

Introducing a Collaborative Oak Collection from North America

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The public gardens of North America hold a well-documented and tremendously diverse representation of the world's plant life in their living collections. Unfortunately, more often than not, public gardens do not coordinate their plant collecting efforts. In 1995 the American Public Gardens Association (APGA, formerly AABGA) launched the North American Plant Collections Consortium (NAPCC) as a way to coordinate the conservation of plant diversity in North American gardens, recognize exceptional plant collections, and promote high standards of collection management.

For the first decade of the program, each recognized NAPCC collection was dedicated to a significant collection of a single plant group growing at a single garden. There are currently 31 plant genera or families that are represented in NAPCC collections by individual gardens. This model would not work well for oaks. The tremendous diversity of *Quercus* prevents any single garden from holding a comprehensive collection of the genus due to climatic limitations alone. In August of 2007 the first multi-institutional NAPCC collection was formed with the induction of 15 public gardens with large oak collections.

The growing NAPCC Multi-Institutional *Quercus* Collection now includes the following 16 member gardens, four of which sent representatives to the 6th International Oak Conference in Puebla to present information about their collections.

Chicago Botanic Garden, Glencoe, Illinois
Cornell Plantations, Ithaca, New York
Denver Botanic Gardens, Denver, Colorado
Holden Arboretum, Kirtland, Ohio
Landis Arboretum, Esperance, New York
Missouri Botanical Garden, Saint Louis, Missouri
Morris Arboretum of the University of Pennsylvania, Philadelphia,
Pennsylvania
The Morton Arboretum, Lisle, Illinois
Mount Auburn Cemetery, Cambridge, Massachusetts

New York Botanical Garden, Bronx, New York
Rancho Santa Ana Botanic Garden, Claremont, California
Scott Arboretum of Swarthmore College, Swarthmore, Pennsylvania
Starhill Forest Arboretum, Petersburg, Illinois
The University of California Botanical Garden, Berkeley, California
UC Davis Arboretum, Davis, California
University of Washington Botanic Gardens, Seattle, Washington

These gardens are located in a diversity of climates across the United States and each makes a unique contribution to the overall collection. Curators and horticulturists from the member gardens collaborate on group goals and initiatives to improve the collection.

There are six goals for improving the NAPCC multi-institutional *Quercus* collection. Many of these reflect the overall goals of the entire North American Plant Collections Consortium program.

Goal 1: Promoting collaborations

Group collaboration is a fundamental underlying premise of a multi-institutional collection. The member gardens share plant inventories to allow tracking and analysis of the combined collection and facilitate the identification of gaps in the collection. From sharing advice and information to sharing acorns to collaborating on collecting expeditions, member gardens collaborate to help the collection grow.

Goal 2: Conserving germplasm

In order to join the NAPCC, each member garden needed to make an institutional commitment to maintain the genetic diversity of its oak collection. Like living libraries, the member gardens serve as public repositories of oak diversity, including wild species from around the world, natural and artificial hybrids, and cultivars.

Goal 3: Strategically expanding the collection

The NAPCC Multi-Institutional *Quercus* Collection is by no means complete. Many oak species are still unrepresented in the group's combined holdings or are represented by just a few individuals. Group efforts to expand the collection are focused first on North American taxa followed by Asian and European species. Acquiring species of conservation concern is, of necessity, a higher priority. Many unrepresented North American oak species are from areas where there are currently no NAPCC gardens. Prioritizing the recruitment of new NAPCC gardens in the southeastern and southwestern United States as well as Mexico will be the most efficient method of increasing representation of taxa from these regions.

Goal 4: Elevating collection management standards

NAPCC member gardens are strongly encouraged to collect voucher herbarium specimens and photographic images as permanent scientific references for their collections. Many member gardens are sending duplicate vouchers to the US National Arboretum Herbarium and the Liberty Hyde Bailey Hortorium Herbarium at Cornell University for further study and verification at these institutions. The UC Davis Arboretum and Starhill Forest Arboretum have each recently embarked

on oak collection photo documentation projects, and the group will be working on sharing photo protocols and plans for posting images online.

Goal 5: Supporting oak-related research

All the member gardens make their collections available for oak-related research, and keeping high standards of documentation ensures the scientific value of the collections. Having the combined oak collection inventory available online on the collection profile webpage (http://www.publicgardens.org/web/2008/08/multiinstitutional_quercus_oak.aspx) also improves researcher access to collection information.

Goal 6: Improving education and public awareness

A broad diversity of educational programs and events at the member gardens reach out to regional audiences and help connect them with the beauty and value of oaks. Journal articles and conference presentations for the American Public Gardens Association and the International Oak Society have spread news about the collection to international networks of oak specialists and public garden peers, and a webpage profiling the collection on the APGA website serves as an introduction and portal to the collection for web users worldwide.

Individual Collection Profiles

Profiles of four individual collection-holding gardens of the NAPCC *Quercus* Collection illustrate the unique qualities each garden brings to the group and how each contributes to group goals.

UC Davis Arboretum – Davis, California

Located on the campus of the University of California at Davis, the UC Davis Arboretum serves as a living museum of plants and a welcoming public outreach arm of the university. The Arboretum's documented plant collections are rich in California native plants and plants from the other Mediterranean climate regions of the world. Taxonomic, geographic, and horticultural collections serve as training grounds for interns, resources for university teaching and research, settings for tours and educational programs for visitors of all ages, and beautiful places for active recreation or peaceful contemplation.

A native population of California valley oaks (*Quercus lobata* Née) with some individuals up to 400 years old persists as a remnant of the original riparian forest along the Arboretum waterway. These massive trees with their ancient, twisted limbs are one of the Arboretum's greatest treasures. With a long growing season, a benign Mediterranean climate, and rich agricultural soils, the Arboretum is well-suited for growing a great variety of oaks. The Arboretum's NAPCC oak collection is our most important scientific collection, thanks in large part to the work of the late Dr. John M. Tucker, a former Arboretum director and lifelong oak scholar. The collection contains 578 oak specimens from 150 accessions, which represent 96 taxa.

The bulk of the UC Davis Arboretum's oak collection resides in Shields Oak Grove, a 10-acre grove at the west end of the Arboretum. Most of the trees

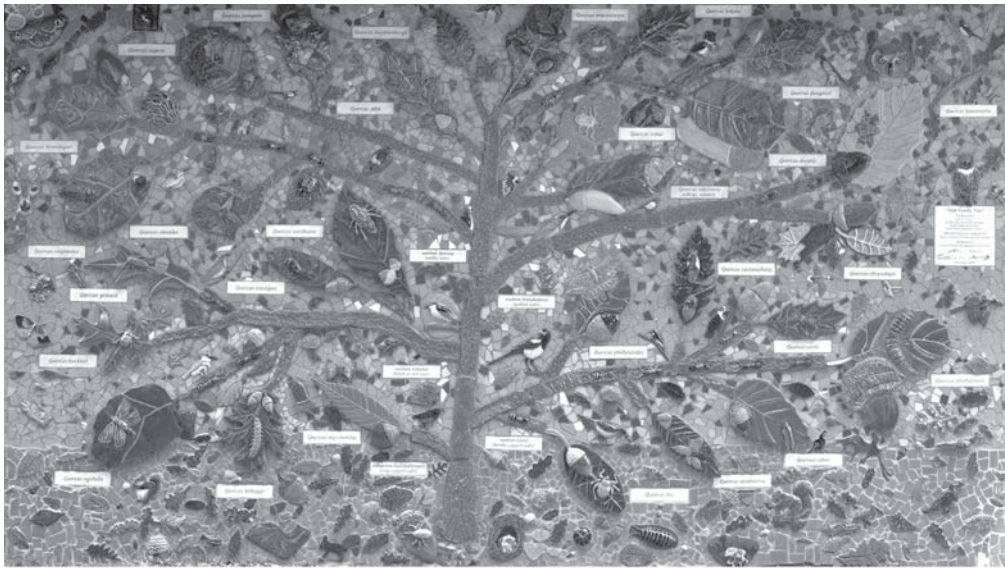


Fig. 1. The completed “Oak Family Tree” mural is a popular visitor attraction near the entrance to Shields Oak Grove.

photo©Donna Billick

were planted from the early 1960s to the early 1970s, and many have grown into impressive mature specimens. Unique features of Shields Oak Grove include large collections of oaks from California, the Mediterranean region, Mexico, and Central America as well as an unusual series of experimental hybrid oaks created by Dr. Walter Cottam. The California island oak (*Quercus tomentella* Engelm.) from the California Channel Islands, the Oak of Tabor (*Quercus ithaburensis* Decne.) from Israel, and Brandegee oak (*Quercus brandegeei* Goldman) from Baja California, Mexico are three of the more unique oaks in the collection.

The Arboretum recently received funding from the Institute of Museum of Library Services to make Shields Oak Grove more physically and intellectually accessible to visitors with the development of an interpretive trail. The Oak Discovery Trail will not only be a physical pathway to guide visitors through the collection, it will also be a rich educational resource with plant labels, interpretive signs, and a cell phone audio tour. The trail development will be accompanied by extra training for volunteer tour guides on the oaks, so that they can share even more stories about the trees with visitors. However, the most innovative element of the Oak Discovery Trail project is the Arboretum’s partnership with the UC Davis Art-Science Fusion program to develop permanent ceramic mosaic art features inspired by the oaks.

The Art/Science Fusion program, an undergraduate curriculum that links scientific learning with artistic expression, has a special affinity with Shields Oak Grove. The diverse oaks and the many animals and insects for which they provide habitats are a rich source for learning and creative inspiration. Diane Ullman, an entomology professor, and Donna Billick, a ceramicist and public artist, team up each fall to teach Entomology 1: Art, Science, and the World of Insects. In fall of 2008, the class project was to create a beautiful ceramic mosaic mural near the entrance of the Oak Discovery Trail. The name of the mural is “Oak Family

Tree,” and it visually represents the evolutionary relationships among oak species in the Arboretum’s living collection (Fig. 1).

Students in the course visited Shields Oak Grove at the beginning of the quarter to study oak taxonomy and diversity and to tour the collection. Each student worked with the ceramic artist instructor and Arboretum staff to create hand-built tiles accurately depicting a leaf, an acorn, and an associated insect for one of the oak species in the Arboretum’s diverse collection (Fig. 2). Branches textured like oak bark connect the 29 oak species on the mural to reflect recent research on oak relationships. Many Arboretum volunteers, community members, and students from a local elementary school also participated in the creation of tiles for the mural.

The mural serves as a visitor-friendly and scientifically-appropriate introduction to the taxonomic collection in Shields Oak Grove, which has been used many times over the decades to study the evolutionary relationships of oaks. The Arboretum staff believes that this partnership with the Art/Science Fusion program can serve as a model for other gardens on involving community in the creation of art that illuminates the scientific meaning of plant collections for visitors.



Fig. 2.
A UC Davis student shows off his *Quercus kelloggii* tile in Shields Oak Grove shortly before his mural installation.

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Morton Arboretum – Lisle, Illinois

The Morton Arboretum's living collections represent one of the most comprehensive repositories of woody plant diversity in North America. Through the Arboretum's 87 years of history, plants have been acquired from various regions around the world. Presently the collections include 4,164 taxa of plants. Over 186,000 individual plants in the living collections are arranged according to five major themes: taxonomic, geographic, special habitat, horticultural, and rare and endangered.

Of them, the Oak Collection is one of the most significant collections at the Arboretum. It consists of well-documented oak species, cultivars, and hybrids. There are seventy-one different taxa and over 281 accessions of oaks that are represented by 1,069 individual plants from North America, Asia, and Europe. The collection is distributed across approximately 12 acres on the east side of the Arboretum.

The site was originally oak-dominated upland forest during pre-settlement times. During the 1800s, forest products were harvested and the cleared areas were farmed. As evidence of this original landscape, many mature white oaks (*Quercus alba* L.) and bur oaks (*Q. macrocarpa* Michx.) commonly occur in the Oak Collection and throughout the Arboretum (including the Illinois Millennium Landmark Tree, predating Illinois' 1818 statehood).

Native species are particularly well represented. Seventeen species out of the total twenty-one Illinois native species are growing in the collection. Among them, white oak is the dominant species. The white oak is the Illinois state tree, and a symbol of Midwestern history and the Midwestern landscape. Another important native oak species is the bur oak (*Q. macrocarpa*) that commonly occurs



The Morton Arboretum oak collection.

photo©The Morton Arboretum



The Morton Arboretum.

photo©The Morton Arboretum

throughout the region's prairies, savannahs and woodlands. Some new and interesting species added to the collection include a Turkey native, Hartwiss' oak (*Quercus hartwissiana* Steven); a Chinese native, Liaotung oak (*Quercus liaotungensis* Koidz.); and the Japanese native, gland bearing oak (*Quercus serrata* Murray).

The collection not only provides a great place to enjoy and study the diversity of oaks but also serves as an important resource for genetic conservation and scientific research. The collection provides the Arboretum with a great opportunity to conduct practical and scientific research in fields such as taxonomy, root biology, urban ecosystems, conservation, and woodland restoration.



photo©The Morton Arboretum

Morris Arboretum at the University of Pennsylvania – Philadelphia, Pennsylvania

The Morris Arboretum is a historic public garden and educational institution that promotes an understanding of the relationship between plants, people, and place through programs that integrate science, art, and the humanities. Among our many significant collections, the *Quercus* collection is a member of the NAPCC Multi-institution Oak Curatorial Group.

There are several aspects to this collection. The first are trees that are over 200 years old and were likely young plants when this area was first settled. Second, are trees that were planted when the property was the Morris Estate and that are



A veteran specimen of *Quercus x benderi* growing at the Morris Arboretum.

photo©Paul W. Meyer



Winter scene of *Quercus bicolor* at the Morris Arboretum.

photo©Robert Gutowski

close to 100 years old. And finally, there are trees added over the past 75 years since we have become a public arboretum. In total we have 63 taxa of *Quercus* and 426 plants throughout the Arboretum.

With a large group of veteran and mature trees, we have started developing arboricultural techniques to preserve these plants for as long as possible, as long as they do not provide a hazard to the public or staff. In the past several years we have treated several of our oaks in ways that have helped sustain their growth, in particular by removing competition from turfgrass and by reducing the scale of the crown to encourage young interior growth. Treating these older plants as veteran trees is a relatively new concept in the United States and our goal is to develop long-range management plans for these specimens.

Our oak collection has been strengthened through domestic and international plant exploration, beginning in the 1950s with the Michaux Quercetum project and continuing for the past 30 years with plant exploration throughout Asia. Currently 62% of our trees are of wild-collected and documented origin, and the seed sources for our trees have come from six countries and 27 states of the U.S.

The uses of the *Quercus* collection at the Morris Arboretum support the goals of our mission, namely horticultural display, research, and education. These trees are planted throughout the Arboretum for the enjoyment of the general public. The trees have been used for breeding and propagation studies and for numerous classes that focus on plant care and identification. In summary, our oaks are a vital and integral part of all that we do as a public arboretum.

Starhill Forest Arboretum – Petersburg, Illinois

Founded in 1976 by Guy and Edie Sternberg, Starhill Forest was influenced strongly by many visits to the Morton Arboretum beginning in the 1950s. It is a small arboretum (48 acres / ~20 hectares) with approximately 150 accessioned genera of woody plants. *Quercus* has been the primary genus of focus almost from the beginning, and the current living collection of oaks comprises one of the most extensive in North America. More than 250 oak taxa are represented, largely from documented wild sources and including nearly 100 that are not fully hardy and must be maintained as container plants. Sand dune areas have been created in several locations and have been used successfully to establish many small oak species more than two USDA hardiness zones north of their normal limits in cultivation. These include *Q. chapmanii* Sarg., *Q. pumila* Walter, *Q. fusiformis* Small, *Q. rugosa* Née, *Q. gravesii* Sudw., *Q. turbinella* Greene, *Q. xundulata* Torr., *Q. lusitanica* Lam., *Q. mohriana* Buckley ex Rydb., and others.

This is the most recent addition to the NAPCC Multi-Institutional *Quercus* Collection, having joined in 2009. Several new oak cultivars originated here, including *Q. texana* Buckley (syn. *Q. nuttallii* E.J. Palmer) ‘New Madrid’, *Q. xwarei* T.L. Green & W.J. Hess ‘Windcandle’, *Q. xwarei* × *Q. alba* ‘Chimney Fire’, *Q. xwarei* × *Q. alba* ‘Birthday candle’, *Q. alba* ‘Brush Creek’, *Q. alba* ‘Gatton Grave’, *Q. alba* ‘Pathfinder’, *Q. macrocarpa* ‘Rough Rider’, *Q. xdeamii* Trel. ‘Champion Seedless’, *Q. xbebbiana* C.K. Schneid. ‘Taco’, and *Q. velutina* Lam. ‘Oakridge Walker’. Several more selections are under observation for possible introduction.



Q. ×sternbergii

photo©Guy Sternberg

Starhill Forest is the official arboretum of Illinois College, the oldest college in Illinois (Chartered in 1829). It remains under the direction of the Sternbergs, with internships, field labs, and credit study programs established for IC students. The collection also supports research for oak genetics, provenance testing, and general study, with more taxa available for observation in a small area than almost anywhere else in North America. Many International Oak Society members have visited here on their way to or from various IOS conferences since 1994, and seed exchanges with some of them have greatly enriched the arboretum. Seed obtained from the 2009 Mexico conference will continue to be shared with other NAPCC institutions and exchange partners.

An Open Invitation for Collaboration

There are many mutually beneficial opportunities for International Oak Society members to collaborate with the NAPCC Multi-Institutional *Quercus* Collection member gardens. Collection managers from the NAPCC member gardens have already been encouraged to join the International Oak Society and participate in IOS activities. Likewise, International Oak Society members are encouraged to help find and recruit new NAPCC gardens that will represent new geographic regions and expand the group's capacity to build the oak collection.

Potential joint projects for IOS members and NAPCC gardens include collecting expeditions, research projects, and acorn exchanges. Sharing information can also be useful to both parties for learning more about collecting localities, import regulations, propagation techniques, and more. IOS members are encouraged to take advantage of NAPCC oak collection resources. The NAPCC member gardens hold documented, diverse, and publicly accessible collections, often with mature specimens. They are reference sites for identification and potential sources of propagules (with permission). These gardens also serve as storehouses for information and expertise with specialized libraries, extensive horticultural records, and highly trained and dedicated staff.



Observation deck
at Starhill Forest.
photo©Guy Sternberg

For those IOS members who live near a public garden with an NAPCC oak collection, please consider volunteering your oak expertise for the benefit of the garden. Specialized volunteer opportunities abound in the areas of collection care and maintenance, collection curation and documentation, and education and interpretation.

The International Oak Society and the NAPCC Multi-Institutional *Quercus* Collection are natural partners, and we hope that the two organizations can work together and benefit from each other's resources and expertise.

For more information:

Griswold, Emily. 2009. Conserving Oaks in North American Plant Collections: A Collaborative Approach. *International Oaks*, No. 20.

NAPCC webpage: http://www.publicgardens.org/web/2006/06/napcc_home.aspx

NAPCC Multi-Institutional Quercus Collection webpage:

http://www.publicgardens.org/web/2008/08/multiinstitutional_quercus_oak.aspx

The authors thank Allen Coombes for his help with review.



Pond at Starhill Forest.

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