



International Oaks

The Journal of the International Oak Society

Proceedings
8th International Oak Society Conference
October 18-21, 2015

Issue No. 27/ 2016 / ISSN 1941-2061



International Oaks

The Journal of the International Oak Society

Proceedings
8th International Oak Society Conference
October 18-21, 2015

Issue No. 27/ 2016 / ISSN 1941-2061





International Oak Society Officers and Board of Directors 2015-2018

Officers

President Charles Snyers d'Attenhoven (Belgium)

Vice-President Shaun Haddock (France)

Secretary Gert Fortgens (The Netherlands)

Treasurer James E. Hitz (USA)

Board of Directors

Membership Director

Robert Routon (USA)

Tour Director

Shaun Haddock (France)

International Oaks

Editor Béatrice Chassé

Co-Editor Allen Coombes (Mexico)

Oak News & Notes

Editor Roderick Cameron (Uruguay)

Co-Editor Ryan Russell (USA)

Website Administrator

Charles Snyers d'Attenhoven

Editorial Committee

Chairman

Béatrice Chassé

Members

Roderick Cameron

Allen Coombes

Dirk Giseburt (USA)

Shaun Haddock

Ryan Russell

For contributions to *International Oaks*

contact

Béatrice Chassé

pouyouleix.arboretum@gmail.com or editor@internationaloaksociety.org

Les Pouyouleix

24800 St.-Jory-de-Chalais

France

Author guidelines for submissions can be found at

<http://www.internationaloaksociety.org/content/author-guidelines-journal-ios>

© 2016 International Oak Society

Copyright of *International Oaks* and to articles in their final form as they appear in the publication belong to the International Oak Society. Copyrights to texts, photographs, illustrations, figures, etc., belong to individual authors and photographers.

Cover illustration. Wendy Brockman (*Quercus palustris*).

Photos. p. 9: James MacEwen (Michael Heathcoat Amory); p. 10: Guy Sternberg (8th International Oak Society Conference participants); p. 11: Charles Snyers d'Attenhoven (*Quercus stellata*); p. 13: Béatrice Chassé (*Q. ×fernowii*).

www.internationaloaksociety.org

Join the International Oak Society today!

Table of Contents

—/ 11 /—

Foreword

Twenty-one Years After

Charles Snyers d'Attenhoven

—/ 13 /—

Preface

From Small Acorns

Sara Oldfield

—/ 15 /—

Introduction

Oak Research in 2015: a Snapshot from the IOS Conference

Andrew L. Hipp

—/ 23 /—

Systematics and Biogeography of the American Oaks

Paul S. Manos

—/ 37 /—

Diversity, Distribution and Ecosystem Services of the North American Oaks

Jeannine Cavender-Bares

—/ 49 /—

Drought Tolerance and Climatic Distributions of the American Oaks

Matthew Kaproth and Jeannine Cavender-Bares

—/ 61 /—

Phylogeny and Introgression of California Scrub White Oaks (*Quercus* section *Quercus*)

Victoria L. Sork, Erin Riordan, Paul F. Grugger, Sorell Fitz-Gibbon, Xinzeng Wei, and Joaquín Ortego

—/ 75 /—

A Tough Little Survivor: The West Texas Oak, *Quercus hinckleyi*

Janet Rizner Backs

—/ 83 /—

Landscape and Conservation Genetics of the Island Oak, *Quercus tomentella*

Mary V. Ashley, Janet R. Backs, and Saji T. Abraham

—/ 91 /—

Hybridization and Adaptive Divergence in Oaks

Olivier Gailing and Jennifer Riehl

—/ 99 /—

Asexual Propagation of Oak Hybrids: Our Progress, and the Challenges of Producing Clonal Plants
Nina L. Bassuk, Bryan R. Denig, and Miles Schwartz Sax

—/ 107 /—

Eating Acorns: What Story do the Distant, Far, and Near Past Tell Us, and Why?
Béatrice Chassé

—/ 137 /—

New and Lesser-Known Cultivars 2013-2015
Ryan Russell and Eike Jablonski

—/ 149 /—

Anther Culture of Turkey Oak (*Quercus cerris*)
Joseph Rothleutner

—/ 155 /—

The Plant Collections Network and the *Quercus* Multisite Collection
Greg Paige

—/ 163 /—

Rescuing Plant Species with Extremely Small Populations in China: the Case of the Xichou oak,
Quercus sichourensis
Weibang Sun, Zhekou Zhou, Wenyun Chen, Yuan Zhou, Lei Cai, Murphy Westwood, and Jessica Turner

—/ 171 /—

Conservation of *Quercus arbutifolia*, a Rare Oak, from Southern China's Montane Cloud Forests
Min Deng, Xu Jun, Yi-Gang Song, and Xiao-Long Jiang

—/ 181 /—

A Genetic Map for the *Lobatae*
Arpita Konar, Olivia Choudury, Oliver Gailing, Mark V. Coggeshall, Margaret E. Staton, Scott Emrich, John E. Carlson, and Jeanne Romero-Severson

—/ 189 /—

Development of New Genomic Resources for Northern Red Oak, *Quercus rubra*
Christopher R. Heim, Mark V. Coggeshall, Arpita Konar, and Jeanne Romero-Severson

—/ 195 /—

Sustaining Oaks in the Chicago Region Landscape: Developing a Plan for Maintaining Oak
Dominance in an Urban Landscape
Lindsay Darling and Robert T. Fahey

—/ 207 /—

Pathfinder: the Last Prairie Sentinel
Guy Sternberg

—/ 217 /—

Oaks in Puebla: Growing Successes and Failures, and New Research Topics
Maricela Rodríguez-Acosta, Allen J. Coombes, Carlos A. Paredes-Contreras, Stephanie Fernández-Velázquez, and Citlali Guevara-González

—/ 227 /—

Searching for the Hardy Southern Live Oak
Anthony Aiello

—/ 233 /—

The Last Basketmaker: Indiana's Forgotten History of Oak-Rod Baskets
Jon Kay

—/ 245 /—

Are Resource Dynamics a Necessity for Oak Masting?
Ian Pearse

—/ 255 /—

Preserving Oak (*Quercus* sp.) Germplasm to Promote Ex-Situ Conservation
Christina Walters, Lisa Hill, Jennifer Crane, Marcin Michalak, Xia Ke, Jeffrey Carstens, Kevin Conrad, Murphy Westwood, Alison Colwell, Joanna Clines, and Pawel Chmielarz

—/ 267 /—

The Pace of Microevolution of European Oaks During Environmental Changes
Antoine Kremer

—/ 277 /—

Launching the Global Oak Conservation Initiative at The Morton Arboretum
Lisa Kenny and Murphy Westwood

—/ 290 /—

Workshops

—/ 305 /—

Poster Sessions

—/ 343 /—

Pre-Conference Tour
Roderick Cameron

—/ 364 /—

The Morton Arboretum
Charles Snyers d'Attenhoven

—/ 375 /—

Post-Conference Tour
James Hitz

—/ 390 /—

International Oak Society Service Awards

—/ 392 /—

First International Oak Society Silent Auction



Quercus aliena (Chicago Botanic Garden).

Documenting *Quercus* at the Chicago Botanic Garden

Boyce Tankersley, Andrew Bunting, and Andrew Bell

Chicago Botanic Garden
Glencoe, IL 60022, USA

The genus *Quercus* is one of the special collections of focus at the Chicago Botanic Garden. As a member of the multi-site *Quercus* collections of the North American Plant Collections Consortium of the American Public Gardens Association, documentation of all aspects of this collection is a priority.

The living collection currently consists of 184 accessions representing 64 taxa and 1,131 plants. An additional 8 taxa and 59 accessions are represented by images, herbarium and DNA vouchers of taxa not part of the living collection.

In an effort to support scientific studies of this collection, the Living Plant Documentation staff and volunteers at CBG collect, document and maintain accurate inventories, maps, labels, accession tags, herbarium vouchers, DNA vouchers, and digital images (of diagnostic characteristics) for each accession.

- Images of 11 different views for each accession are shared outside the Garden using an application called Smugmug that enables taxonomic experts to comment/annotate the images remotely.
- DNA vouchers are collected and stored to support requests from outside the institution.
- 3 herbarium vouchers are collected for both vegetative and reproductive features.
- Each specimen has a unique accession tag allowing for latitude and longitude coordinates to be captured with ESRI ArcGIS software.
- 4 staff and 85 volunteers support different aspects of this project.

(Boyce Tankersley is Director of Living Plant Documentation; Andrew Bunting is the Assistant Director of Chicago Botanic Garden and Director of Plant Collections; Andrew Bell is Woody Plant Curator.)

Introduction

The genus *Quercus* is one of the special collections of focus at the Chicago Botanic Garden. As a member of the multi-site *Quercus* collection of the North American Plant Collections Consortium, documentation and curation of this collection is a priority.

The living collection of *Quercus* currently consists of 184 accessions representing 63 taxa and 1,131 plants. There are 59 non-living accessions of images, herbarium and DNA vouchers that include eight taxa not currently part of the living collection. Also on the property are seven taxa of *Quercus* naturally occurring in the McDonald Woods, 100 acres of restored oak/hickory woodland.

All aspects of these accessions are carefully documented for the use of Garden staff, researchers at other institutions, and the general public. The condition of individual trees is monitored and maintained, and new threats such as climate change are analyzed for impacts. As a guardian of *Quercus* germplasm, emphasis is placed on acquisition and preservation of rare taxa.

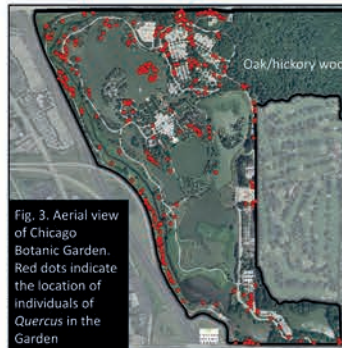


Fig. 3. Aerial view of Chicago Botanic Garden. Red dots indicate the location of individuals of *Quercus* in the Garden

Documentation

In an effort to support scientific studies of the *Quercus* collection, the Living Plant Documentation staff and volunteers at CBG maintain accurate inventories, maps, labels, accession tags, herbarium vouchers, DNA vouchers, and digital images of diagnostic characteristics for each accession.

- Images of 11 different views of each accession are shared outside the Garden using an application called Smugmug that enables taxonomic experts to annotate the images remotely (Fig. 1).

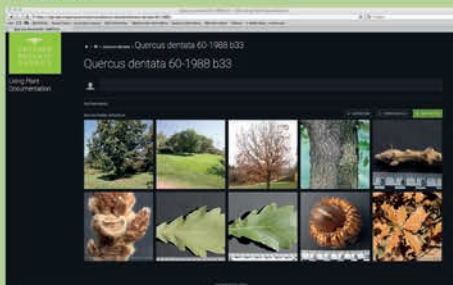


Fig. 1. Images of one accession of *Quercus dentata* in Smugmug

- DNA vouchers are collected and stored to support requests from outside the institution.
- Three herbarium vouchers are collected for both vegetative and reproductive features (Fig. 2). Images of herbarium vouchers are uploaded to www.sciencecollections.org.
- Each specimen has a unique identification number allowing its latitude and longitude coordinates to be captured on garden maps using ESRI ArcGIS software (Fig. 3).
- Photos, plant locations, and basic cultural information can be viewed on the PlantFinder app at www.chicagobotanicgarden.org/plantcollections#plantfinder.
- A complete collections inventory is uploaded to Botanic Gardens Conservation International annually.
- Four staff and 85 volunteers support different aspects of documentation.



Fig. 2. Image of herbarium voucher of *Quercus alba*

63 Taxa of Quercus

<i>Q. acerifolia</i>	<i>Q. imbricaria</i>
<i>Q. acutissima</i>	<i>Q. lyrata</i>
<i>Q. alba</i>	<i>Q. macrocarpa</i>
<i>Q. aliena</i>	<i>Q. macrocarpa</i>
<i>Q. aliena</i> var. <i>acutiserrata</i>	<i>Q. macrocarpa</i>
<i>Q. arkansana</i>	<i>Q. macrocarpa</i>
<i>Q. baronii</i>	<i>Q. marilandica</i>
<i>Q. bicolor</i>	<i>Q. mongolica</i>
<i>Q. bicolor</i> 'Bonnie and Mike'	<i>Q. mongolica</i>
<i>Q. bicolor</i> 'JFS-KW18'	<i>Q. montana</i>
<i>Q. bicolor</i> × <i>robur</i> var. <i>procara</i>	<i>Q. muehlenbergii</i>
<i>Q. castaneifolia</i>	<i>Q. palustris</i>
<i>Q. coccinea</i>	<i>Q. palustris</i> 'P'
<i>Q. dentata</i>	<i>Q. palustris</i> 'S'
<i>Q. dentata</i> 'Pinnatifida'	<i>Q. palustris</i> ×
<i>Q. ellipsoidalis</i>	<i>Q. petraea</i>
<i>Q. gambelii</i> × <i>macrocarpa</i>	<i>Q. phellos</i>
<i>Q. glandulifera</i>	<i>Q. prinoides</i>
<i>Q. glandulifera</i> var. <i>brevipetiolata</i>	<i>Q. prinus</i>
<i>Q. iberica</i>	<i>Q. robur</i>
	<i>Q. robur</i> 'Fast'

Plant conservation is a major focus at the Chicago Botanic Garden. There are five species of *Quercus* native to eastern North America (Fig. 5). The Garden has a long history of conserving plants for *ex situ* conservation in the Arboretum is planned for Fall 2015 in the

Future collection trips also targeting the Chicagoland area, Wabash Valley, Ozark

In addition to wild-collected germplasm, the Garden also conserves cultivars and commercially-available herbarium specimens, and for street trees and urban plantings, and landscape architecture.

Garden: Documentation and Curation

Dr. Andrew Bell, Boyce Tankersley, and Andrew Bunting
Garden, Glencoe, IL 60022



Living Collection

	<i>Q. robur</i> 'JFS-KW2QX'
	<i>Q. robur</i> 'Purpureascent'
	<i>Q. robur</i> 'Purpurea'
	<i>Q. robur</i> 'Variiegata'
	<i>Q. robur</i> × <i>alba</i> 'JFS-KW1QX'
	<i>Q. robur</i> × <i>bicolor</i> 'Nadler'
	<i>Q. rubra</i>
	<i>Q. serrata</i>
	<i>Q. shumardii</i>
	<i>Q. shumardii</i> var. <i>schneekii</i>
	<i>Q. sp.</i>
	<i>Q. stellata</i>
	<i>Q. stellata</i> × <i>alba</i>
	<i>Q. variabilis</i>
	<i>Q. velutina</i>
	<i>Q. virginiana</i>
	<i>Q. × bimundorum</i> 'Crimschmidt'
	<i>Q. × f. ernowii</i>
	<i>Q. × jackiana</i>
	<i>Q. × macdaniellii</i> 'Clemons'
	<i>Q. × warei</i> 'Long'

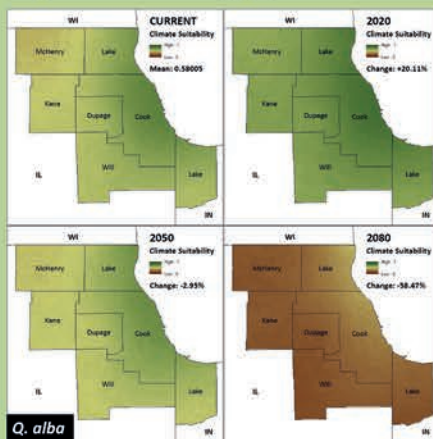
Curatorial Practice and Research

The Curator of Woody Plants manages the development and preservation of the *Quercus* collection for display, research and education. A grant from the Institute of Museum and Library Services from 2011-2013 supported a curatorial review of the collection and new research into the potential effects of climate change on 52 taxa of trees.

Health assessments were conducted on all trees in the display gardens, noting pest, disease, environmental, cultural, and structural problems. Leaf scorch, chlorosis, and girdling roots were the most common problems noted among the *Quercus*. 18 oak trees were found to be in poor condition and of these, four accessions were propagated to preserve valuable germplasm.

Garden staff developed climate change models to aid in the management of the tree collection and to create an adaptive planting list for the City of Chicago. Projections were made with MaxEnt Species Distribution Modeling for the decades 2020, 2050, and 2080 using temperature and precipitation data from a high emissions scenario (Fig. 4).

Fig. 4. Projections of climate suitability for *Quercus alba* in the Chicago region using temperature and precipitation data from A2 high emissions climate scenario



Quercus alba, *Q. bicolor*, *Q. imbricaria*, *Q. robur* 'Fastigiata', and *Q. rubra* were included in the climate change study. All five of these taxa retained 80% or more climate suitability in the Chicago region in the 2050s, and can be recommended for plantings with an expected lifespan of 35-60 years. However, none of these taxa retained 50% or more climate suitability for the decade 2080, a threshold used to recommend "legacy" plantings. More results of this study are available at www.chicagobotanic.org/plantinfo/tree_alternatives.

Future Acquisitions

Chicago Botanic Garden. Targeted for acquisition in North America that are on the IUCN Red List of Threatened Species. Will collect and propagate germplasm from these species. A joint collection trip with the Morton Arboretum to the Southeastern United States.

Species native to North America will include the species from the Daniel Boone National Forest.

The Garden collects and preserves species of *Quercus*. These plants are significant for horticulture and can be used for breeding new selections, research and as a reference for students of horticulture and

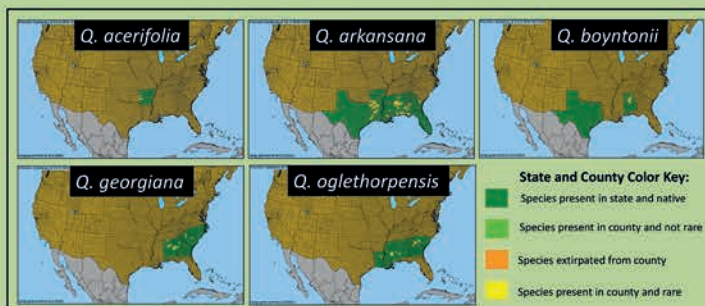


Fig. 5. County-level distribution maps of five species of *Quercus* of conservation concern native to eastern North America