Characteristics of an Exemplary

GALEN GATES

Widely considered a must-see, Royal Botanic Garden Edinburgh beautifully displays over 20,000 taxa on a mere 54 acres.

How should a public garden build a plant collection? What are the components? What distinguishes a good collection from a great one? If one were to envision the consummate botanic garden, what would its plant collections encompass? The Chicago Botanic Garden has pursued answers to these questions with the goal of developing an exemplary, world-class plant collection.

In 2002 the Chicago Botanic Garden benchmarked the living plant collections of 20 national and international institutions and began a three-year Collections Study Tour of 12 gardens and arboreta in seven countries. The results from these two initiatives provide a framework for what the Garden has identified as the 12 characteristics that define the model for a world-class living plant collection. This article is an examination of those characteristics.

Collections Policy and Development Plans

Public garden living collections are documented holdings assembled and maintained to fulfill specific goals. Prior to establishing or further developing a plant collection, institutions should create an institutional Collections Policy and Development Plan that provides a unifying vision, establishes a clear set of objectives, determines acquisition criteria, and outlines operating procedures. This document should be broad in scope and plan for collections of all types within the organization (e.g., plants, library, herbarium, and sculpture). An inter-disciplinary team should be charged with creating a vertically integrated Concept Paper that aligns one collection with the next, generates consensus, and garners support from the administration.

Diversity

Breadth of diversity is a key element in judging a plant collection. The degree of diversity within a living collection is of primary importance. One should not confuse quantity (number of plants) with diversity (number of taxa). The number of plants is important for long-term *ex situ* conservation efforts, genetic variability, and display purposes. The number of taxa refers to the number of unique plants from documented sources. Larger organizations (based on budgets) tend to have more collections with a high degree of diversity within each. This reflects the ability to accumulate the resources necessary to build and sustain a larger and more diverse collection. Smaller institutions can also achieve diversity with a fewer number of collections, when this is an institutional goal.

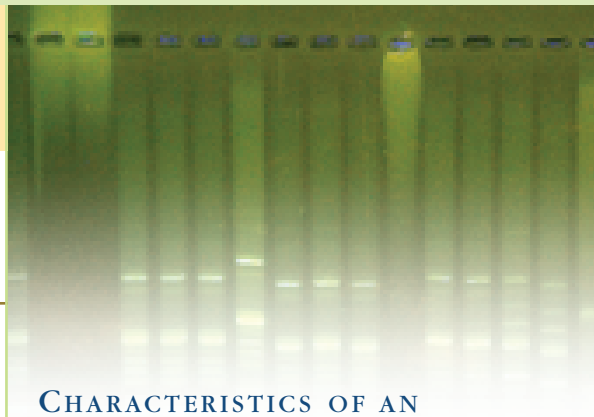
Depth

In today's world of diminishing resources, public gardens must concentrate their efforts. Gardens can focus on collections of specific plant groups with the goal of acquiring and studying every known taxon within a particular group (e.g., specialized collections). These areas of specialization add to the institution's intellectual capital and have value for potential programs in education, conservation, and research, thereby providing value to a wider audience. Aligning these efforts with agendas outside the institution is also advantageous—in the U. S., membership in the North American Plant Collections Consortium (NAPCC) is an excellent example. With proper planning, your collections can develop in a meaningful way and dovetail with the coordinated efforts and goals of a larger collaborative. Working within this greater context can provide a broader perspective, increase the institution's impact, and advance a national or international agenda.

Documentation

Thorough recordkeeping is a key characteristic in defining an exemplary plant collection. Documentation of living collections is fundamental to the existence of a

Intersimple Sequence Repeat (ISSR) Fingerprinting is used at the Chicago Botanic Garden to investigate the genetic variability in rare and endangered plants and holds promise for verifying other groups of plants. A native population of *Ammophila breviligulata* was examined to determine whether a widely commercial dune grass strain was native to the region.



Plant Collection

Galen Gates

botanic garden. Computerized records should include provenance, scientific nomenclature, verification data, and other information. Records are important for many reasons: to reference relevant national and international guidelines, policies, and legislation; to track plants suspected of weediness; to observe those species that are threatened and endangered; and to monitor patented plants or those impacted by a Memorandum of Understanding (MOU).

To preserve the integrity of the collection, regular inventories should be mandatory. Widely accepted documentation practices today also include accession tags and display labels to provide the most basic level of interpretation. Detailed and electronically stored maps that locate each recorded specimen are also strongly recommended.

Care

Living plant collections must be kept in good health; this requires that each plant is consistently nurtured. Regardless of how plants are presented, display quality is clearly influenced by the level of maintenance applied. A collection is a Noah's Ark of valuable germplasm and should always be given appropriate care.

To safeguard specialized collections, replicated holdings can ensure that precious germplasm is not lost. Duplicates can be located on the same property or at a satellite location. Depending on available planting space and plant type (species, hybrids, etc.), it can be advantageous to utilize lifelong seed storage. Further, long-term care should also include institutional safekeeping as collections pass from one administration to the next, and casualty insurance in case of disaster. Select or Specialized collections should be maintained in perpetuity.

Verification

Botanical organizations striving to create and maintain ideal collections have an active and ongoing Verification Program. For an institution to establish a reputation of veracity or scientific accuracy, a methodical system to authenticate its holdings is critical. A collection that is not verified is of questionable value. Three methods are currently used to verify collections:

1) The classic phenotypic approach of comparing morphological traits with previously authenticated herbarium specimens and scientific literature;
2) A molecular approach of comparing DNA extracts with other authenticated samples; and
3) The newer approach of digital imagery of exterior features taken during peak bloom periods that are then compared with known specimens or with the literature.

Characteristics of an Exemplary Living Plant Collection

I. Institutional Collections Policy and Development Plans
II. High diversity (breadth in taxa and germplasm)
III. Depth or areas of specialization (plant-related areas)
IV. Thorough record-keeping
V. Care—maintenance practices
VI. An active Verification Program
VII. Plants of wild origin with cultivated plants from their introducer
VIII. Taxa of conservation concern
IX. Staff expertise (knowledge acquired from the building and study of the Collection)
X. Public access (to view and study plants and benefit from associated programming)
XI. Plant Exploration Programs
XII. Relevance to science and society for multiple generations

The interior of the Royal Botanic Gardens, Kew, Water Lily House

Original Source Germplasm

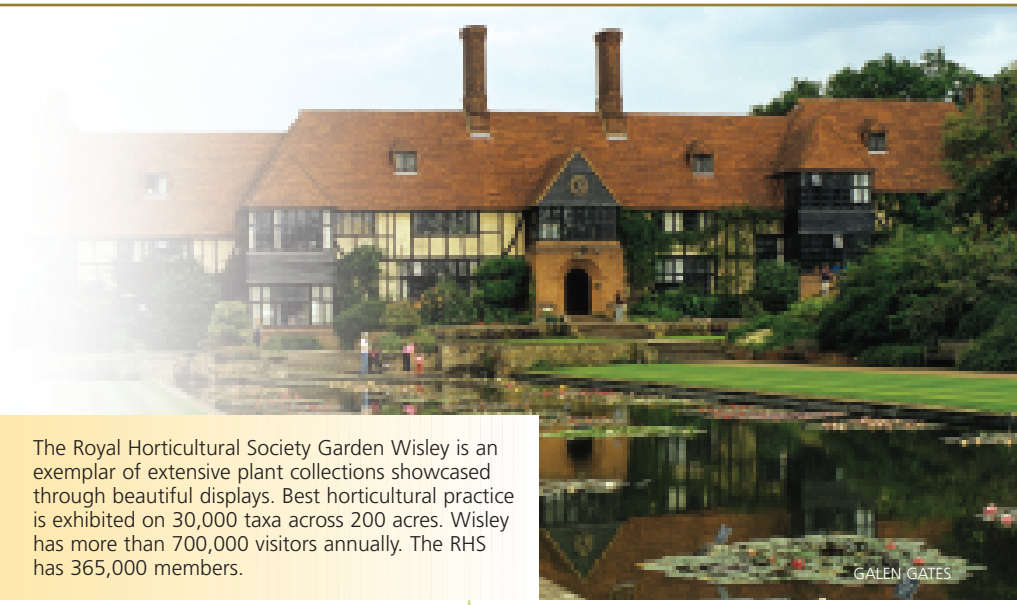
A plant collection is a storehouse of valuable genetic material. As one establishes a collection for future generations, it makes sense to curate holdings that best exemplify each taxon. Plants of wild origin should originate from the appropriate region of their native habitat, providing an inherent adaptability for the institution's climatic and edaphic (soil) conditions. Plants found or bred in cultivation should be acquired from authenticated sources or from the person who bred, found, or introduced them. Adhering to this policy secures taxa that are relevant to the goals and objectives of the program and minimizes questions of authenticity.

Conservation

Plant species are disappearing at an alarming rate worldwide due to such factors as land development, degradation of habitat (e.g., fire suppression and altered hydrology), and competition from weedy and invasive species. Taxa of conservation concern need protection both locally and globally. Botanic gardens can conserve plants against the threats of local extirpation and global extinction. It is worth noting that stewardship of these plants brings with it certain responsibilities. Taxa of conservation concern may fall under the auspices of regional, state, national, and international regulations.

Expertise

As staff develop a collection, their expertise grows in tandem. Breadth and depth in a collection is particularly dependant upon curatorial staff who are actively developing, and studying it. A collection in and of itself is valuable; however, a collection is limited when it stands alone. Philosophically, it is one thing to have a collection, another to truly know it (with staff actively noting observations in the field), and yet a third to share it. Most gardens have the first component in their collections (the physical aspect). To know the collection and to share it are two additional elements. Staff expertise soundly places a garden and its collections into another stratum.



The Royal Horticultural Society Garden Wisley is an exemplar of extensive plant collections showcased through beautiful displays. Best horticultural practice is exhibited on 30,000 taxa across 200 acres. Wisley has more than 700,000 visitors annually. The RHS has 365,000 members.

GALEN GATES

Public Access

Public gardens often share their "products" openly through display gardens, plant sales, classes, and gift shops. Conversely, the private sector tends to closely guard the formulas of products and their techniques in manufacturing and sales in order to remain financially viable. In both cases the consumer drives the "business." A public organization that is insular or that operates in a vacuum is not likely to garner public, and consequently, financial support for itself, reach its full potential, or achieve leadership status. It is possible for public institutions to conduct outstanding work, but the work must be shared, and if shared, public support will be there. Widespread public and professional

Collection Study Tour Program: Participating Gardens

Royal Botanic Garden Edinburgh
Royal Botanic Gardens, Kew
Royal Horticultural Society Garden Wisley
The Botanic Garden and Botanical Museum Berlin-Dahlem
Palmengarten
Botanischer Garten Munchen-Nymphenburg
Universitat Hamburg Botanischer Garten
Universiteit Utrecht Botanic Gardens
Arboretum Trompenburg
National Botanic Garden of Belgium
Museum National d'Histoire Naturelle
Longwood Gardens
Chicago Botanic Garden

PALMENGARTEN

The Tropicarium of the Palmengarten displays plants of various vegetation types including: semi-deserts, cloud forests, and mangroves. These scientific collections are valuable for University classes, research projects, and children taught through Palmengarten's "Green School."

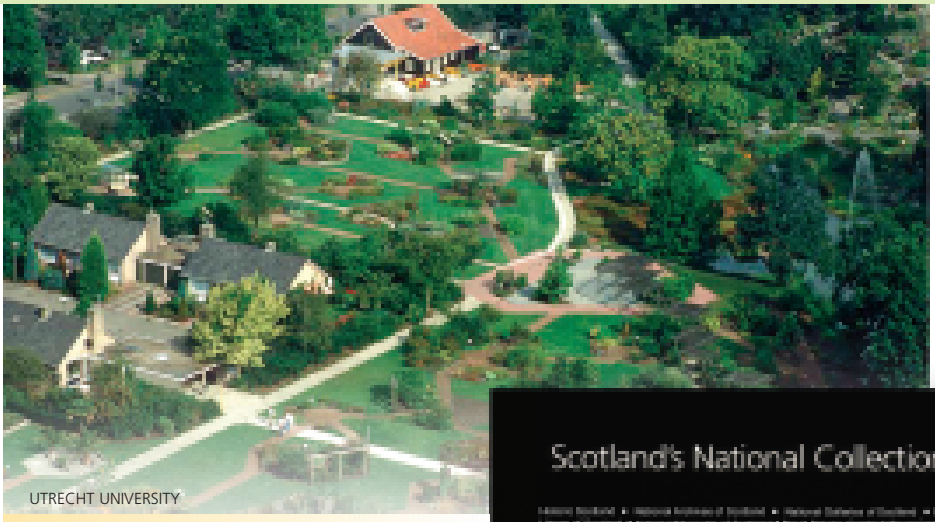
access, by physical or virtual means, provides justification and financial support for the continuation of important work in conservation, display, education, and research.

Plant Exploration Programs

National and international germplasm acquisition programs are another important characteristic found in institutions with exemplary plant collections. This attribute is often, although not always, a reflection of an institution's age and size. Obtaining wild collected germplasm of documented origin cannot be left to others who might someday collect. These programs, whether domestic or foreign, require a vision, specific goals, and resources to seek and find living plants wherever they exist in the world. In situ preservation for some taxa may become even more difficult as environmental conditions change significantly. Ex situ conservation, therefore, is becoming increasingly important to the preservation of many plant taxa. Whether collecting regionally, nationally, or internationally, an evaluation period or risk analysis should be in place to monitor for potential weedy or invasive behavior in unknown plants prior to public display.

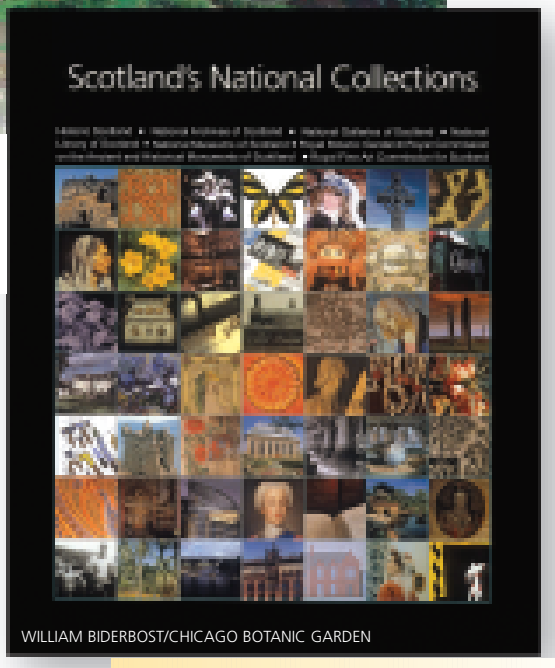
Relevance

Botanic gardens as nonprofit, public entities must share pertinent information and expertise with others. To reflect their mission and public orientation, botanic gardens should ensure that efforts to curate their collections are continuous and the information gathered and disseminated is scientifically accurate. Representatives of an outstanding collection who provide accurate and unbiased information promote the trust and commitment of the public and the profession. It is vitally important for botanic gardens to have curated collections that are, and will remain, relevant to science and society for multiple generations.



UTRECHT UNIVERSITY

The Utrecht Botanic Gardens of Utrecht University has 18,000 taxa displayed in areas like the Systematic Garden used for teaching. Paths here act as subclasses and the hexagons are the orders.



WILLIAM BIDERBOST/CHICAGO BOTANIC GARDEN

Scotland holistically manages its major collections: Royal Botanic Garden Edinburgh; National Library of Scotland; and their primary art holdings, museums, and monuments.

Conclusion

A collection's value is a reflection of its components. Living collections require institutional commitment for their development, care, and use; are fundamental in on-site education and research; and create a unique visitor experience.

The increasing number of botanic gardens over the past two decades indicates that the public understands and appreciates the importance of these organizations. The tone and tenor of these institutions understandably varies from one to the next. However, with plant collections at their core, guiding principles are needed as presented in this model. Astute planning and deliberate progress leads to excellence.

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