Oaks to Know and Grow:The Promise and Problems of the Genus

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INTRODUCTION

The oak genus, *Quercus*, comprises one of the most useful, diverse, widespread, and fascinating of all genera of woody plants. Unfortunately, the oaks constitute a nightmare for taxonomists, with species that merge and collide like freeway traffic. They can present some complex and frustrating problems for propagators as well.

No one person ever really has known all the oaks. There may be some 500 species (depending upon how one chooses to define a species in this plastic genus), and potentially thousands of hybrids distributed within, but normally not across, the subtle boundaries of several primary subgeneric groups. Oaks can be large trees or prostrate groundcover plants; they can display brilliant fall colors or be fully evergreen; and they can thrive in, and frequently dominate, habitats ranging from desert scrublands to deep swamps.

NATURAL DISTRIBUTION OF THE OAK GENUS

Oaks constitute a major component of the flora over much of the Northern Hemisphere. Here in eastern North America they are known especially for their seasonal attributes: prominent staminate catkins and colorful early foliage in spring; glossy or rugose summer leaves, and toughness in the face of hot weather; acorn massed in the autumn, coupled with the rich and long-lasting fall color of many species; and a diverse winter portfolio that includes evergreen oaks, marcescent oaks, and fully deciduous oaks, all with the venerable character for which the genus is famous and admired.

Western North America has fewer species but can boast a broader range of infrageneric oak groups. The ubiquitous white oak group (section *Quercus*, formerly called *Lepidobalanus*) grows in mixture with the endemic American group called red oaks (section *Lobatae*, often known as *Erythrobalanus*) and the western American endemic golden oaks (section *Protobalanus*). All share woodland habitats in the western states and adjacent areas of Mexico (and, for one species only, western Canada).

The Mediterranean region of Europe and North Africa includes several white oak species which have evolved under similar conditions as have our western species, and which resemble some of them closely in striking examples of parallel evolution. They frequently are evergreen, and are extremely tolerant of drought and of hot summers. Other regions of Europe support more mesic white oak species, which resemble their white oak counterparts of eastern North America as closely as the Mediterranean species do the oaks of the American West.

In Asia, oaks have achieved a very high level of diversity. China alone has 130 species, some of which are members of the unique *Cyclobalanopsis* or ring-cupped oaks, a distinct Asian taxonomic subgenus sometimes assigned generic rank. Mexico is an even greater center of diversity for oaks, with at least 150 known

species. Rounding out the genus, Central America and the adjacent north edge of Columbia in South America contain perhaps 30 species, mostly in mountainous areas.

OAK CULTIVARS

Considering the plasticity of the genus and its notorious propensity to form interspecific hybrids, relatively few oak cultivars have been selected and propagated. The notable exception is the common European (pedunculate, or English) oak, *Q. robur*, which has spawned more than 100 cultivars. Several selections have been made from *Q. ilex* also. Other European species such as *Q. petraea* and *Q. cerris* have contributed a few, as have some American species (whose cultivars usually have been selected and propagated in Europe).

Virtually no cultivar selections have come as yet from the oak-rich regions of Mexico and Asia, with the almost singular exception of a few forms and hybrids of *Q. dentata*. The development of oak cultivars is lagging in another way as well: many existing oak selections were made from aberrant material, and exhibit the horticultural oddities of which the genus is capable as opposed to its most superior characteristics. This seems to represent a juvenile stage in plant selection, with individuals and clines of outstanding performance potential initially being overlooked in favor of conspicuous curiosities.

The primary hurdle in oak cultivar development has been the difficulty with which oaks are grafted, rooted from cuttings, increased through micropropagation, or otherwise reproduced asexually, coupled with problems associated with transplanting, container production, mildew under irrigation, and other aspects of nursery practice. Without successful and dependable techniques to replicate and grow ramets faithful to the ortet from which it was selected, a selection by definition cannot become a cultivar. These techniques are becoming available today, or are in our immediate future, as we will learn from the speakers who follow.

WHAT ELSE SHOULD WE PROPAGATE?

The famous "oakmasters" of Europe, like J.R.P. van Hoey Smith of Trompenburg, Michel Decalut of Waasland, and Allen Coombes of Hilliers, are intensely observant and dedicated people who will continue to seek and find unusual and superior characteristics worthy of ornamental cultivar status. They can be counted upon to continue to enrich our horticultural lives with new selections and hybrids, if only we can find ways to propagate these selections successfully. As new species and clines are introduced into the great European collections in larger numbers from Asia and the Americas, look for useful forms and hybrids to be selected from a much broader species palette than that which has contributed most oak cultivars to date. There are other reasons, though, besides perpetuating yet another variegated leaf type or another columnar or plagiotropic growth form, to propagate certain oaks.

Heritage Trees. We should perpetuate the genotypes of superior specimens such as national champion trees. We might not yet know why, other than for subjective or sentimental values, but the old tinker's rule of saving all the pieces certainly applies to preservation of a potentially unique genetic base which helps enable an individual organism to succeed beyond all others of its kind. Similarly, we should attempt to maintain living reference collections of type specimens, when such trees can still be found, so that future taxonomists with new techniques will be able to

review something more revealing than crumbling old herbarium specimens. We also should propagate individual oaks associated with our American aboriginal or written history.

Such trees might be unique only in their stochastic circumstance of being in the right place at the right time, or in surviving long enough to be recognized for their size, age, or association with historic human events. But ancient and champion trees arguably rank among the most inspirational of nature's works, and they impart to receptive people a spiritual presence and a mirror in which to view our own mortality. They also serve as living connections to the past and, by their genuine and obvious venerability, they establish a time scale to place history in perspective. Such trees, particularly oaks, have inspired human interest in these ways for centuries, and at worst they may be effective when used to draw public interest to a just cause or to recruit financial or political support for worthy scientific purposes.

Rare or Restricted Endemic Species. The general importance of propagating rare or restricted endemic taxa for ex situ conservation is widely accepted. This need cannot be overemphasized in dealing with a genus so polymorphous and so characteristically heterozygous as *Quercus*. There are many oak taxa confined to habitats so restricted that much or most of the genetic diversity of such taxa is at risk of catastrophic loss. This category might include the golden oak *Q. tomentella* and the red oak *Q. parvula*, both virtually limited in nature to the Channel Islands of California, and the white oak *Q. hinckleyi* from Solitario Peak in the Presidio of Texas. It also should include more cold-tolerant species, like the red oak *Q. acerifolia* (syn. *Q. shumardii* var. *acerifolia*) from Magazine Mountain in the highlands of western Arkansas and the surprisingly hardy white oak *Q. oglethorpensis* from the vicinity of Ninety-Six, South Carolina.

Nor should our conservation concerns be limited to American species. The beautiful *Q. alnifolia* is found in nature only on the Mediterranean island of Cyprus, and should be brought into more extensive cultivation. *Quercus baloot*, from the Himalayas, was probably unknown in cultivation until a pilot happened to bring a few seeds back to Europe recently, out of curiosity, in his shirt pocket.

Many rare oak species in the biodiversity centers of China and Mexico may be disappearing, due to the pressures of human population, before they can be brought into cultivation or even described. *Quercus uxoris*, a unique tropical montane winter-deciduous oak from southwestern Mexico, has been studied so little that the botanist who named it in 1972 lamented that even he had not seen enough fruiting material to describe it fully. This species, due to its autumn-deciduous habit (unusual for this climate zone), might be adaptable to much colder habitats than those of its isolated natural range; yet it was brought into cultivation only in 1995, by an expedition which included two of the people at this conference.

Unique Individuals or Populations. Many oaks constitute one-of-a-kind taxa. Single groves, or even single trees, represent species or hybrids which may have scientific or commercial value. No one knows the exact identity of the Langtry oak growing along a tributary of the Pecos River in Texas, but we do know that it's an unusual, annual-fruiting analog of the biennial-fruiting red oak *Q. gravesii*, and that much of it is being destroyed by dam construction. No one knows exactly what the Fendler oaks of Lincoln, New Mexico are. They could be a super-hardy cline or hybrid of the beautiful Mexican blue oak (*Q. oblongifolia*); we do know that only a few

individuals are left, and that at least some already have been cut for firewood.

The original cross *Q.* ×*vilmoriniana*, a hybrid of the European *Q. robur* with the Asian *Q. dentata*, is an ancient specimen declining from root decay in the Arboretum des Barres in France. Hopefully, it will be propagated vegetatively while there is still time. And who knows why *Q.* ×*organensis*, the supposed hybrid of two semideciduous species in southern New Mexico, is evergreen? We do know that it exists only as a few individuals, growing at a fragile oasis in desert mountains precariously on the edge of a military bombing range.

The outlier population of magnificent Nuttall's oaks (*Q. texana*, formerly *Q. nuttallii*) I discovered in 1972 at Horseshoe Lake in Illinois thrive many miles north of the natural range of the species and display unusually brilliant fall color. But there were only two trees remaining after the great flood of 1993, and the largest, fully 2 m in diameter, is nearly gone now due to storm damage. One nurseryman is rooting cuttings from this unique provenance, and I have propagated it from seed as well, for ex situ conservation.

Politically Isolated Species. Political considerations might make it difficult for us to obtain material from additional provenance to broaden the genetic base of a species in cultivation. Are you willing to spend hundreds of dollars for a permit to bring material back from Costa Rica? Would anyone volunteer to collect acorns of *Q. infectoria* var. *boissieri* (syn. *Q. infectoria* ssp. *veneris*) from its native range in Iraq?

Plus Trees. Superiority in selected performance parameters can demand the vegetative propagation of plus trees for forestry and of additional ornamental selections. Provenance could play a major role in identifying commercially useful, cold-hardy sources of cork, for example, by selectively testing promising individuals of *Q. suber* var. *occidentalis*, the biennial-fruiting northern form of cork oak. Lime-tolerant species such as *Q. pubescens* and *Q. muhlenbergii* might be used in hybridization programs, or as grafting understock, for areas where alkaline soil conditions restrict the use of other oaks.

Examples of ornamental oak cultivars selected for superior, rather than abnormal, characteristics include *Q. frainetto* 'Hungarian Crown', *Q.* ×*libanerris* 'Rotterdam' (an improvement over the older hybrid selection 'Trompenburg'), and the superior *Q.* ×*saulii* #168 and *Q.* ×*bebbiana* #190 I currently am naming and introducing. They all are uncommon individuals of common taxa, and their superior ornamental characteristics cannot be replicated dependably except via asexual propagation.

A New Frontier Underfoot for Oak Propagators. For centuries, humans have been enchanted by the venerable qualities of giant, ancient oak trees, and understandably so. But the genus *Quercus* offers us something else, which to date we have not sufficiently appreciated nor exploited. It is time to direct some attention to the diminutive oak species which have so much potential for horticultural and habitat purposes.

There are rambling groundcover species, like the waist-high *Q. havardii* that stabilizes hundreds of miles of shifting sand in Texas, New Mexico, and Oklahoma. Tame it, maybe grow it on a non suckering rootstock, and it's a shrub with great potential. Cross it with some larger species, which it does frequently in nature, and you might have a mid-sized oak with the best characteristics of both parents. The same can be said for *Q. gambelii*, *Q. georgiana*, *Q. prinoides*, and *Q. incana*, all small

oaks which have proven hardy for us in the heart of Illinois in U.S.D.A. Zone 5.

Quercus ilicifolia, another hardy dwarf species that spreads to form thickets, already has been domesticated into a refined shrub cultivar Nana at Arboretum Trompenburg in the Netherlands. *Quercus palustris* 'Swamp Pygmy' is a miniature globe form of pin oak discovered by the Bomer Nursery Boomkwekerij, also in the Netherlands. These and similar selections from our North American red oaks must await the perfection of propagation techniques that can circumvent graft incompatibility before they can be introduced into the trade on a commercial scale.

We also might explore the possibilities of the truly dwarf, knee-high oaks, which may prove to be root-hardy in winter climates far more severe than their native haunts. *Quercus minima* and *Q. pumila*, stoloniferous oaks (respectively white and red) from the Southeast, could fit this mold, as might the creeping *Q. monimotricha* from China and the ultimate dwarf oak, *Q. repanda* from the great volcanoes of Central Mexico.

THE KEY TO THE FUTURE

We are at a crossroads in the development of oaks for ornamental horticulture, forestry, wildlife, and conservation uses. Advancements in propagation techniques can lead the way to a prodigious reservoir of superior oaks for the future. But the oaks are like fine, spirited horses, and will not be tamed easily. People at the leading edge of propagation science—people who have the motivation to participate in conferences like this one—must rise to meet this challenge. Nothing truly great comes easily!