THE CALIFORNIA OAKS, BY SUBGENERA

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<tr>
<th>WHITE OAKS</th>
<th>BLACK OAKS</th>
<th>INTERMEDIATE OAKS</th>
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<td><strong>Subgenus</strong></td>
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<td><em>Quercus</em></td>
<td><em>Erythrobalanus</em></td>
<td><em>Protobalanus</em></td>
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<td><strong>TREE OAKS</strong></td>
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<td>Blue</td>
<td><em>Q. douglasii</em></td>
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<td>Engelmann</td>
<td><em>Q. engelmannii</em></td>
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<td>Garry or Oregon white Valley</td>
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<td><strong>SHRUB OAKS</strong></td>
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<td>Muller</td>
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<td>Scrub</td>
<td><em>Q. dumosa</em></td>
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<td>Leather</td>
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<td>Brewer</td>
<td><em>Q. garryana</em></td>
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<td>Deer</td>
<td><em>Q. saderoiana</em></td>
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<td>Desert scrub</td>
<td><em>Q. turbinella</em></td>
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Bur Oak Influences

When the first European settlers advanced into the prairie, looking for new lives, they naturally sought the open oak groves, which they called "oak openings" or "scattering timber." The bur oaks trees they found there furnished shade, shelter from wind, building materials, fuel, and forage for livestock. These trees also offered a psychological connection to more familiar forest environments, since bur oaks, and oaks in general, had been dominant components of forests back in the Ohio Valley. Perhaps they even appealed to human genetic memories of the supposed savanna origins of the human species.

But the oaks provided more than wood, shade, and homey comfort. They gave the savanna structure; they were its bones. The inclusion of scattered oaks in the tallgrass prairie created the major source of diversity in areas devoid of streams, potholes, or topographic breaks. The oaks nurtured obscure organisms like bullet galls, and spectacular ones like the giant silkmoths. They furnished roosting and nesting sites, browse, and mast for tree-dwelling birds and mammals. They modified their own micro-environments to the benefit of the grasses like *Chasmanthium* and *Elymus*, and forbs like *Polygonatum* and *Zizia*.

When they died, the oaks became hunting perches for hawks, and dens and forage for woodpeckers. They served as carbon sinks and sources of lignin, and as they fell, they sheltered amphibians, and supported the fungi and other recyclers that expanded and renewed the food chain. Sometimes the bur oaks were joined or replaced on good upland soils by white oak (*Q. alba L.*), on dry or calcareous soils by chinkapin oak (*Q. muehlenbergii* Englem.), on wet soils by swamp white oak (*Q. bicolor* Willd.), and on poor soils by black oak (*Q. velutina* Lam.) or post oak (*Q. stellata* Wang.) or others. But bur oak was the principal tree in most of the upper Midwest savannas, and the predominant biological and visual force which shaped them.

The Unique Adaptability of Bur Oak

Conventional wisdom sometimes holds that the oak components of our savannas existed mostly as relics of forest, persisting temporarily in the face of the advancing prairie. This certainly could be true in some areas, but the special ability of bur oak to colonize the prairie should not be overlooked. This capability is due to several morphological and physiological tendencies which combine to make bur oak resistant to, and tolerant of, the forces which created and maintained the prairie.

Bur oak acorns are different from those of most other oaks in that they frequently are more than 50% enclosed by the cupules, or caps, that develop from the floral involucre. This can cause them to fall with the caps still attached, and those which happened to lodge "nose down" in the savanna could be held in that position by the unique broad fringe. The oak embryo, thus brought into direct soil contact by its inverted position and protected from light autumnal fires by the thick, woody cap, would germinate that same autumn, sending its radicle deep into the soil during the fall rains. The root would continue to grow, fed by the large cotyledons, until the soil froze. The following spring, the plumule would emerge, while the tap root continued to deepen, racing against the onset of summer drought and the competition of other plants.

Oaks for Urban Landscapes in Northern Illinois

by George Ware, Morton Arboretum, Lisle, Illinois

"Oaks are hard to transplant." "Oaks grow too slowly." "Oaks have too many problems." "Oaks don't grow well near people." Perhaps there is some truth in all of these statements, but the fact remains that oaks can be useful and valuable urban trees if their requirements and vulnerability are understood and attention given to the attributes and requirements of their root systems.

For any kind of tree to become established, it is important that new root growth take place within a reasonable length of time after transplanting. Apparently most oaks do not initiate new root growth so rapidly as do many other kinds of planted trees. Thus planting in spring just before the start of the growing season is best, because this allows root and shoot development to begin before the tree is subjected to summer dryness. Even so, the loss of a planted oak during the first summer is a possibility. Fall planting is less desirable, as these trees may be exposed to winter winds which dry out the twigs at a time when roots cannot take up replacement moisture because the ground is frozen.

A practice which may give a transplanted oak a better chance of becoming re-established is the thinning out of the crown by pruning some of the twigs and small branches. This reduces the amount of foliage and thus the demand on the root system which has been reduced in size in the process of transplanting. Arborists and nurserymen often call this "balancing the crown-root ratio," and the practice may also be used to improve the shape of the young tree."
**Quercus macrocarpa:**
The Consummate Tree of the Nearctic Savanna
by Guy Sternberg, Starhill Forest, Petersburg, Illinois

Savanna communities are, by definition, transitional habitats comprising both forest and prairie species. The predominate forest canopy tree species which visually and biologically rules savannas throughout the Tallgrass Prairie Region of midwestern North America is the versatile Bur Oak, *Quercus macrocarpa* Michx.

A unique combination of physiological and morphological characteristics gives this tree, a classic ecological generalist of many climatic and edaphic zones, the ability to thrive under savanna conditions where almost no other temperate forest tree can exist. This species is arguably the most important single biotic factor in the molding of a savanna community.

An insight into the capability of the bur oak to adapt to tallgrass savanna conditions is presented, toward a better understanding of suitable techniques for management and restoration of these vanishing natural systems.

Introduction

The deciduous forest of eastern North America is a dynamic, but morphologically stable, ecosystem. The prairie of the upper Midwest is stable, too, as a climax maintained by environmental forces. But the transition between them—the oak savanna—is war. Woody plants attack from the East, with their ally, shade; herbaceous plants counter-attack from the West, with their own allies of drought, wind, fire, and lightning. And so the battle persisted for millennia, ebbing and flowing with every subtle climate shift and every stochastic local environmental anomaly, from Manitoba to Texas.

Recently, it seems that the herbaceous plants have been losing, due to human interference with natural systems of balance. Restoration scientists understandably are rushing forward to apply their craft in behalf of the vanishing herbaceous understorey. But the savanna could still exist without any single plant species, except for one: the bur oak, with a little help from some of its co-generic counterparts, is the sole element that defines our oak savannas, and creates the conditions that make them what they are.

How much thought do most of us give to the management of the oak resource, other than as an increaser to be beaten back? Have we considered the long-term welfare of this strategic element?

Transplanting

Some oaks will transplant better than others, and this again relates to the nature of their root systems. Oaks that normally occur in sandy soils have long, wide-ranging, and sparsely branched roots that are difficult to preserve when digging. A young oak dug from sandy soil often will have only a few unbranched root stubs which cannot possibly provide enough new fine roots for absorbing sufficient water for the transplanted tree. Oaks which in nature occur on clay soils or in swampy situations are likely to have compact and finely branching root systems. Thus a newly dug tree, especially when transplanted with a ball of earth, will probably have a multitude of fine roots which can form sufficient new fine roots and assure survival and establishment of the tree.

The production of healthy, non-stunted, green leaves is evidence that a young oak is becoming successfully established. The weeks following leaf-out are important to a young tree, as this is the period of most active photosynthesis, or food production. Even though photosynthesis continues more slowly into July, this is also a critical time because if the soil dries out, the roots may not be able to take up sufficient water to replace rapid losses from foliage. Fortunately, the need for periodic watering of newly planted trees is generally understood and appreciated. Thorough soaking of the roots every few days is better than daily light watering.

Rate of Growth

Fast-growing trees seem to have a special appeal to homeowners in today's mobile society, even though in general such trees tend to be shorter-lived and suffer more breakage. How fast do oaks grow? In the book Aristocrats of the Trees, E.H. Wilson claims that oaks are not really slow-growing and that in the long run they grow more rapidly than many other shade trees. However, oaks generally do grow slowly while becoming established, and the growth rate may not accelerate for three to five years. Our observations of oak growth at the Morton Arboretum suggest that pin oak, red oak, and English oak grow moderately rapidly and that white oak and bur oak grown somewhat less rapidly. Most oaks also seem to be resistant to wind damage. Both their strength and longevity enhance the value of real estate.

Oak Problems

It is true that oaks are subject to several common insect and fungus problems, ranging from a few which may jeopardize the health of trees, to others that are merely aesthetically objectionable. Cankerworms, or inchworms, may defoliate and disfigure oaks at a time when the young leaves are just beginning their food production for summer; if extensive, this can deplete an oak and threaten its health. Late summer attacks on foliage, after food production is nearly completed, may be little or no threat to the health of the tree.

Oak wilt, a disease in which a fungus blocks the passage of water from roots to leaves and produces wilting, can be a serious problem, particularly when the whole crown is affected. Sometimes one sees the persisting brown leaves of a dead tree or group of trees in the midst of a green forest. This disease tends to affect species of the red oak group much more than those of the white oak group.
Insect galls (enlargements of leaf or stem tissue caused by the larvae of tiny wasps, so small that they are rarely seen as adult flying insects) come in many shapes and sizes and are usually only slight disfigurements, rarely affecting tree health.

Building Near Oaks

A common problem in neighborhoods where homes have been built on wooded lots is a decline in vigor of oak trees. This has been termed "oak decline", and the most common evidence of it is the failure of the uppermost branches to leaf out in spring. Decline may result in gradual or sometimes fairly rapid death of the trees involved. Oak decline does not seem to involve any insect, fungus, bacterium or other causal organism, but seems to result from the abrupt changes in the oak tree's environment caused by construction and landscaping, especially the destruction of the soil/air interface to which the finely branched surface root system has become attuned over a period of many decades. The less the root system of oaks are disturbed during construction, the better the chances for tree survival.

Selecting and Obtaining Oaks

The oak species most commonly offered by nurseries is the pin oak, *Quercus palustris*, and virtually all of the planted oaks in urban landscapes in the Chicago region are this kind. However, there are other oak species that are worthy of consideration for home landscapes here, most of them native to North America. Some are evaluated below.

Because few kinds of oaks are commonly available from nurseries, growing trees from acorns is a possible means of establishing specimens of the species in this list. All of the oaks listed except shingle oak, pin oak and northern red oak produce acorns that germinate immediately if they are planted soon after the acorns are gathered in the fall. The best procedure is to plant acorns in a pot of commercial potting soil indoors in fall or winter. The young plants should appear in two to four weeks and may be treated as house plants for a while. After attaining a height of a few inches they may cease growth. Sometime the leaves wither and drop off, however, a few weeks later a new set of leaves appears and a few more inches of growth usually occurs. In May, the seedlings may be transplanted in separate pots or they may be planted outside. Shingle oak, pin oak, and northern red oak may be refrigerated in tightly sealed plastic bags or they may be planted in pots and kept in moist soil in an unheated space where freezing does not occur. Caution: acorns may lose viability in a few day at household temperature and humidity.

A Selection of Oaks

*Quercus acutissima, Sawtooth Oak*

Sawtooth oak is native to China, Korea and Japan. It has a straight central trunk and becomes broadly or sometimes narrowly conical in form as it matures. Branches often occur from the ground up. In silhouette the tree has an attractive symmetry and a pleasingly even outline. It may reach a height of forty to fifty feet. The lobeless, toothed leaves are lustrous and elongate, resembling those of a chestnut. The foliage, with its rich tawny fall color, is rather dense and persists through the winter. This characteristic makes the tree useful for windbreaks and for visual screening.
crown even as a young tree. It seems to become no more than forty to sixty feet tall in our area, though it grows much larger in other areas. Here it sometimes develops a dieback of the top limbs. Its small leaves have rounded lobes, and sometimes a bluish cast.

English oaks are relatively easy to transplant and may be found at some of the nurseries of this region. It is easily grown from the very large and sometimes prolifically produced acorns.

**Quercus rubra**, Northern Red Oak

Northern red oak is native to the eastern and central United States and is found in our local woodlands. It is an attractive tree with large, glossy leaves with sharp-tipped lobes. It grows moderately rapidly, developing a straight trunk with branches that usually extend somewhat upward. Like white oak, it suffers when forests are drastically modified with the construction of homes. Unlike white oak, it is more commonly seen as a planted shade tree.

Northern red oak can be transplanted rather easily and is generally available from nurseries. It is easily damaged by drought when it is young, and it does not compete with grass as well as do most shade trees. It requires ample space for the horizontal spreading of its root system and its crown, as it becomes quite large, sometimes as tall as seventy-five feet or more. It is easily grown from acorns that have been in sealed containers under refrigeration for planting in spring.

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**THE BIGGEST BUR OAK**
by Deborah Gangloff
from *American Forests*, January/February 1991

This bur oak has reigned as champ since 1980, when it was nominated by Owen H. Robinson, now a retired district forester for Kentucky’s Division of Forestry. It stands near a pond on the 1,140-acre Indian Creek Farm, a horse, hay, and tobacco operation near Paris, Kentucky.

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Although this stately tree has suffered the indignities of lightning strikes a few times in its long life, it has held its own among the bur oaks. The tree is a symbol of the farm and is shown on its stationery and work hats.

Twenty seedlings transplanted from the shade of the champ to one of several wild areas on the farm were killed by frost last year. The owners are determined to try again to preserve the progeny of this nationally renowned oak.

Sawtooth oak grows moderately rapidly at the Morton Arboretum, but in the Chicago region, is little known and rarely seen as a planted tree. It is listed in a few nursery catalogs and seems to be a very promising tree for urban landscapes. The tree produces abundant acorns when only a few years old. These germinate readily, making this an easy tree to grow from seed.

**Quercus alba**, White Oak

A common tree of northern Illinois forests, the white oak may attain a height of sixty to one hundred feet and live more than two hundred years. A white oak with room to grow may attain a massive size with a very broad, rounded, symmetrical crown.

All of the large white oaks in northern Illinois are bequests from forests that have taken centuries to develop to their present state. When homes are built in a woods and selected specimens retained for shade and amenity, the abrupt transformation of surroundings is often devastating to white oak, as this tree has a special dependence upon the forest environment. The shelter created by a nearly continuous canopy for forest trees, which favorably modulated the temperature and moisture in the atmosphere and soil, is necessary for this oak. Removing the surrounding forest usually initiates decline or death for the trees that have been singled out to be saved! A large part of the problem seems to be the modification of soil environment brought about by the opening up of the woods and the damage (compaction, scraping, filling, etc.) done by heavy construction machinery.

White oak is seldom seen as a planted tree, probably because it transplants with difficulty. It does not grow well in clay soils, especially those with spring wetness problems. It is probably best established by planting very small saplings in well-drained soil and providing a mulch for many years. White oaks are stocked by only a few nurseries in this area.

**Quercus bicolor**, Swamp White Oak

Swamp white oak is one of the most suitable of the native oaks for landscape use in the Midwest. It is at home in floodplains and swampy places and grows satisfactorily where planted in inhospitable clay soils, a desirable attribute for success as an urban tree. In the natural landscape this oak sometimes attains massive size and great age, but as a planted tree usually reaches only sixty to seventy feet in height. It grows moderately rapidly. On young tree the central trunk may be evident well into the crown of the tree. Old trees may have a broad vase-like shape. The slightly lobed leaves are glossy green on the upper side and whitish on the lower.

Though swamp white oak is a desirable shade tree, it is available at very few nurseries in the Midwest area. It is quite easy to grow from acorns. Young saplings are not too difficult to transplant.
Quercus macrocarpa, Leaf with distinctive cup.

Shingle oak makes an attractive ornamental or shade tree, but is not commonly planted. It is available at very few nurseries. It is easily grown from acorns, but acorn crops are irregular and birds and small mammals may quickly consume whole crops.

Quercus macrocarpa, Bur Oak

The coarsely-branched but graceful bur oak is a bold and impressive element of Midwestern landscapes. In pre-settlement times, it was found in open groves in the prairie, and huge specimens -- three hundred years or more in age and reaching heights of eighty to one hundred feet -- may still be found here and there. Bur oaks of all sizes are common in the region, especially in open woodlands. Young bur oak saplings grow rather slowly, but growth accelerates after five or six years, producing an impressive young tree by the tenth year. It is unfortunate that the slow start seems to deter people from planting bur oak, as it is a greatly valued tree when mature, and greater planting for shade and enhancement of home landscapes is desirable.

Bur oak can be transplanted as a young sapling if care is taken, but it becomes more difficult with trees more than six to eight feet tall. Mulching the young tree and protecting it with stakes is desirable. Seedlings for transplanting can sometimes be found during the spring after a year of high acorn production. This oak can be found at a few nurseries in this region, and it is easy to grow from acorns.

Quercus muhlenbergii, Chinquapin Oak

Chinquapin oak is native to eastern and central United States and is an uncommon tree of uplands and slopes, thriving on alkaline soils. It has glossy, large-toothed (or finely lobed) leaves that are rather small in comparison to the leaves of most oaks. For many years, young chinquapin oaks retain a pyramidal to oval crown, dominated by a conspicuous, white-barked central trunk. As trees get older, the crown becomes more rounded. The tree may become more than one hundred feet tall, but usually considerably less.

Growth of young chinquapin oaks is moderately fast. The tree's satisfactory performance on alkaline clay soils makes it a good possibility for landscape use in our region. However, it is not at all common on the natural landscape in the Midwest, and because its acorns are quickly consumed by birds and mammals, it is not easy to obtain acorns for propagation. Perhaps this explains its uncommonness as a landscape tree. It is easily grown from acorns but is rare in nurseries.

Quercus palustris, Pin Oak

Pin oak, a native of our eastern and central state, is commonly planted along streets in the Midwest and East Coast. It is easily recognized from a distance by its straight trunk and many horizontal branches, especially in winter when brown foliage persists. The pointed-lobed leaves are commonly a brilliant red in autumn. The place of pin oak in the natural landscape is on poorly drained soils, where it may grow to heights of sixty to eighty feet or more. It grows rapidly after a year or two of establishment. Its shallow, compact root system makes it easy to transplant, and this is probably a reason it is the most frequently planted oak in urban situations.

The yellowing of leaves (chlorosis) may be a serious problem with planted pin oaks here. This condition is attributable to iron deficiency resulting from the availability of iron in the alkaline soils that are so widely characteristic of the glacial landscape of northern Illinois. It is possible to correct chlorosis by applications of chelated iron, but the treatment must be repeated yearly. Trying to solve the problem by modifying the soil to reduce alkalinity is very difficult. For these reasons the desirability of planting pin oaks is perhaps questionable. Pin oaks are easily grown from acorns and are available at most nurseries.

Quercus prinus, Chestnut Oak

The chestnut oak, another native of the eastern and central United States, is a handsome tree which reaches about forty to sixty feet in height. It has a straight, dark, central trunk with a conical to rounded crown. Its glossy, wavy-edged leaves have long yellow petioles that create a special foliage effect.

This oak grows moderately fast once established. Young trees are not too difficult to transplant and seem to fare quite well as landscape trees in the Midwest. Unfortunately, this oak is not yet offered by nurseries of this area. It is easily grown from readily germinated acorns.

Quercus robur, English Oak

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**Quercus imbricaria**, Shingle Oak

Shingle oak, a native to the eastern and central United States, is an attractive medium-sized tree with a dense, nearly symmetrical, conical to rounded crown. It attains a height of forty to fifty feet. On the natural landscape it is found in fencerows, old fields, disturbed woodlands, and on fringes of forest. It is unusual among oaks in that its leaves are neither lobed nor toothed but have an entire margin and somewhat resemble the leaves of a magnolia. The brown leaves do tend to persist in winter, a frequently occurring feature of oaks, and thus provide screening.