity that gradually spread through all social classes and to all who sought tranquility and pleasant environments.³¹ During this same period, scientists began assembling collections of plants that were of scientific and economic interest to them.³² Explorers collected plants from around the world to grow in European and American gardens and used these collections to study taxonomy and classifications and to develop new ornamental and medicinal plants.³³ Many botanical gardens today have added education and biodiversity conservation to their missions.³⁴ In recent years, botanical gardens have started to research *ex situ* conservation³⁵, ecology, phenology, anatomy and physiology, assisted migration, and comparative genetics.³⁶ Botanical gardens also work to record and preserve traditional knowledge about plant use in indigenous communities.³⁷

The world's botanical gardens are collectively working to make their collections and missions relevant to a modern, high-tech world facing a biodiversity crisis by digitizing their records and saving more information about their plants.³⁸ Natural history collections, including botanical gardens, are useful for many kinds of research – ecology, environmental science, climate change, and genetics – as well as for commercial plant breeding and crop development.³⁹ Geo-referencing from provenance data can help researchers locate endangered species in the wild, track their movements

²⁹ Dosmann, *supra* note 2 at 209; *see also Living Collections*, *supra* note 27.

³⁰ *Botanical Garden (Orto Botanico), Padua*, UNITED NATIONS EDUC., SCI. & CULTURAL ORG., <http://whc.unesco.org/en/list/824> (last visited Oct. 7, 2012).

³¹ Joanne Connell, *The Purest of Human Pleasures: The Characteristics and Motivations of Garden Visitors in Great Britain*, 25 TOURISM MGMT. 229, 230 (2004).

³² *The History of Botanic Gardens*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/resources/history/> (last visited Nov. 6, 2012).

³³ *Id.*

³⁴ *History of Botanic Gardens*, *supra* note 32.

³⁵ Dosmann, *supra* note 2, at 210.

³⁶ *See* Richard B. Primack & Abraham J. Miller-Rushing, *The Role of Botanical Gardens in Climate Change Research*, 182 NEW PHYTOLOGIST 303, 305-309 (2009); *see also* Adel Jalili et al., *Climate Change, Unpredictable Cold Waves and Possible Brakes on Plant Migration*, 19 GLOBAL ECOLOGY & BIOGEOGRAPHY 642, 642 (2010); Graham H. Pyke & Paul R. Ehrlich, *Biological Collections and Ecological/Environmental Research: A Review, Some Observations and a Look to the Future*, 85 BIOLOGICAL REVS. 247, 248 (2010).

³⁷ *Indigenous and Local Knowledge*, BGCI: PLANTS FOR THE PLANET, http://www.bgci.org/ourwork/Indigenous_knowledge/ (last visited Oct. 7, 2012).

³⁸ Dosmann, *supra* note 2, at 227.

³⁹ *Id.* at 218.

over decades, and show which species occupy the same habitats.⁴⁰ Accurate provenance data can help develop conservation collections that represent a full range of genotypes.⁴¹ Accurate long-term data sets are particularly useful for ecological and climate change research.⁴²

B. Botanical Gardens and Conservation

Botanical gardens serve dual functions: first, as museums displaying interesting or beautiful specimens; and second, as repositories of living genetic material which can be used for breeding.⁴³ Every botanical garden has limited resources – space, money, manpower, and climate – and must decide how best to use those resources to further its conservation mission while also educating and entertaining the public.

Botanical gardens focus much of their attention on the conservation of plants, specializing in what is known as *ex situ* conservation. In *ex situ* conservation, plants are grown in sheltered environments away from their natural habitats.⁴⁴ To conserve plants *in situ*, the plants are maintained in their natural habitat.⁴⁵ *In situ* conservation is ideal, but *ex situ* conservation is becoming more prevalent and more important as plants' natural habitats disappear.⁴⁶ Many gardens grow *ex situ* collections with the goal of preserving endangered or extinct species or as a complement to *in situ* conservation.⁴⁷ BGCI predicts that botanical gardens may become important sources of plant material in the near future, as ecosystems must be stocked with new species to combat climate change.⁴⁸

Many plant species would have become extinct if gardeners had not preserved them. *Franklinia alata* survives thanks to John and William Bartram, who discovered the tree in Georgia in 1765 and began propagating it shortly before it disappeared completely from the wild around 1800.⁴⁹ The spectacular Dove Tree, *Davidia involucrata*, exists in European and North American gardens through sheer luck.⁵⁰ In 1899, plant collector E.H. Wilson went to China seeking the fabled tree only to discover that the one

⁴⁰ *Id.* at 226.

⁴¹ David Rae, *Fit for Purpose: The Importance of Quality Standards in the Cultivation and Use of Live Plant Collections for Conservation*, 20 BIODIVERSITY CONSERVATION 241, 250 (2010).

⁴² Mike J. Jeger & Marco Pautasso, *Plant Disease and Global Change: The Importance of Long-Term Data Sets*, 177 NEW PHYTOLOGIST 8, 11 (2008).

⁴³ *Role of Botanic Gardens*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/resources/1574/> (last visited Oct. 30, 2012).

⁴⁴ Fred Powledge, *The Evolving Role of Botanical Gardens*, 61 BIOSCIENCE 743, 745 (2011).

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ De-Zhu Li & Hugh W. Pritchard, *The Science and Economics of Ex Situ Plant Conservation*, 14 TRENDS IN PLANT SCIENCE 614, 615 (2009).

⁴⁸ *Role of Botanic Gardens*, *supra* note 43.

⁴⁹ Peter del Tredici, *Against All Odds: Growing Franklinia in Boston*, 63 ARNOLDIA 2, 3 (2005).

⁵⁰ Richard Schulhof, *The Dove Tree: A Long Journey West*, 63 ARNOLDIA 9, 9-10 (2005).

known specimen had been cut down for lumber.⁵¹ During his exhaustive search for Dove Trees growing in the wild, Wilson managed to collect enough seeds to introduce the tree to the nursery trade.⁵²

Many plant taxa are extinct in the wild and exist in captivity solely because of botanical gardens. For example, *Sophora toromiro*, a small tree from Easter Island, went extinct in its natural habitat but was preserved for reintroduction by the Bonn University Botanical Garden.⁵³ The Kew Royal Botanic Gardens has collaborated with the Seychelles Botanic Garden to breed and re-establish *Rothmannia annae*, a plant native to the Seychelles that is nearly extinct in its natural habitat.⁵⁴ *Kokia cookei*, a tree endemic to Molokai, Hawaii, went extinct in the wild in 1918 but has been cultivated in botanical gardens since then.⁵⁵ As of 2008, the tree was growing at Waimea Audubon, Lyon Arboretum, Volcano Rare Plant Facility, and the National Tropical Botanical Garden.⁵⁶ The last known wild *Cyanea pinnatifida*, endemic to Oahu, Hawaii, died in 2001, leaving its cultivated progeny in the Lyon Arboretum and the National Tropical Botanical Garden.⁵⁷

Some plant species formerly thought to be extinct have been rediscovered and now live in botanical gardens. The Hawaiian plant *Cyanea truncata* was thought to be extinct after the last known plant died in the 1980s.⁵⁸ Subsequent surveys discovered a few more wild plants, three of which survived until 2006 and provided genetic material that botanists used to propagate more plants and outplant them into a protected habitat.⁵⁹ Hawaii's Genetic Safety New Program and the Lyon Arboretum maintain seeds and tissue samples that can be used to propagate more plants in the future.⁶⁰

⁵¹ *Id.* at 9-10.

⁵² *Id.* at 10.

⁵³ Mike Maunder et al., *Conservation of the Toromiro Tree: Case Study in the Management of a Plant Extinct in the Wild*, 14 CONSERVATION BIOLOGY 1341, 1342-43 (2000).

⁵⁴ *The International Plant Exchange Network (IPEN): An Instrument of Botanic Gardens to Fulfil the ABS Provisions*, INT'L PLANT EXCHANGE NETWORK, <http://www.botgart.uni-bonn.de/ipen/background.html> (last visited Oct. 7, 2012).

⁵⁵ ARTHUR C. MEDEIROS, U.S. FISH & WILDLIFE SERV., RECOVERY PLAN FOR KOKIA COOKEI 13 (1998).

⁵⁶ *Species Profile: Kokia cookei*, U.S. FISH & WILDLIFE SERVICE, <http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q1XP> (last visited Oct. 7, 2012).

⁵⁷ *Cyanea pinnatifida*, IUCN RED LIST OF THREATENED SPECIES, <http://www.iucnredlist.org/apps/redlist/details/44109/0> (last visited Oct. 7, 2012).

⁵⁸ See U.S. FISH & WILDLIFE SERV., 5-YEAR REVIEW SUMMARY AND EVALUATION: CYANEA TRUNCATA (HAHA) (2007), available at http://www.fws.gov/ecos/ajax/docs/five_year_review/doc1132.pdf.

⁵⁹ *Id.*

⁶⁰ *Id.*

C. Preserving Genetic Diversity

Like zoos with captive breeding programs, botanical gardens face several problems associated with *ex situ* collection, including small population sizes, genetic drift, spontaneous hybridization, and inbreeding depression.⁶¹ To alleviate the potentially harmful effects of these problems, botanical gardens attempting to re-establish wild populations through *ex situ* conservation must ensure that their *ex situ* collections contain as much genetic diversity as possible.⁶²

There are several ways to accomplish this. One is to store seeds, which are small and genetically unique. Some botanical gardens have invested in cold-storage technology and cryopreservation, which may make their seeds, embryos, and tissues viable for many years.⁶³ The United States Department of Agriculture runs the National Plant Germplasm System (NPGS), a cooperative effort by federal, state, and private organizations to preserve the genetic diversity of plants and facilitate the breeding of new crop varieties.⁶⁴ In addition, some regional networks of seed banks share materials. The Kew Seed Bank has embarked on the Millennium Seed Bank Project to collect and conserve seeds from most plant species in the United Kingdom and from 10% of the world's flowering plants.⁶⁵ However, not all seeds can be stored.

Another method to preserve genetic diversity is to collect plant material from as wide a variety of wild sources as possible and then to grow that plant material in the living collections of a number of different institutions that can then share germplasm for breeding and reintroduction programs.⁶⁶ Plants in living collections can furnish genetic material as seeds, which contain unique genotypes, or as tissue, which produces clones.

D. Criticisms of Ex Situ Collection and Responses

Some critics believe that *ex situ* conservation is of limited value.⁶⁷ Botanists worry that botanical gardens do not represent a wide array of genotypes; indeed, many *ex situ* collections of rare and endangered plants

⁶¹ See S. Volis & M. Blecher, *Quasi in Situ: a Bridge Between Ex Situ and In Situ Conservation of Plants*, 19 BIODIVERSITY & CONSERVATION 2441 (2010).

⁶² See John S. Donaldson, *Botanic Gardens Science for Conservation and Global Change*, 14 TRENDS IN PLANT SCIENCE 608 (2009).

⁶³ *Seed Banks*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/resources/Seedbanks/> (last visited Oct. 7, 2012).

⁶⁴ *National Plant Germplasm System*, U.S. DEPT. AGRIC.: AGRIC. RES. SERVICE, <http://www.ars-grin.gov/npgs/> (last updated Mar. 25, 2010).

⁶⁵ S. H. Linington, *The Millennium Seed Bank Project*, BGCI: PLANTS FOR THE PLANET (Dec. 1997), <http://www.bgci.org/resources/article/0134/>.

⁶⁶ Rae, *supra* note 41, at 254-257.

⁶⁷ Nigel D. Swarts & Kingley W. Dixon, *Perspectives on Orchid Conservation in Botanic Gardens*, 14 TRENDS PLANT SCIENCE 590, (2009).

consist of very few individual plants taken from only one site.⁶⁸ Collection is often biased by ease, with collectors procuring the most accessible plants instead of getting a wider sampling of individuals from the wild population.⁶⁹ The most acutely threatened species are not the most represented in collections, only a small percentage of plant material is of known wild provenance, and most collections of particular taxa within individual botanic gardens are very small, between one and ten individuals.⁷⁰ Researchers have found large genetic differences between *ex situ* collections and their wild counterparts after several decades of separation, with *ex situ* collections losing genetic diversity in cultivation.⁷¹

Preserving plants that have become extinct in the wild is extremely complicated, especially if a botanical garden wants to reintroduce an extinct plant to its former habitat.⁷² Ideally, reintroduced plants would still contain the genetic makeup of their wild ancestral plants, but that is often not the case. Genetic diversity can decrease through genetic drift, which is a loss of genetic diversity in small populations over several generations,⁷³ and hybridization, which is interbreeding of related species, resulting in offspring that are not members of either parent species.⁷⁴ Both are natural processes that may become unavoidable when dealing with living organisms that reproduce freely. For example, tree species may not be best conserved in botanical gardens, which are too small to contain many individuals of the same species.⁷⁵

Gardens have responded to criticisms of their effectiveness by revising their collections policies to focus on high-priority taxa, maintaining better data and sharing it with other institutions and conservation networks, and integrating *in situ* with *ex situ* preservation.⁷⁶ Techniques such as adequate sampling at the time of collection, collecting from large populations, and using near-natural cultivation to allow generation overlap and interspecific competition can improve genetic diversity within

⁶⁸ Stephanie Samain & Eduardo Cires, *Plants for the Future - A Future for Our Planet: Towards a Protocol for Genetic Management of Ex Situ Living Plant Collections*, 9 BG J. 3, 4 (2012).

⁶⁹ *Id.*

⁷⁰ Gregor Kozłowski et al., *Conservation of Threatened Relict Trees Through Living Ex Situ Collections: Lessons From the Global Survey of the Genus Zelkova (Ulmaceae)*, 21 BIODIVERSITY CONSERVATION 671, 675 (2012).

⁷¹ Daniel Lauterbach et al., *Rapid Genetic Differentiation Between Ex Situ and Their In Situ Source Populations: An Example of the Endangered Silene Otites (Caryophyllaceae)*, 168 BOT. J. LINNEAN SOC. 64, 69-71 (2012).

⁷² Maunder et al., *supra* note 53, at 1348.

⁷³ Andreas Enlin et al., *Consequences of Ex Situ Cultivation of Plants: Genetic Diversity, Fitness and Adaptation of the Monocarpic Cynoglossum Officinale L. in Botanic Gardens*, 114 BIOLOGICAL CONSERVATION 272, 273 (2011).

⁷⁴ J. J. Zhang et al., *Spontaneous Interspecific Hybridization and Patterns of Pollen Dispersal in Ex Situ Populations of a Tree Species (Sinojackia xylocarpa) That is Extinct in the Wild*, 24 CONSERVATION BIOLOGY 246, 246 (2010).

⁷⁵ See SARA OLDFIELD, *BOTANIC GARDENS: MODERN-DAY ARKS* (2010).

⁷⁶ Mike Maunder et al., *The Effectiveness of Botanic Garden Collections in Supporting Plant Conservation: A European Case Study*, 10 BIODIVERSITY & CONSERVATION 383, 397-98 (2001).

collections.⁷⁷ Gardens are beginning to coordinate conservation efforts among institutions and to perform large-scale genetic studies to verify provenance.⁷⁸ BGCI has sponsored research to verify the genetic diversity of garden collections, which will lead to better conservation in the future.⁷⁹

To succeed in their *ex situ* and *in situ* conservation efforts, botanical gardens must be able to collect wild plant material, including seeds, cuttings, and whole plants. They must also be able to visit as wide a range of sites as possible and take samplings from as many populations as possible. This is precisely where collections law comes in.

E. Building Collections

Botanical gardens acquire material for their collections through several means, including gifts, purchases, breeding and propagation from existing accessions, and wild collection.⁸⁰ Gardens with serious conservation missions consider wild collections the highest priority – these are the plants that preserve wild genotypes adapted through natural selection to live in specific habitats.⁸¹ Ideally, botanical gardens acquire and grow only those plants that have been acquired in accordance with all applicable laws and regulations. To assist in this effort, most maintain meticulous and open records of provenance of all plant materials.⁸²

Wild plant material typically comes from field collection.⁸³ Several centuries ago, European botanists such as Mark Catesby and John Fraser collected whatever plants they wished and shipped them back to Europe for the horticultural trade.⁸⁴ Today, botanical garden curators must comply with a plethora of laws and regulations governing the types and quantities of plants that can and cannot be removed from wild habitats.

Some collectors are lucky enough to find their desired plants on private property and obtain permission from the landowners to collect plant material; that obviously simplifies the issue. In most cases, however, collecting a particular plant requires at least a certain amount of paperwork to apply for permits. First, there is the federal Endangered Species Act (ESA).⁸⁵ Anyone wishing to collect a federally listed plant must first apply for the correct permit from the United States Fish and Wildlife Service.⁸⁶ If

⁷⁷ Lauterbach et al., *supra* note 71, at 71-72.

⁷⁸ Kozlowski et al., *supra* note 70, at 673.

⁷⁹ Samain & Cires, *supra* note 68.

⁸⁰ TIMOTHY C. HOHN, CURATORIAL PRACTICES FOR BOTANICAL GARDENS 41-69 (2008).

⁸¹ *Id.*

⁸² *Id.* at 42.

⁸³ *Id.* at 50-68.

⁸⁴ W.C. Coker, *Our Mountain Shrubs*, 31 J. ELISHA MITCHELL SCI. SOC'Y 91, 92-93 (1915).

⁸⁵ *Endangered Species Act: Overview*, U.S. FISH & WILDLIFE SERVICE, <http://www.fws.gov/endangered/laws-policies/index.html> (last updated Aug. 28, 2012).

⁸⁶ *Permits*, U.S. FISH & WILDLIFE SERVICE, <http://www.fws.gov/endangered/permits/index.html> (last updated Aug. 28, 2012).

the taxon is also listed under a state endangered species act, another permit will be necessary.⁸⁷ If a federal or state agency such as the United States Forest Service owns the land, that agency will also need to issue a permit.⁸⁸ All permits must be current at the time of collection.⁸⁹

For example, Schweinitz's sunflower, *Helianthus schweinitzii*, an endangered species under the ESA, grows in North and South Carolina.⁹⁰ As of 2010, some populations grew in two Heritage Preserves owned by the South Carolina Department of Natural Resources.⁹¹ South Carolina law prohibits "gathering, damaging, or destroying plants, fallen vegetation, animals, and fungi except to the extent these activities are authorized by permit."⁹² North Carolina's Plant Protection and Conservation Act makes it unlawful "[t]o uproot, dig, take or otherwise disturb or remove for any purpose from the lands of another, any plant on a protected plant list without a written permit from the owner which is dated and valid for no more than 180 days and which indicates the species or higher taxon of plants for which permission is granted."⁹³ Any botanical garden that wishes to add Schweinitz's sunflower from these populations to its collection must therefore apply for at least two permits.

It might of course be easier to collect plants growing in the highway right-of-way, which would only require permission from state departments of transportation. Getting a full range of genotypes, however, requires collection from as many habitats as possible. Simply collecting plants from the most accessible sites will not result in great genetic diversity and will not produce as good of a conservation collection as could be achieved by collecting more widely.

If the botanical garden wishes to export plant material to another country or import foreign material for its collection, it must comply with additional laws and regulations. The Department of Agriculture's Animal and Plant Health Inspection Services (APHIS) enforces laws and regulations contained in the ESA and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to keep non-

⁸⁷ *Permits: Frequently Asked Questions*, U.S. FISH & WILDLIFE SERVICE, <http://www.fws.gov/endangered/permits/faq.html> (last updated Aug. 28, 2012).

⁸⁸ *Laws and Regulations to Protect Endangered Plants*, U.S. FOREST SERVICE, <http://www.fs.fed.us/wildflowers/rareplants/conservation/lawsandregulations.shtml> (last visited Nov. 16, 2012).

⁸⁹ *Permits*, *supra* note 86.

⁹⁰ *Species Profile: Schweinitz's Sunflower (Helianthus Schweinitzii)*, U.S. FISH & WILDLIFE SERVICE, <http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2B7> (last updated Oct. 7, 2012).

⁹¹ U.S. FISH & WILDLIFE SERVICE, SCHWEINITZ'S SUNFLOWER (HELIANTHUS SCHWEINITZII) 5-YEAR REVIEW: SUMMARY AND EVALUATION 10 (2009), available at <http://www.fws.gov/southeast/5yearReviews/5yearreviews/20100825%20helisch.pdf>.

⁹² S.C. CODE ANN. § 50-11-2200(c)(20) (2012).

⁹³ N.C. GEN. STAT. ANN. § 106-202.19(a)(1) (West 2012).

native pests and diseases out of the United States.⁹⁴ To import live plants that fall under CITES jurisdiction, a botanical garden needs a valid USDA Protected Plant Permit and a permit under the Department's nursery stock regulation.⁹⁵ CITES-listed plants must enter the United States through a "Designated Port".⁹⁶ The U.S. Fish and Wildlife Service also requires import permits for wild-collected CITES Appendix I species.⁹⁷

APHIS inspects millions of plants every year at its inspection stations and seizes those that lack proper documentation.⁹⁸ Many of the seized plants end up at botanical gardens. Ideally, these gardens hold the plants for up to 30 days while the U.S. Fish and Wildlife Service's International Affairs Division of Management Authority attempts to arrange for the plants to be returned to their country of origin. If the plants are not returned, the participating botanical garden may then incorporate them into its collection.⁹⁹

III. NATIONAL AND INTERNATIONAL BOTANICAL GARDEN NETWORKS

Botanical gardens' efforts at conservation have been enhanced considerably by the creation of worldwide networks of gardens that share information and genetic material and can collaborate to efficiently distribute limited resources. The worldwide botanical garden network, with more than 2,500 gardens worldwide, is the largest plant conservation network in existence.¹⁰⁰ Botanical gardens around the world cultivate more than 150,000 plant taxa in their living collections, including about 12,000 taxa that are either extinct or nearly extinct in the wild.¹⁰¹

There is a long tradition of sharing botanical materials, dating from the days of explorers who carried plants from continent to continent in the 17th-19th centuries.¹⁰² As a result of this tradition, botanical gardens typically hold highly international collections of plants.¹⁰³ Many ornamental

⁹⁴ *USDA - APHIS - Import and Export*, U.S. DEP'T OF AGRIC. ANIMAL & PLANT HEALTH INSPECTION SERVICE, http://www.aphis.usda.gov/import_export/plants/plant_imports/cites_endangered_plants.shtml (last visited Oct. 7, 2012).

⁹⁵ *Id.*

⁹⁶ *Id.*

⁹⁷ *Id.*

⁹⁸ U.S. DEP'T OF AGRIC. ANIMAL & PLANT HEALTH INSPECTION SERVICE, THE CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA (CITES) (2006), available at http://www.aphis.usda.gov/publications/plant_health/content/printable_version/fs_cites3-06.pdf.

⁹⁹ *Id.*

¹⁰⁰ *The History of BGCI*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/global/history/> (last visited Oct. 7, 2012); see also *Global Distribution of Botanic Gardens Mapping Applet*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/resources/map/> (last visited Oct. 7, 2012).

¹⁰¹ *The History of BGCI*, *supra* note 100.

¹⁰² *Historic Expeditions: First Voyage of Captain James Cook*, SMITHSONIAN NAT'L MUSEUM NAT. HIST., http://www.botany.si.edu/colls/expeditions/expedition_page.cfm?ExpedName=13 (last visited Oct. 7, 2012).

¹⁰³ *The History of BGCI*, *supra* note 100.

plants popular in American and European gardens are native to Asia. For example, many types of azaleas,¹⁰⁴ camellias,¹⁰⁵ and magnolias¹⁰⁶ came from China and Japan several hundred years ago. As a consequence of long-ago plant movements, gardens in the West house taxa that are endangered in the East. Small, unknown gardens can sometimes hold rare and endangered species without even realizing it.

Serendipitous conservation is all very well, but modern technology and communication has made it much easier to set up deliberate exchange and collaboration programs. Within the United States, several organizations coordinate plant conservation efforts. The American Public Gardens Association (APGA) is a group of botanical gardens dedicated to information sharing, networking, public awareness, and research.¹⁰⁷ The North American Plants Collections Consortium (NAPCC) is a collaboration between APGA and the Department of Agriculture's NPGS.¹⁰⁸ NAPCC coordinates a continent-wide approach to managing plant collections and preserving plant germplasm.¹⁰⁹ Members share information and germplasm to more efficiently conserve important plant groups and facilitate scientific research and breeding.¹¹⁰ The Center for Plant Conservation (CPC), housed at the Missouri Botanical Garden in St. Louis, Missouri, is dedicated to preventing the extinction of plants native to the United States.¹¹¹ It maintains informational profiles on numerous endangered and threatened plant species and contracts with participating botanical gardens to serve as custodians of particular taxa.¹¹² Major botanical gardens such as Arnold Arboretum of Harvard University, the Missouri Botanical Garden, and the National Arboretum in Washington, D.C., also participate in collaborative and individual research and conservation initiatives.¹¹³

On an international level, Botanic Gardens Conservation International (BGCI), established in 1987 by the IUCN, is the leading

¹⁰⁴ *Azalea Plant History*, GARDENGUIDES.COM, <http://www.gardenguides.com/79994-azalea-plant-history.html> (last visited Nov. 16, 2012).

¹⁰⁵ *Camellias – Southern Cham with a History*, TEXAS A&M AGRILIFE EXTENSION, <http://easttexasgardening.tamu.edu/homegardens/camellias.html>, (last visited Nov. 16, 2012).

¹⁰⁶ *History of Magnolias*, HERBS2000.COM, http://www.herbs2000.com/flowers/m_history.htm (last visited Nov. 16, 2012).

¹⁰⁷ *About Us*, APGA, <http://www.publicgardens.org/content/about-us> (last visited on Sept. 11, 2012).

¹⁰⁸ N. AM. PLANTS COLLECTIONS CONSORTIUM (NAPCC), <http://www.ars-grin.gov/npgs/napcc.html> (last visited Sept. 11, 2012).

¹⁰⁹ *Id.*

¹¹⁰ *Id.*

¹¹¹ *Mission*, CENTER FOR PLANT CONSERVATION, <http://www.centerforplantconservation.org/About/Mission/Mission.asp> (last visited Sep 11, 2012).

¹¹² *Id.*

¹¹³ *Research*, ARNOLD ARBORETUM HARVARD U., <http://arboretum.harvard.edu/research/> (last visited Nov. 16, 2012); *Floral & Nursery Plants Research Unit*, U.S. NAT'L ARBORETUM, <http://www.usna.usda.gov/Research/index.html> (last visited Nov. 16, 2012).

international organization working to save endangered plants.¹¹⁴ Its headquarters are in London and it has regional offices in the United States, Kenya, Singapore, and China.¹¹⁵ BGCI is registered as a charity in the United Kingdom and receives support from the Royal Botanic Gardens of Kew and Edinburgh.¹¹⁶ It is a member organization, but non-members can participate in its activities and benefit from its information.¹¹⁷

BGCI's stated goals are to reverse the loss of key plant species and their habitats, preserve threatened plants in *ex situ* collections, promote the conservation and sustainable use of plants important to human life, and study the effect of climate change on plants.¹¹⁸ This is a massive undertaking, requiring the participation of botanical gardens around the world. Every botanical garden in the world can participate in BGCI's effort because every garden offers a unique location and set of assets. The *International Agenda for Botanic Gardens in Conservation*, published by BGCI in 2000, outlines a framework for the development of botanical gardens worldwide with an ultimate aim of halting the loss of plant biodiversity and environmental degradation.¹¹⁹ High on its list of priorities is the creation of partnerships and alliances among institutions to create a united approach to plant conservation.¹²⁰ Hundreds of botanical gardens have signed the Agenda, which serves as a formal agreement confirming their commitment to plant conservation.¹²¹ BGCI was instrumental in developing the Global Strategy for Plant Conservation (GSPC) to the Convention on Biological Diversity in 2002 and in revising the GSPC for 2011-2020.¹²²

BGCI's work includes gathering data from gardens on which species are held in *ex situ* collections to help gardens and networks focus their collection efforts.¹²³ The exact number of threatened plants held in *ex situ* collections is unknown, and many individual gardens are unaware that they hold rare or endangered species in their collections. This data will

¹¹⁴ *Welcome to BGCI U.S.*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/usa/> (last visited Nov. 16, 2012).

¹¹⁵ *Contact BGCI*, BGCI: PLANTS FOR THE PLANET, www.bgci.org/global/contact/ (last visited Sept. 29, 2012).

¹¹⁶ P.S. WYSE JACKSON & L.A. SUTHERLAND, INT'L AGENDA FOR BOTANIC GARDENS CONSERVATION 3 (2000), available at http://www.bgci.org/files/All/Key_Publications/interagendaeng2580.pdf.

¹¹⁷ *Become a Member*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/joinin/member/> (last visited Sept. 29, 2012).

¹¹⁸ *Conservation Approaches*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/global/conservation/> (last visited Sept. 29, 2012).

¹¹⁹ JACKSON & SUTHERLAND, *supra* note 116.

¹²⁰ *Id.*

¹²¹ *The history of BGCI*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/global/history/> (last visited September 28, 2012).

¹²² *Id.*

¹²³ *Securing Ex Situ Collections of Critically Endangered and Endangered Quercus*, BGCI: PLANTS FOR THE PLANET (Oct.17, 2008), <http://www.bgci.org/resources/news/0551/>.

allow the world's botanical gardens to decide where to focus their conservation resources.¹²⁴ Identifying the world's plants is a first step toward determining which plants most need conservation efforts.¹²⁵

Next, discrepancies in scientific names must be reconciled. This process can present problems for those trying to list threatened species. Botanists across the world are working to reconcile taxonomy, a task that will require botanical gardens to improve their digital inventories and share data with one another.¹²⁶

A. Endangered Species Lists

Several different institutions maintain lists of endangered species.¹²⁷ These listings give plants, animals, and other living organisms legal protection¹²⁸ and are of particular interest to botanical gardens for two reasons. First, the lists identify species that could benefit from *ex situ* conservation, which can guide collection building. Second, endangered status can complicate efforts to collect the plant in order to conserve it.

1. Endangered Species Act (ESA)

The ESA, administered by the U.S. Fish and Wildlife Service, makes it unlawful to take, collect, import, export, or otherwise handle any endangered or threatened plant in areas under federal jurisdiction or in violation of state law.¹²⁹ This includes seeds and plant parts; however, seeds from artificially propagated threatened plants are fair game.¹³⁰ An "endangered" species is in danger of extinction throughout all or a significant part of their natural habitat ranges.¹³¹ A "threatened" species is likely to become endangered in the foreseeable future.¹³² For endangered species, the Fish and Wildlife Service will issue permits for scientific research or enhancement of propagation or survival, which would cover *ex*

¹²⁴ *Id.*

¹²⁵ See Elizabeth Pennisi, *Tending the Global Garden*, 329 SCI. 1241, 1274 (2010), available at <http://www.sciencemag.org/content/329/5997/1274.full.pdf>; *Kew and Missouri Botanical Garden Announce the Completion of The Plant List*, KEW ROYAL BOTANIC GARDENS (December 29, 2010), <http://www.kew.org/news/plant-list-complete.htm>.

¹²⁶ Alan Paton, *Biodiversity Informatics and the Plant Conservation Baseline*, 14 TRENDS PLANT SCI. 575, 635-636 (2009), available at http://ac.els-cdn.com/S1360138509002064/1-s2.0-S1360138509002064-main.pdf?_tid=cc1826e6-0a7a-11e2-83f5-00000aab0f6b&acdnat=1348953510_1924bfaec68bd47c2a4c6266974c96d3.

¹²⁷ *Listing and Critical Habitat Overview*, U.S. FISH & WILDLIFE SERVICE, <http://www.fws.gov/endangered/what-we-do/listing-overview.html> (last visited Sept. 29, 2012).

¹²⁸ *Id.*

¹²⁹ *Permits: Frequently Asked Questions*, *supra* note 87.

¹³⁰ *Id.*

¹³¹ *United States Fish & Wildlife Service Glossary*, U.S. FISH & WILDLIFE SERVICE, <http://www.fws.gov/midwest/endangered/glossary/index.html> (last visited September 29, 2012).

¹³² *Id.*

situ conservation within botanical gardens.¹³³ For threatened species, the Service will also issue collection permits for botanical or horticultural exhibitions or educational use.¹³⁴

2. IUCN Red List

Botanic Gardens Conservation International collaborates with the International Union for Conservation of Nature (IUCN) to compile the Red List of Threatened Species.¹³⁵ The Red List uses specific criteria to determine the extinction risk of plant and animal species and is the main global resource on the conservation status of species.¹³⁶ The list ranks species according to threat level and lists types of threats affecting individual species.¹³⁷ It also contains information on how many threatened species live in individual nations and which listed species have gone extinct.¹³⁸ There are nine categories on the list: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, Least Concern, Data Deficient, and Not Evaluated.¹³⁹ Several groups participate in the compilation of the list, which is updated every year. Government agencies, non-governmental organizations, conservation organizations, and other groups use the Red List to assess threats to biodiversity.¹⁴⁰

Plants hold a relatively minor place on the Red List compared to vertebrates, as only about three percent of plant species appear on the list.¹⁴¹ Conifers and cycads are the only plants to have been thoroughly assessed.¹⁴² A number of assessments are several years old, dating from 2003 to 1998.¹⁴³ As of 2009, 167 plant families had not yet been assessed and incorporated into the Red List, with basal angiosperms having been particularly neglected.¹⁴⁴

¹³³ *Permits, supra* note 86.

¹³⁴ *United States Fish & Wildlife Service Glossary, supra* note 131.

¹³⁵ See INT'L UNION FOR CONSERVATION OF NATURE, GUIDELINES FOR USING THE IUCN RED LIST CATEGORIES AND CRITERIA (2010), available at <http://intranet.iucn.org/webfiles/doc/SSC/RedList/RedListGuidelines.pdf>.

¹³⁶ *Red List Overview*, IUCN RED LIST, http://www.iucnredlist.org/about/red-list-overview#redlist_criteria (last visited Sept. 29, 2012).

¹³⁷ *A Peek Behind the Figures*, IUCN (Sept. 30, 2010), <http://www.iucn.org/what/tpas/biodiversity/resources/news/?6164/A-peek-behind-the-figures>.

¹³⁸ *Id.*

¹³⁹ *Id.*

¹⁴⁰ *The IUCN Redlist*, IUCN, http://www.iucn.org/about/work/programmes/species/our_work/the_iucn_red_list/ (last visited Sept. 29, 2012).

¹⁴¹ *Biodiversity Assessments and Indicators work*, IUCN, http://www.iucn.org/about/work/programmes/species/our_work/the_iucn_red_list/biodiversity_assessments_and_indicators_work/ (last visited Sept. 29, 2012).

¹⁴² *About*, IUCN REDLIST, <http://www.iucnredlist.org/about> (last visited Sept. 29, 2012).

¹⁴³ *Id.*

¹⁴⁴ George E. Schatz, *Plants on the IUCN Red List: setting priorities to inform conservation*, 14 TRENDS PLANT SCI., no. 11, 2009, at 638, 640.

3. CITES

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), in force since 1975, regulates the international trade of wild plants and animals.¹⁴⁵ It classifies plants and wildlife into three categories according to the level of endangerment.¹⁴⁶ Appendix I species are the most strictly protected because they are threatened with extinction, even if trade does not affect the species; Appendix II includes plants that are primarily threatened by trade, such as ginseng and some orchids.¹⁴⁷

4. Convention on Biological Diversity (CBD)

The CBD is an international convention established in 1992 at the United Nations Conference on Environment and Development in Rio de Janeiro, Brazil, also known as the “Earth Summit.”¹⁴⁸ Members agree to protect biodiversity in their own territories and to support the protection and sustainable use of biodiversity elsewhere.¹⁴⁹ The United Nations Environment Programme (UNEP) created the CBD in response to threats to biodiversity of species and ecosystems by human activities.¹⁵⁰ It became effective on December 29, 1993.¹⁵¹

The United States signed the CBD on June 4, 1993, but, along with Andorra and the Holy See, is not a party to it.¹⁵² American representatives attend meetings as observers but cannot engage in negotiations or participate in final decisions.¹⁵³

The CBD aims to promote sustainable development and use of resources.¹⁵⁴ Its stated objectives include the conservation of biodiversity, sustainable use of biodiversity, and fair sharing of the benefits of genetic

¹⁴⁵ U.S. FISH & WILDLIFE SERVICE, CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES (2012), available at <http://www.fws.gov/international/pdf/factsheet-cites-overview-2012.pdf>.

¹⁴⁶ *Id.*

¹⁴⁷ *Id.*

¹⁴⁸ *History of the Convention*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/history/> (last visited Sept. 26, 2012).

¹⁴⁹ *Sustaining Life on Earth*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/convention/guide/> (last visited Sept. 26, 2012).

¹⁵⁰ *History of the Convention*, *supra* note 148.

¹⁵¹ *Id.*

¹⁵² *List of Parties*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/information/parties.shtml> (last visited Sept. 26, 2012).

¹⁵³ See William J. Snape, *Joining the Convention on Biological Diversity: A Legal and Scientific Overview of Why the United States Must Wake Up*, 10 SUSTAINABLE DEV. L. & POL'Y 6, 8, 11 (2010) (discussing why the U.S. did not ratify the CBD when the rest of the world did, after championing the idea of a biodiversity treaty in the 1980s – reasons included biotechnology industry fears that it would have to pay too much to use genetic resources and a general reluctance to use the USDA's repositories to provide access to any user, any time, free of charge).

¹⁵⁴ *Sustaining Life on Earth*, *supra* note 149.

resources and relevant technologies.¹⁵⁵ Members have the right to exploit their own natural resources but must ensure that their activities do not harm the environments of other members.¹⁵⁶ All members must cooperate with each other to manage areas beyond their jurisdictions.¹⁵⁷ Every member must develop its own national strategies for preservation of biological diversity, including identification of important components of biodiversity, monitoring those components, and determining what activities could damage that diversity.¹⁵⁸ Biodiversity should first be preserved *in situ*, with *ex situ* conservation as a complementary measure.¹⁵⁹ Every member is encouraged to educate the public about the need to protect the environment.¹⁶⁰ National governments hold the right to determine access to local genetic information, but all members are obligated to share access to technology that makes use of genetic resources.¹⁶¹ Finally, all members must facilitate the exchange of biological information.

Of particular interest to botanical gardens, Articles 8 and 9 of the CBD cover *in situ* and *ex situ* conservation.¹⁶² Under Article 8, *in situ* conservation, each member must establish and regulate protected areas, promote the protection of ecosystems and populations of species in natural settings, use sustainable development next to protected areas, restore degraded ecosystems, prevent the introduction and spread of invasive alien species, and protect indigenous lifestyles.¹⁶³ *Ex situ* conservation, covered under Article 9, is meant to complement the above *in situ* measures.¹⁶⁴ Each member should create facilities for the *ex situ* conservation and research of plants, animals, and micro-organisms and plan for the reintroduction of preserved species into the wild when possible.¹⁶⁵

Major botanical gardens should be keenly interested in the CBD, both for its specific provisions on *in situ* and *ex situ* conservation and its controversial requirements for Access and Benefit Sharing. According to Peter Wyse Jackson, the current director of the Missouri Botanical Garden, the international plant conservation scene has been transformed over the

¹⁵⁵ *Introduction*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/intro/> (last visited Sept. 26, 2012).

¹⁵⁶ Convention on Biological Diversity art. 3, June 5, 1992, 1760 U.N.T.S. 79, *available at* <http://www.cbd.int/doc/legal/cbd-en.pdf>.

¹⁵⁷ *Id.*

¹⁵⁸ *Id.*

¹⁵⁹ *Id.*

¹⁶⁰ *Id.*

¹⁶¹ *Id.* at art. 15.

¹⁶² *Id.* at arts. 8-9.

¹⁶³ *Id.* at art. 8.

¹⁶⁴ *Id.* at art. 9.

¹⁶⁵ *Id.*

past decade with the adoption of the GSPC and the flurry of activity that followed it, especially among botanical gardens around the world.¹⁶⁶

B. Access and Benefit Sharing (ABS)

One of the purposes of the CBD was to equalize the imbalance in profits derived from the exploitation of biological materials.¹⁶⁷ For most of the modern era, genetic resources – tissues of plants, animals, and other living organisms that contain DNA – have been considered the common heritage of mankind, to be exchanged, accessed, and exported freely.¹⁶⁸ Advances in genetic engineering in the 1970's and 1980's allowed advanced nations to develop genetic resources into commercially valuable products protectable as intellectual property.¹⁶⁹ Developing nations in the "Global South" tended to be the sources of the genetic resources while more advanced nations in the "Global North" created the profitable products.¹⁷⁰ The profits generally remained in the advanced nations, leaving the countries providing the genetic resources little or no benefit from their unique biota.¹⁷¹ Developing nations protested that the genetic resources, or "common heritage," were turning into private property and demanded a share of the profits.¹⁷²

Article 15 of the CBD, *Access to Genetic Resources*, is the source of the legal basis for the principles of Access and Benefit Sharing. Under this Article, signatories to the Convention recognize that members have sovereign rights over their natural resources and determine how natural genetic resources can be accessed.¹⁷³ Every party to the CBD agrees to try to facilitate access to those genetic resources by other parties for environmentally sound uses and under mutually agreed terms.¹⁷⁴ The party in whose territory the genetic resources are found must give informed consent to their use prior to any use of those resources unless the parties have come to another arrangement.¹⁷⁵ Ideally, any scientific research on genetic resources should take place in the country of origin; the country

¹⁶⁶ Peter Wyse Jackson & Kathryn Kennedy, *The Global Strategy for Plant Conservation: A Challenge and Opportunity for the International Community*, 14 TRENDS PLANT SCI. 578, 580 (2009).

¹⁶⁷ Convention on Biological Diversity, *supra* note 156.

¹⁶⁸ Paul Gepts, *Who Owns Biodiversity, and How Should the Owners be Compensated?*, 134 PLANT PHYSIOL. 1295 (2004), available at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC419806/pdf/pp1341295.pdf>.

¹⁶⁹ Fikremarkos Merso Birhanu, *Challenges and Prospects of Implementing the Access and Benefit Sharing Regime of the Convention on Biological Diversity in Africa: The Case of Ethiopia*, 10 INT'L ENVTL. AGREEMENTS: POL., L. & ECON., 249 (2010), available at <http://www.springerlink.com/content/c3893726127p1290/>.

¹⁷⁰ *Id.*

¹⁷¹ *Id.*

¹⁷² *Id.*

¹⁷³ Convention on Biological Diversity, *supra* note 156, at art. 15.

¹⁷⁴ *Id.*

¹⁷⁵ *Id.*

supplying the resources should at least be able to participate in the research.¹⁷⁶ Every signatory agrees to enact laws or regulations to guarantee that the results of research and the benefits of commercial use of genetic resources are shared with the country or countries providing the resources.¹⁷⁷

Article 15 introduced several new principles to the rules governing research permits and licenses.¹⁷⁸

1. Prior Informed Consent – the relevant authority of the nation providing the genetic material must know about the collection and give its consent before any collection can take place;
2. Mutually Agreed Terms – users and providers of genetic material must agree on the conditions governing use of that material and the sharing of any benefits gained from it; and
3. Benefit Sharing – the country providing the genetic material must share in the benefits of the resulting research. Sharing need not be restricted to monetary benefits; it can occur through infrastructure building, technology transfer, and academic networks, all of which are necessary to building the knowledge bases of developing nations.

“Genetic material” refers to any plant, animal, or microbial material that contains functional units of heredity.¹⁷⁹ “Genetic resources” means genetic material of actual or potential value.¹⁸⁰

“Access” is not defined in the CBD, which leaves its meaning open to interpretation by members.¹⁸¹ As interpreted, it applies to genetic materials and the traditional knowledge involved in obtaining or using them. If research utilizes traditional knowledge or is done in conjunction with indigenous communities, the ABS system applies and the holders of the traditional knowledge must be included in the research process.

C. Global Strategy for Plant Conservation (GSPC)

The GSPC was adopted in 2002 as the first specific conservation strategy developed under the CBD to serve as a pilot project for the CBD as

¹⁷⁶ *Id.*

¹⁷⁷ *Id.*

¹⁷⁸ *What's new for academic research?*, SWISS ACAD. SCI., <http://abs.scnat.ch/basics/research.php> (last visited Sept. 26, 2012).

¹⁷⁹ Convention on Biological Diversity, *supra* note 156, at art. 2.

¹⁸⁰ *Id.*

¹⁸¹ *See generally id.*

well as a first step toward implementing the CBD's goals.¹⁸² Its original goals included:

1. documenting the plant diversity of the world;
2. monitoring the status of plants and identifying those in need of protection;
3. creating an integrated information system for the sharing of plant diversity information;
4. promoting research on systematics, taxonomy, ecology, and conservation biology of plant communities;
5. conserving plant diversity *in situ* and, where necessary, *ex situ*, preferably in countries of origin;
6. using plant diversity sustainably; and
7. promoting education about plant diversity.

Leading botanical gardens immediately began working on these tasks. The GSPC set ambitious goals for 2010: 60% of the world's threatened plant species conserved *in situ*, 60% of threatened plant species in accessible *ex situ* collections (with 10% of those in recovery and restoration programs), and 70% of the genetic diversity of crops and other socioeconomically valuable plants conserved.¹⁸³

Additional goals included an accessible working list of all plant species, an assessment of the conservation status of all plant species, an end to threats to wild flora by international trade, preservation of plant resources and indigenous knowledge that support local food security and sustainability, the establishment or strengthening of networks of plant conservation at all levels, and more publicity and education about the importance of plant diversity.¹⁸⁴

These goals were easier propounded than met. According to BGCI's 2010 survey of North American threatened plants, which considered 230 collections, only 39% of the 9,496 threatened taxa were being grown in living collections or maintained as germplasm.¹⁸⁵ Many of those holdings were of questionable viability.¹⁸⁶

Although the world's botanical gardens did not meet the GSPC's 2010 goals, that year, the parties to the GSPC created a new "Global

¹⁸² *Introduction*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/gspc/intro.shtml> (last visited Sept. 27, 2012).

¹⁸³ *COP 6 Decision VI/9*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/decision/cop/?id=7183> (last visited Sept. 27, 2012).

¹⁸⁴ Jackson & Kennedy, *supra* note 166, at 578-580.

¹⁸⁵ ANDREA KRAMER ET AL., CONSERVING NORTH AMERICA'S THREATENED PLANTS: PROGRESS REPORT ON TARGET 8 OF THE GLOBAL STRATEGY FOR PLANT CONSERVATION 5 (2011), available at http://www.bgci.org/files/UnitedStates/NACA/naca_report_final.pdf.

¹⁸⁶ *Id.*

Strategy 2011-2020”, intended to guide progress over the next decade.¹⁸⁷ The Strategy’s objectives include documenting and conserving plant diversity, using plants sustainably and equitably, and creating public awareness and engagement to protect plants.¹⁸⁸ Targets include:

1. An online flora of all known plants;
2. assessment of conservation status of all known plant species;
3. at least 75% of known threatened plant species conserved *in situ*;
4. at least 75% of threatened plant species in *ex situ* collections, preferably in their countries of origin, and at least 20% of threatened species in recovery and restoration programs;
5. no wild plants endangered by international trade;
6. local and indigenous knowledge and practices maintained or increased;
7. public education about the importance of plant diversity; and
8. cultivation of individuals, institutions, and networks to achieve these targets.¹⁸⁹

Implementing the Strategy will require the cooperation of many institutions at international, national, regional, and local levels, including international organizations, communities, governments, universities and research institutions, and the private sector.¹⁹⁰ BGCI’s recommendations for reaching the 2020 goal included better data sharing and collections management, stronger collaborative networks, and improved genetic diversity of collections.¹⁹¹ Improving genetic diversity necessarily forces botanical gardens to collect more wild plants and exchange plants with one another.

D. Bonn Guidelines

In 2006, the Secretariat of the CBD adopted the Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the

¹⁸⁷ *GSPC Objectives*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/gspc/objectives.shtml> (last visited Sept. 27, 2012).

¹⁸⁸ *Id.*

¹⁸⁹ *GSPC Targets 2011-2020*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/gspc/targets.shtml> (last visited Sept. 27, 2012).

¹⁹⁰ *GSPC Global Strategy Framework*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/gspc/framework.shtml> (last visited Sept. 27, 2012).

¹⁹¹ KRAMER ET AL., *supra* note 185, at 4.

Benefits Arising Out of Their Utilization.¹⁹² The purpose of the Bonn Guidelines was to assist stakeholders in developing practical guidelines and strategies for ABS, with particular emphasis on users seeking prior informed consent from providers.¹⁹³ The guidelines are not legally binding, but Executive Secretary Hamdallah Zedan remarked at the time that the fact that about 180 countries had already adopted them demonstrated that parties wanted a clear authority guiding ABS issues.¹⁹⁴

The Bonn Guidelines recommend that each party designate one national focal point to handle ABS matters and that competent national authorities be responsible for granting access and negotiating with users.¹⁹⁵ While users are encouraged to seek prior informed consent and respect indigenous communities and customs, providers are instructed to avoid imposing arbitrary restrictions on access to genetic resources.¹⁹⁶ Paragraph 32 addresses *ex situ* collections, stating that “prior informed consent should be obtained from the competent national authorit[ies] and/or the body governing the *ex situ* collection concerned as appropriate.”¹⁹⁷

Appendix II lists possible monetary and non-monetary benefits that users can furnish providers. Such benefits can include payments, fees, royalties, license fees, salaries, research funding, or joint ownership of intellectual property rights.¹⁹⁸ Non-monetary benefits might include the sharing of research results, participation in product development, technology transfer, use of databases, contributions to the local economy, and sufficient additional examples that users ought to be able to make a case that nearly anything is a “benefit.”¹⁹⁹

E. What ABS Means to Botanical Gardens

Botanical gardens must still gain access to wild plant material in order to develop their collections and fulfill their mission of documenting and conserving plant diversity. However, gardens in most of the world must follow the CBD’s guidelines on access and the sharing of benefits in order to develop their collections legally.²⁰⁰

¹⁹² *Background of ABS*, CONVENTION ON BIOLOGICAL DIVERSITY, <https://www.cbd.int/abs/background/> (last visited Sept. 27, 2012).

¹⁹³ SECRETARIAT OF THE CONVENTION ON BIOLOGICAL DIVERSITY, BONN GUIDELINES ON ACCESS TO GENETIC RESOURCES AND FAIR AND EQUITABLE SHARING OF THE BENEFITS ARISING OUT OF THEIR UTILIZATION (2002), available at <https://www.cbd.int/doc/publications/cbd-bonn-gdls-en.pdf>.

¹⁹⁴ *Id.*

¹⁹⁵ *Id.* at 4.

¹⁹⁶ *Id.* at 6.

¹⁹⁷ *Id.* at 10.

¹⁹⁸ *Id.* at 18-20.

¹⁹⁹ *Id.* at 19-20.

²⁰⁰ *Access and Benefit Sharing*, BGCI: PLANTS FOR THE PLANET, <http://www.bgci.org/index.php?id=84> (last visited Sept. 27, 2012).

BGCI and its members have created principles of ABS for participating institutions.²⁰¹ Members promise to honor the letter and spirit of the CBD, CITES, and other applicable laws and regulations related to ABS and traditional knowledge.²⁰² Anyone wishing to collect genetic resources must describe how they intend to use those resources and acquire prior informed consent from the government of the country and other relevant stakeholders, including botanical garden management, when acquiring resources from *ex situ* collections.²⁰³ Members must create transparent policies on the commercialization of genetic resources acquired both before and after passage of the CBD.²⁰⁴ Not surprisingly, written agreements are an important component of these transactions. Accurate curation and record keeping is essential.²⁰⁵

Many botanical gardens in Europe belong to the International Plant Exchange Network (IPEN), an international network of approximately 70 botanical gardens designed to facilitate and regulate the exchange of genetic materials among its members.²⁰⁶ The IPEN requires its members to adhere to a code of conduct that governs acquisition and handling of living plant materials and benefit sharing.²⁰⁷ Gardens promise to accept only plant material acquired in accordance with the CBD.²⁰⁸ They agree to obtain prior informed consent from countries of origin when collecting wild material.²⁰⁹ The documentation rules are quite strict, and materials distributed through the IPEN can be used only for non-commercial activities; if commercial uses of some plant material are contemplated, the botanical garden must revisit the country of origin for new prior informed consent.²¹⁰ Benefit sharing can include joint expeditions, projects, or publications, reintroduction of threatened plant species to countries of origin, and exchange of technology and staff.²¹¹ Such organization makes it easy for members to exchange plant materials because each uses the same practices of documentation and ABS.²¹²

²⁰¹ *Principles on Access to Genetic Resources and Benefit-Sharing for Participating Institutions*, KEW ROYAL BOTANIC GARDENS, <http://www.kew.org/conservation/principles.html> (last visited Sept. 27, 2012).

²⁰² *Id.*

²⁰³ *Id.*

²⁰⁴ *Id.*

²⁰⁵ *Id.*

²⁰⁶ *List of Registered Botanic Gardens*, INT'L PLANT EXCHANGE NETWORK, <http://www.botgart.uni-bonn.de/ipen/list.html> (last visited Nov. 7, 2012).

²⁰⁷ *Description of IPEN*, INT'L PLANT EXCHANGE NETWORK, <http://www.botgart.uni-bonn.de/ipen/description.html> (last visited Nov. 7, 2012).

²⁰⁸ *IPEN Code of Conduct*, BGCI: PLANTS FOR THE PLANET, http://www.bgci.org/resources/Criteria_for_IPEN_membership_and_registration/ (follow "IPEN Code of Conduct" hyperlink) (last visited Sept. 27, 2012).

²⁰⁹ *Id.*

²¹⁰ *Description of IPEN*, INT'L PLANT EXCHANGE NETWORK, <http://www.botgart.uni-bonn.de/ipen/description.html> (last visited Oct. 7, 2012).

²¹¹ *Id.*

²¹² *Id.*

In 2006, BGCI prepared materials on the CBD for those working with botanical collections to introduce them to the treaty and its requirements.²¹³ These materials list some of the main ways in which botanical garden work is affected by the CBD: access to genetic resources, sustainable use, exchange of information and technology, and identification and monitoring.²¹⁴ They explain that botanical garden personnel must follow the provisions regarding genetic material, particularly when gathering plants for botanical gardens' collections. The provisions must be followed even in nations without post-CBD ABS legislation, such as most European nations, many of which had ABS procedures in place before the CBD was passed.²¹⁵

The World Intellectual Property Organization maintains a database of biodiversity-related ABS agreements.²¹⁶

IV. THE CBD AS AN IMPEDIMENT TO COLLECTION

A number of scholars in Europe and other parts of the world are worried that the CBD's ABS provisions actually impede scientific research by unreasonably restricting access to genetic resources in source countries.²¹⁷ Access procedures can be difficult and time-consuming. Not every country has an ABS system in place, and in many places there seems to be some confusion as to exactly what needs to be done to apply for access.²¹⁸ The various national authorities tasked with vetting applications may not understand the goals of scientific research and tend to be restrictive in their interpretation of applications.²¹⁹ There is also the fact that commercial research is usually preceded by strictly academic research; countries do not want to risk allowing scientists to come explore their biota for academic reasons only to have that research turn into a profitable commercial enterprise in the future.²²⁰ Many nations feel that they have little reason to trust scientists and fear biopiracy.²²¹ Scientific publishing might be against the interests of the providing country if information in the

²¹³ CHINA WILLIAMS, KATE DAVIS & PHYLLIDA CHEYNE, *THE CBD FOR BOTANISTS: AN INTRODUCTION TO THE CONVENTION ON BIOLOGICAL DIVERSITY FOR PEOPLE WORKING WITH BOTANICAL COLLECTIONS* (2006), available at http://www.kew.org/conservation/CBD_for_Botanists/CBD_for_Botanists_V2.pdf.

²¹⁴ *Id.*

²¹⁵ *Id.*

²¹⁶ WORLD INTEL. PROP. ORG., <http://www.wipo.int/portal/index.html.en> (last visited Sept. 11, 2012).

²¹⁷ S.I. Martinez & S. Biber-Klemm, *Scientists - Take Action for Access to Biodiversity*, 2 CURRENT OPINION ENVTL. SUSTAINABILITY 27, 28 (2010).

²¹⁸ *Id.* at 2.

²¹⁹ *Id.*

²²⁰ *Id.* at 3.

²²¹ *Id.*

public domain ceases to be the providing country's intellectual property and strict access regulations result.²²²

Brazil, for example, has a notoriously onerous application process.²²³ Scientists who work there and their Brazilian collaborators must spend a great deal of time working through the bureaucracy. Brazilian scientists might actually be losing opportunities to collaborate with foreign scientists.²²⁴ Costa Rica and Panama, on the other hand, have streamlined their permitting processes, leading to greater knowledge of local biodiversity, increased international collaboration, and improved conservation.²²⁵

Rather than being restrictive, countries should realize that scientific research could offer many benefits to providing countries. Parties to the CBD are supposed to monitor their biodiversity, and basic research certainly contributes to that effort.²²⁶ However, many of the countries with the greatest needs lack the capacity to accomplish this on their own.²²⁷ Taxonomic research in particular is essential to the cataloguing of biodiversity, and every nation needs non-national experts if it is to get a complete survey of its organisms.²²⁸ Overly restrictive access procedures benefit no one, including the providing countries that miss out on the benefits of scientific research on their biota.²²⁹ Scientists argue that plant genetic material should be considered the common heritage of all humanity and that all nations depend on the interdependence of plant genetic material; therefore, no country should restrict access to plant germplasm.²³⁰ Scientists in developing countries such as India now worry that international access requirements are driving away foreign collaborators.²³¹

Some scholars believe that the fundamental assumptions behind the CBD were flawed. In 2012, Sylvia Martinez and Susette Biber-Klemm that ABS regulations were written with commercial uses of biological materials in mind; host nations are keen to maximize the monetary benefits that can accrue from the use of genetic resources in products such as pharmaceuticals.²³² Noncommercial research faces the same prior informed consent requirements as commercial research, but academic researchers do

²²² *Id.* at 30.

²²³ Alexandre Antonelli & Victor Rodriguez, *Brazil Should Facilitate Research Permits*, 23 CONSERVATION BIOLOGY 1068, 1068 (2009).

²²⁴ *Id.*

²²⁵ *Id.* at 1068-1069.

²²⁶ WILLIAMS, DAVIS & CHEYNE *supra* note 213.

²²⁷ Martinez & Biber-Klemm, *supra* note 217, at 2.

²²⁸ *Id.* at 4.

²²⁹ *Id.*

²³⁰ Priyadarsanan Dharma Rajan & Prathapan Divakaran, *Shared Ownership of Biological Resources*, 324 SCI. 1014, 1014-15 (2009).

²³¹ Sikina Jinnah & Stefan Jungcurt, *Could Access Requirements Stifle Your Research?*, 323 SCI. 464, 464-65 (2009).

²³² Martinez & Biber-Klemm, *supra* note 217, at 28.

not anticipate economic profits from their work.²³³ There is also the simple matter that plants are living organisms, and do not themselves obey the CBD. Plants will readily spread on their own, even in captivity.²³⁴

In 2010, Rachele Adam looked at the reasons that biodiversity loss did not slow in the decade after the CBD was passed.²³⁵ She suggested that the CBD's initial assumptions, such as the assumption that compliance with multilateral environmental agreements could halt biodiversity loss, are mistaken.²³⁶ Instead, she posits that biodiversity is being lost partly because many countries do not agree that biodiversity needs to be protected.²³⁷ Adams also points out that biodiversity is inevitably lost through ordinary human activities such as eating and home building, presenting what appear to be insurmountable obstacles to halting the loss of biodiversity.²³⁸ She suggests that the CBD addresses the symptoms of biodiversity loss without addressing its causes, such as population growth and the failure of the market to reflect true environmental costs in prices, and recommends alternative approaches to halting the biodiversity crisis.²³⁹

F.M. Birhanu, a law professor in Addis Ababa, Ethiopia, concluded that creating a national ABS regime is quite challenging for developing countries such as Ethiopia.²⁴⁰ He notes that the CBD describes ABS in the most general of terms, leaving it up to individual countries to create regulatory schemes.²⁴¹ Not surprisingly, since the CBD entered into force in 1993, few African nations have passed ABS laws.²⁴² Ethiopia, for example, has very high genetic diversity in food and cash crops, but until recently did not keep track of which of its genetic resources were taken out of the country.²⁴³ In 2006, it created an ABS Law, the Access to Genetic Resources and Community Knowledge and Community Rights Proclamation, which is intended to ensure that Ethiopia gets fair and equitable shares of benefits from resources.²⁴⁴ It applies to genetic resources both *in situ* and *ex situ*, including *ex situ* conservation efforts outside Ethiopia.²⁴⁵ Anyone who wants to access a genetic resource must obtain a written access permit from the Institute of Biodiversity Conservation and

²³³ *Id.*

²³⁴ See Ian D. Rotherham, *Invasive Plants – Ecology, History, and Perception*, 4 J. PRAC. ECOLOGY & CONSERVATION SPECIAL SERIES, 52, 52-62 (2005).

²³⁵ See Rachele Adam, *Missing the 2010 Biodiversity Target: A Wake-up Call for the Convention on Biodiversity?*, 21 COLO. J. INT'L ENVTL. L. & POL'Y 123, 127 (2010).

²³⁶ *Id.*

²³⁷ *Id.* at 127.

²³⁸ *Id.* at 129.

²³⁹ *Id.* at 127-28.

²⁴⁰ Birhanu, *supra* note 169, at 249.

²⁴¹ *Id.* at 252.

²⁴² *Id.* at 250.

²⁴³ *Id.* at 255.

²⁴⁴ *Id.* at 249.

²⁴⁵ *Id.* at 256.

Research, a government institution.²⁴⁶ However, the law does not require the Ethiopian government to consult regional or local governments, resulting in ABS agreements that are often poorly drafted with minimal enforcement or follow-up efforts.²⁴⁷

A. Improving the CBD

The parties to the CBD have been discussing refinements to the ABS system for the past decade. In 2008, the Barcode of Life initiative and other groups presented suggestions on methods of improving access for noncommercial research.²⁴⁸ The participants did not agree on a definition of noncommercial research, but did agree that certain criteria distinguish noncommercial from commercial research.²⁴⁹ For example, noncommercial research results are placed in the public domain instead of being privately held, and noncommercial researchers do not file patents on their products.²⁵⁰ Martinez and Biber-Klemm have made several recommendations for the future: active scientist participation in ABS permit-granting committees, adaptations to the ABS system to accommodate noncommercial research, and simplification of ABS application procedures.²⁵¹ Academic researchers can build trust by presenting transparent research goals and results and by cooperating with research partners in countries providing genetic resources.²⁵² Unexpected discoveries that show commercial potential should be presented to providing countries for renegotiation of ABS agreements.²⁵³

Researchers want the ABS regime to include exemptions for genetic material procured exclusively for noncommercial academic research.²⁵⁴ One major question is whether the CBD should establish new ABS standards for scientific research or simply set minimum standards and allow researchers and countries to make ABS agreements on a case-by-case basis.²⁵⁵ Scientists could become more involved in the negotiation process by lobbying national governments, forming professional networks to participate, and attending CBD meetings as observers.²⁵⁶ Observer organizations are allowed to submit their opinions on specific issues to CBD conferences.²⁵⁷

²⁴⁶ *Id.*

²⁴⁷ *Id.* at 257.

²⁴⁸ Martinez & Biber-Klemm, *supra* note 217, at 5-6.

²⁴⁹ *Id.* at 5.

²⁵⁰ *Id.* at 6.

²⁵¹ *Id.* at 5-6.

²⁵² *Id.* at 5.

²⁵³ *Id.* at 5.

²⁵⁴ Jinnah & Jungcurt, *supra* note 231, at 464.

²⁵⁵ *Id.* at 465.

²⁵⁶ *Id.*

²⁵⁷ *Id.*

Some countries are considering various systems of certificates of origin, public documents that would certify the provenance of objects.²⁵⁸ Such a system could be voluntary or legally binding, and national offices entrusted with handling *ex situ* collections or plant breeding could take charge of the cases in their fields.²⁵⁹ An international searchable database of certificates of origin could vastly speed up the process of moving genetic material between countries.²⁶⁰ The IPEN system already functions like this. European scholars have been pondering the logistical difficulties of the CBD and publishing guides for researchers.²⁶¹

B. Nagoya Protocol

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits was adopted by the Conference of the Parties of the CBD in Nagoya, Japan, on October 29, 2010.²⁶² It was open for signature by parties until February 1, 2012,²⁶³ and by October 29, 2012, eight nations had ratified the Nagoya Protocol.

The Nagoya Protocol attempts to refine the ABS provisions of the CBD. It creates provisions that emphasize a user country's compliance with the laws and regulations of countries providing genetic resources.²⁶⁴ The idea is to make sharing and access more predictable. The Protocol also strengthens provisions giving benefits to indigenous communities furnishing traditional knowledge and specifically invokes the role of women in those matters.²⁶⁵

Of particular interest to scientists are the following provisions:

1. Article 8, which calls on each party to encourage research that could lead to the conservation and

²⁵⁸ Markus Rüssli, *Access and Benefit Sharing User Measures in Switzerland*, 14 J. WORLD INTELL. PROP. 54, 64 (2011).

²⁵⁹ *Id.*

²⁶⁰ *Id.* at 64-65.

²⁶¹ See generally Carl-Gustaf Thomstrom & Lars Bjork, *Access and Benefit Sharing: Illustrated Procedures for the Collection and Importation of Biological Materials*, 2 INTELL. PROP. MGMT. HEALTH & AGRIC. INNOVATION: A HANDBOOK BEST PRACS. 1469 (2007) (discussing the importance of proper ABS procedure); BOTANICAL GARDENS CONSERVATION INT'L, A CBD MANUAL FOR BOTANIC GARDENS (2008), available at http://www.amjb.unam.mx/repositorio/documentos/polit_doc/internacionales/CBD_manual_for_botanic_gardens.pdf (providing a guide to understanding and implementing CBD procedures).

²⁶² *About the Nagoya Protocol*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/abs/about/> (last visited Sept. 26, 2012).

²⁶³ *Status of Signature, Ratification, Acceptance, Approval, or Accession*, CONVENTION ON BIOLOGICAL DIVERSITY, <http://www.cbd.int/abs/about/> (last visited Sept. 26, 2012).

²⁶⁴ *About the Nagoya Protocol*, *supra* note 262.

²⁶⁵ *Article 12: Traditional Knowledge Associated with Genetic Resources*, CONVENTION ON BIOLOGICAL DIVERSITY, <https://www.cbd.int/abs/text/articles/?sec=abs-12> (last visited Sept. 26, 2012).

- sustainable use of biological diversity by simplifying access procedures for non-commercial research;²⁶⁶
2. Article 14, which creates an ABS Clearing-House to share information on ABS provisions in various nations;²⁶⁷
 3. Article 17, which requires each party to monitor the use of genetic resources;²⁶⁸
 4. Article 23, which encourages parties to transfer technology and encourage technological growth in developing countries; and²⁶⁹
 5. Article 24, which advises parties to encourage nonparties to adhere to the protocol and contribute information to the ABS Clearing-House.²⁷⁰

Developing the infrastructure to administer the key provisions of the Nagoya Protocol will be expensive for many counties.²⁷¹ The Global Environment Facility established a fund in June 2011 to assist developing countries in building their capacities to implement the Protocol and pay for technological development and sustainable use of genetic resources.²⁷²

C. The United States and the CBD

With so many other countries participating in the CBD's ABS regime, the United States will inevitably feel the effects of the treaty even though it is not a member of the CBD. As a practical matter, the U.S. government recognizes the CBD as an international framework that ensures equitable sharing of access and benefits.²⁷³ In addition, the State Department has advice on compliance for researchers who want to collect genetic resources in other countries.²⁷⁴ The National Plant Germplasm System's Plant Exploration Program has found it much more difficult to collect plant materials as other countries have implemented ABS laws.²⁷⁵ The NPGS has shared benefits in the form of non-monetary benefits such as

²⁶⁶ Press Release, Secretariat of the Convention on Biological Diversity, United Nations Environmental Programme, GEF establishes the Nagoya Protocol Implementation Fund (June 3, 2011), available at <http://www.cbd.int/doc/press/2011/pr-2011-06-03-GEF-ImpFund-en.pdf>.

²⁶⁷ *Id.*

²⁶⁸ *Id.*

²⁶⁹ *Id.*

²⁷⁰ *Id.*

²⁷¹ *Id.*

²⁷² *Id.*

²⁷³ Karen A. Williams, *An Overview of the U.S. National Plant Germplasm System's Exploration Program*, 40 HORTSCIENCE 297, 299 (2005).

²⁷⁴ *Id.*

²⁷⁵ *Id.*

paying the costs of travel, sharing collected germplasm, and strengthening professional ties through collaborative research.²⁷⁶

Some U.S. botanical gardens are adopting ABS provisions on their own. For example, in 2007, the National Tropical Botanical Garden in Coral Gables, FL, wrote its own policy on access to plant genetic resources and benefit-sharing.²⁷⁷ Fairchild Tropical Botanic Garden, also in Coral Gables, Florida, has created its own agreement to supply biological material that complies with the CBD.²⁷⁸ The Missouri Botanical Garden created a Plant Genetic Resources Policy that guarantees all plant genetic resources will be collected in compliance with international laws and regulations and recognizes that states have sovereignty over their genetic materials.²⁷⁹ Missouri is committed to supporting the GSPC's 2011-2020 update and its 16 outcome-oriented global targets.²⁸⁰

In October 2012, the APGA held a national summit to discuss a possible code of conduct for U.S. botanical gardens that would help them conform to international ABS norms without restricting the sharing of plants and germplasm.²⁸¹ Many participants expressed concern that European laws were too restrictive, and that material transfer agreements requiring a donating institution to track the uses of plant materials by third parties effectively locked plants into a sort of "gulag."²⁸² Regulations arguably have forced researchers to spend a huge amount of energy and money to gain rights to objects with no commercial value. Forcing botanical gardens to vet all possible recipients of plant materials in order to ensure that they do not exploit genetic material without sharing benefits with a country of origin could be an unreasonable burden, especially to smaller gardens. Some garden representatives pointed out that growing plants is in itself a benefit to the world, and that a system such as that used by the NPGS, allowing unrestricted uses of all plant materials in its collection, are an excellent way of furthering scientific and conservation research.²⁸³ The NPGS will not accept germplasm from sources that restrict

²⁷⁶ *Id.*

²⁷⁷ *Access to Plant Genetic Resources and Benefit Sharing*, NAT'L TROPICAL BOTANICAL GARDENS, <http://www.ntbg.org/resources/geneticsharing.php> (last visited Sept. 26, 2012).

²⁷⁸ *Agreement to Supply Biological Materials*, FAIRCHILD TROPICAL BOTANICAL GARDENS, http://www.bgci.org/ourwork/case_studies_policies/ (last visited Sept. 30, 2012).

²⁷⁹ *Missouri Botanical Garden Plant and Genetic Resources Policy*, MO. BOTANICAL GARDEN, http://www.bgci.org/ourwork/casestudies_mbg/ (last visited Sept. 30, 2012).

²⁸⁰ *Conservation Around the World*, MO. BOTANICAL GARDEN, <http://www.missouribotanicalgarden.org/sustainability-conservation/conservation-in-action/around-the-world.aspx> (last visited Sept. 30, 2012).

²⁸¹ Michael Dosmann, The Arnold Arboretum of Harvard University, Address at the 2012 Face2Face Summit: What's at Stake? (Oct 25, 2012).

²⁸² See Chad Husby, Montgomery Botanical Center, Address at the 2012 Face2Face Summit: Putting Policy into Practice: Access and Benefit Sharing: MBC/FNGLA Seedbank Online Auction (Oct 25, 2012) (explaining in the address the restrictions in the European laws, spurring further discussion among those in attendance at the conference).

²⁸³ *Id.*

distribution of those materials to third parties.²⁸⁴ Many garden representatives want to be able to use those terms as well, accepting and sharing plant materials as they wish, without having to worry about future commercial applications of that material.²⁸⁵

Should the United States join the CBD? Widespread international membership illustrates that many countries think the treaty is a good idea, though one that needs refinement. William J. Snape, senior counsel at the Center for Biological Diversity, based in Tuscon, Arizona, believes that membership in the CBD would benefit American Scientists.²⁸⁶ With biodiversity disappearing at an alarming rate, real threats to human comfort and safety are presented.²⁸⁷ Snape argues that the U.S. already has in place many of the CBD's requirements – it has a system of protected areas, laws such as the Endangered Species Act, processes to oversee adverse impacts on biodiversity, and acknowledgement of tribal rights.²⁸⁸ The ABS provisions rely on parties' freedom to contract and to mutually agree on terms, so no party will be forced into an agreement.²⁸⁹ Snape argues that membership in the CBD would not result in changes of land use or allow the United Nations to sue the United States and that worries about the CBD's effects are not legitimate reasons to delay ratification.²⁹⁰

In any case, American botanical gardens that wish to play on the international conservation field effectively belong to the CBD community. There are good reasons for botanical gardens that do any international plant collecting to create their own ABS policies. Building trust with other countries is crucial, and our national attitude toward environmental resources probably does not inspire confidence from other countries. Individual gardens, however, can form agreements with partners that observe currently expected standards of access and benefit sharing while avoiding unnecessary restrictions on research, propagation, and other activities. U.S. botanical gardens might be in a pleasantly unique position to negotiate; because such gardens are not bound by the CBD, they could potentially have more access to genetic resources in other nations, especially in cases where the potential for commercial profit is low. The new openness and sharing of information might lead to new opportunities

²⁸⁴ Karen A. Williams, National Plant Germplasm System, Address at the 2012 Face2Face Summit: The US NPGS Plant Exploration/Exchange Program: Access and Benefit Sharing (Oct. 25 2012).

²⁸⁵ See Husby, *supra* note 282.

²⁸⁶ William J. Snape, *Joining the Convention on Biological Diversity: A Legal and Scientific Overview on Why the United States Must Wake Up*, 10 SUSTAINABLE PATHWAYS TO BIODIVERSITY PRESERVATION 6, 6 (2010).

²⁸⁷ *Id.* at 6.

²⁸⁸ *Id.* at 8-9.

²⁸⁹ *Id.* at 10.

²⁹⁰ *Id.* at 14-15.

and collaborations, and ultimately to more effective conservation of biodiversity in American botanical gardens.

Ultimately, the CBD attempts to facilitate the sharing of materials and information to conserve biodiversity. The primary reason to share access and benefits is to ensure that genetic resources and the benefits they confer on humans are available to as wide a range of institutions and individuals as possible. Selfishness will ultimately prove counterproductive to botanical gardens' conservation efforts.