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**Cover: *Quercus muehlenbergii* (an ancient specimen)  
photograph by Guy Sternberg**

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**table of contents**



<u>Letter From the Editor</u> .....	2
<u>Management and Silvicultural Practices Applied</u> .....	3
<u>To Pine-Oak Forest in Durango, Mexico.</u> by V. M. Hernandez, F. J. Hernandez, and Santtiango S. Gonzales.	
<u>Distribution of Oak in the State of Sonora, Mexico.</u> .....	6
by Luis M. Islas.	
<u>Ecology of Oak Woodlands in the Sierra Madre</u> .....	7
<u>Occidental of Mexico.</u> by V. M. Hernandez, F. J. Hernandez, and Santtiango S. Gonzales.	
<u>Mexican Magic</u> (excerpts).....	10
by John G. Fairey and Carl M. Schoenfeld	
<u>Chinkapin Oak: Satisfaction for the Homeowner,</u> <u>Skulduggery for the Botanist.</u> .....	17
by Ross C. Clark.	
<u>The Acorn Odyssey.</u> .....	21
by Len Stubbs.	
<u>First I.O.S Conference information</u> .....	25

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## LETTER FROM THE EDITOR

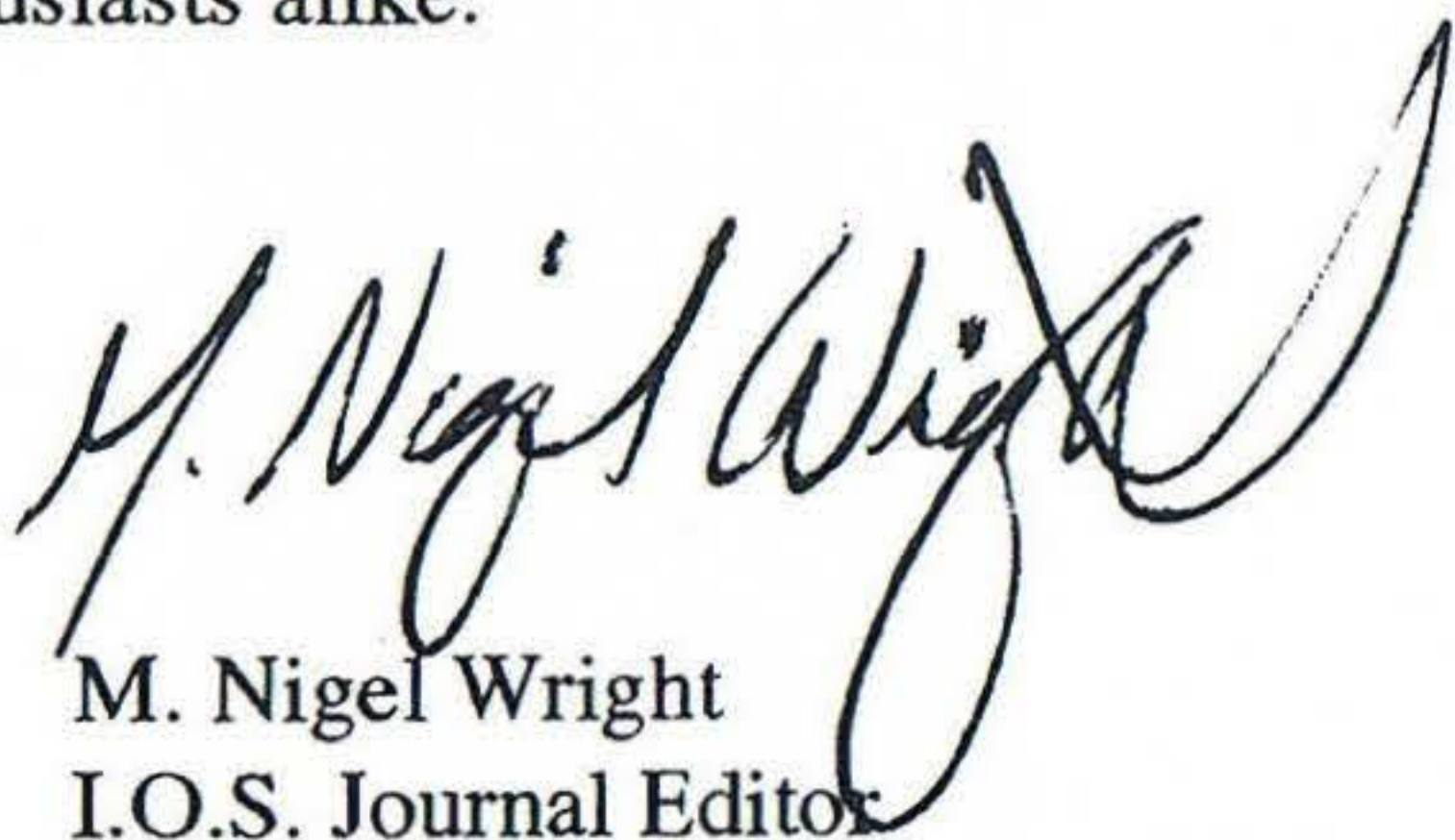
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This year has brought many changes and perhaps a few strange and trying situations such as the record snowfall and record low temperatures that hit the eastern part of North America this past winter. Some of us will wonder how their highly regarded plants (young oak trees of course !) have faired over the winter months. For those in the Northeast of America, we are looking forward to spring with a hunger and thirst that is quite boundless, verging on the violently impatient. For an "International" organization such as the International Oak Society, I don't like to linger on one geographic region to avoid an impression of regionalism, but I wish everyone a joyous spring and relief to the burdens of winter. To those of you in the southern hemisphere, like Mr. Len Stubbs, I hope that your coming winter will be a mild one. My advice for future winter survival is a well-planned trip to a topical island paradise.

Whilst we are on the topic of spring a sense of rejuvenation is instilled and we look forward to the season to come, with the many lessons to be learned from our journeys into the plant kingdom. Certainly, this year holds much promise as the foundations are being set for the First International Oak Society Conference at The Morton Arboretum, Lisle, Illinois U.S.A., at this very moment. Just to meet with the people that we have been corresponding with over the last few years would be enough of an event, but the multitude of lectures and activities planned is virtual extravaganza. Much credit and thanks is due to Mr. Guy Sternberg, who has worked hard to arrange this event, along with the kind cooperation of The Morton Arboretum. I hope that all our members will try to make an extra special effort to attend this historic event as we inaugurate the International Oak Society.

I would like to extend a warm welcome to our new members, especially those of you who sent oak related articles from your geographic region or specific field of interest, we are always looking for such diverse information to include in our journal publication. Please forgive me if I haven't replied to your kind and enthusiastic letters promptly, but unfortunately, the demand on our time seems to be increasing as our membership grows, therefore, limiting our ability to reply to your letters.

In summary, the future of the I.O.S. is bright as the membership has been increasing rapidly. Such membership growth affords better printing for the Journal as witnessed in this issue. To better serve its members and work to its goals of oak research, I strongly believe that the I.O.S. must now shift its gears from a volunteer commitment to a full-time operation. Hopefully we will be able to address the setup and structure of the society at the upcoming conference, until then we will endeavor to entreat you with tidings of oak enthusiasts alike.

  
M. Nigel Wright  
I.O.S. Journal Editor



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# MANAGEMENT AND SILVICULTURAL PRACTICES APPLIED TO PINE-OAK FOREST IN DURANGO, MEXICO<sup>1</sup>

by  
Victor M. Hernandez C., Francisco J. Hernandez,  
and Santiago S. Gonzales<sup>2</sup>

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## Study Area

Durango state is located in the northwest region of Mexico. It is surrounded by Chihuahua state in the North and Northeast, Coahuila and Zacatecas in the East, Jalisco and Nayarit in the South, and Sinaloa in the West (Inegi, 1988; Zavala, 1985). It has an area of 11,964,800 hectares.

Half of Durango territory is located on the Sierra Madre Occidental with a 125 km width, 425 km length and mean altitude of 2500 m. The remaining area is located on the altiplanicie (high plain) Mexicana. The lowest altitude record is registered at Tamazula, Durango, with 250 m and the highest record reaches 3,300 m at the Huehuento Mountain.

According to the broad diversity in climatic and physiographic conditions throughout the state, Durango is divided into four regions, each one with characteristic types of vegetation. These physiographic regions are:

1. The Quebradas Region - It is characterized by its tropical type of vegetation (deciduous tropical forest and semi-deciduous tropical forest). It is located on the west side of the Sierra Madre Occidental, in an altitude range from 27 to 500m; with a warm and subhumid climate and a summer rainy season. The annual mean precipitation is 1250 mm in this region (Zavala, Z. 1982, Gonzalez, S. 1985).

2. The Mountains or Central Region - It involves the highest elevations of the Sierra Madre Occidental, and it is mainly covered by coniferous forest (pure pine forest, mixed pine-oak forest, and grassland-shrubs forest). The mean altitude is 2600 m; there are some mountains higher than 3000 m. It presents a temperate-cold climate with a very intensive rainy season in the summer. The annual mean precipitation varies from 500 to 1200 mm. There are many forest species growing throughout this region; however, the most important genera in this area are: *Pinus*, *Quercus*, *Cupressus*, *Abies*, *Pseudotsuga*, *Juniperus*, and *Arbutus* (Gonzalez, S. 1985, Zavala, Z. 1982 and Rzendowski, J. 1981).

3. Valleys Region - It involves great plains that form extensive valleys along the east side of the Sierra Madre Occidental. The most important types of vegetation growing in this area are grassland-oak Juniper forest and grassland-shrubs communities. The common

<sup>1</sup> Paper presented at the Symposium on Ecology and Management of Oak and Associated Woodlands: Perspectives in the Southwestern United States and Northern Mexico, April 27-30, 1992, Sierra Vista, Arizona, United States.\*

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\*Note: Edited for *The Journal of the International Oak Society*

genera in these areas are: *Quercus*, *Juniperus*, *Pinus*, *Arctostaphylos*, *Arctos*, *Populus*, *Salix*, *Acacia*, *Prosopis*, *Echinocactus*, *Coriphanta*, *Yucca*, *Boutelovua*, *Aristidia*, and *Eurphybia*. The annual mean precipitation varies from 700 mm to 400 mm and the rain takes place during the summer season.

4. The Semiarid Region - It is located at the East of Durango state. It involves different types of desert vegetation and the main genera are: *Acacia*, *Cactus*, *Agave*, *Bursera*, *Mimosa*, *Larrea*, *Parthenium*, *Yucca*, *Celtis*, *Dasyilirion*, and *Fouquieria*, *Forestieria*. It is formed by long prairies with an altitude from 1100 to 2100 m. The climate is warm and dry with a mean temperature about 23°C. The annual mean precipitation ranges from 150 to 500 mm and the rainy season occurs in the summer. It has a dry season during seven to nine months.

### The Oak Forest

In Durango state, the oak type of forest is located not only on the Mountains of the Central Region mixed with pine species, but it also forms a narrow transition zone between the pine-oak forest and the tropical forest at the west side of the Sierra Madre Occidental. There are other oak species on the transition zone at the east side of the Sierra Madre; they are mixed with *Juniperus*, *Arctostaphylos*, *Arbutus*, and pinyon pine.

In Durango state, the oak forest grows in a temperate-cold climate with an intensive raining season occurring in summer. It is mixed with *Pinus*, forming mixed pine-oak forests in the mountains regions. There are small areas with a temperate and semi-dry climate in the East of the Mountain Region where oak species are growing mixed with some forest species such as *Arbutus chiapensis*, *A. xalapensis*, *Juniperus monosperma*, *Arctostaphylos pungens*, *Pinus cembroides* (pinyon pine) *Pinus engelmannii* and some grassland species as *Boutelovua* spp.; *Aristida*, etc. There are also a few oak species in the Quebradas region growing mixed with tropical species within a warm and humid climate (Rwendowski, J. 1981). According to the altitude, *Quercus* grows on a range of 600m to 2400 m in the Quebradas Region and 2000m to 2400 m in the middle part of Durango State.

*Quercus emoryi*, *Q. virens*, *Q. macrophylla*, *Q. arizonica*, *Q. intrinseca*, *Q. crassifolia*, *Q. hartwegii*, and *Q. cordifolia* are deciduous species growing as trees or as small shrubs.

At the Quebradas Region and a small area in the Mountain Region, the main oak species is *Quercus macrophylla*, mixed with tropical species such as *Acacia pennatula*, *Ipomea arborences*, *Bursera* spp., and some conifers like *Pinus michoacana*, *P. oocarpa*, *P. lumholtzii*, *P. tenuifolia*, *P. douglasiana*, and *P. leiophylla*.

There are other types of forests stands (grassland-oak-juniper forest) in the transition zone and the dominant species are: *Quercus cordifolia*, *Q. emoryi*, *Q. chihuahuensis*, and *Q. macrophylla* mixed with *Juniperus monosperma*, *Pinus cembroides*, *P. chihuahuana*, *P. lumholtzii*, *P. engelmannii*. This type of forest is located in the Valley Region forming a transition zone with the Mountain Region.

In the Mountain Region, within the pine-oak forest, the more common *Quercus* species are: *Quercus arizonica*, *Q. durifolia*, *Q. sideroxyla*, *Q. rugosa*, *Q. laxa*, *Q. omissa*, *Q. nigra*, *Q. obtusata*, *Q. resinosa*, and *Q. castanea* growing mixed with *Pinus duranguensis*, *P. cooperii*, *P. herrerae*, *P. ayacahuite*, *P. teocote*, *Arbutus xalapensis*, *A. chiapensis*, *Alnus* spp., *Cornus* spp., *Prunus* spp., *Abies duranguensis*, *Picea chihuahuana*, *Cupressus arizonica* and *Pseudotsuga* spp.

### **Silviculture and Management Practices of Pine-Oak Forests**

The silvicultural treatments applied to pine-oak forests are focused upon conifers (*Pinus* spp.). Selection thinnings and regeneration cuttings are applied to mixed pine-oak stands based on age, density and stand conditions.

Ecological restrictions are considered to protect soil, wildlife and natural resources associated with oak woodlands.

At the present time, girdling of oak trees is a common management practice to establish natural pine regeneration and protect the soil. However, the results of this practice are not well documented.

The management practices applied to grassland-shrub oak forests are detrimental to natural vegetation. Cattle overgrazing and fuelwood consumption for domestic use are contributing to soil erosion and resulting in a low-quality shrub-oak forest.

### **Conclusions**

According to the scarce studies conducted on oak woodlands, there is an urgent need for basic studies on the biology, ecology and management practices of Mexican oak species, as well as the effects of silvicultural practices such as girdling and harvesting operations on the ecology of pine-oak forests in Durango.

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# DISTRIBUTION OF OAK IN THE STATE OF SONORA, MEXICO<sup>1</sup>

by Luis M. Islas<sup>2</sup>

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The State of Sonora, situated in the northeastern part of the Mexican Republic, presents numerous and varied climates that promote floristic diversity in arid and semi-arid as well as more temperate climates. These more temperate climates, found in the mountainous regions in the Northeast, East, and South of the state, support a great diversity of oaks. These oaks are associated primarily with conifers at the highest elevations, and form a part of the natural grasslands in the North, including the counties of Magdalena de Kino, Nogales, Imuris, Cananea, Santa Cruz, Bacoachi, Nacozari, Bacerac, Bavispe, and Huchineras.

The oaks are found in 8 of the 22 vegetation types identified by SAHR-COTECOCA and published in 1986. The most important of these vegetations types, according to the presence and number of species of *Quercus*, are: deciduous oak woodland, located in the coldest part of the state, in the counties of nacori Chico, Sahuaripa, Yecora and Alamos, where 18 of the 30 species of oak are found; and the oak-pine forest, with a similar distribution and 17 species of oaks. The arbofrutescent (shrubby vegetation) mid-grassland is the vegetation type of greatest area, and 32 species of oak are found there. The oaks are found over an area of about 3,585,000 hectares, dominated by the arbofrutescent vegetation type of 1,710,000 hectares and the deciduous oak woodland with 265,000 hectares.

## Uses

At present, the oak species are little utilized, their principal uses being for the construction and maintenance of corrals, fences, and habitations by ranch owners. The potential of these species as lumber, firewood, and charcoal is not being realized. The finishing of the lumber is the primary constraint.

The acorns of all species are consumed by cattle and wildlife, and at least one edible species, *Quercus emoyi* is gathered for food and commercial markets.

## Taxonomy

*Quercus arizonica*, *Q. chihuahuensis*, *Q. emoryi*, and *Q. oblongifolia* have been identified from the forested areas of Sonora, as well as other woodland and grassland species.

<sup>1</sup>This paper was presented at the Symposium on Ecology and Management of Oak and Associated Woodlands: Perspectives in the Southwestern United States and Northern Mexico, April 27-30, 1992, Sierra Vista, AZ.\*

<sup>2</sup>Ing. Martínez is with the Subdelegado Forestal, Secretaria de Agricultura y Recursos Hidraulicos (SARH), Delegacion Estatal en Sonora, Hermosillo, Sonora, Mexico.

\*Note: edited for The Journal of the International Oak Society.



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# ECOLOGY OF OAK WOODLANDS IN THE SIERRA MADRE OCCIDENTAL OF MEXICO<sup>1</sup>

by  
Victor M. Hernandez C., Francisco J. Hernandez  
and Santiago S. Gonzales<sup>2</sup>

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## Introduction

Oak woodlands are found in all Mexico, except the Yucatan state. The *Quercus* genus is characterized by having a wide adaptation variability, and it can be found in temperate, subtropical, tropical and semi-desertic regions as dominant or complementary species in association with other woody species.

Mexico is well known as a country with a very high biodiversity, and the Mexican forests have different pine-oak associations, with more than 200 species of classified oaks (Bejar, H.G., 1982); however, the precise number of oak species in Mexico is not exactly known.

The *Quercus* species are classified in several selections, and three selections have been documented in Mexico: The erythrobalanus (lobatae) or red oaks, composed of 53 species which represent 49% of the known Mexican *Quercus* species; lepidobalanus or white oaks, with 52 identified species; and the intermediate oaks (red-white oaks), the smallest group with 3 known oak species that correspond to the protobalanus and represent three percent of the identified oaks in Mexico (Zavala, Ch. F., 1991). This taxonomic section has a small distribution in North Baja California and close islands, and it is considered the transition group between the red and white oaks (Valdez, T.V. and Aguilar, e. Ma. L., 1983). At the present time, subgenus cyclobalanopsis has not been documented in the Mexican forests.

## Oak Distribution in Mexico

Some oak species can be found in a wide range, growing in many Mexican states; meanwhile, other species grow in different environmental conditions within the same state. Other endemic species grow in special environmental conditions.

Some examples of oak species that have a wide range of variability are: *Quercus rugosa*, a white oak documented in 22 Mexican states; and red oaks *Q. castanea*, *Q. candicans*, *Q. laurina*, growing in 20, 18 and 17 states, respectively; *Quercus laeta*, classified as a white oak can be found in 16 states; at the same time, *Q. crassifolia* and *Q. obtusata*, a red oak and a white oak, respectively, are represented in 15 states.

Zavala (1991) describes the following species which each grow in only one state: *Q. agrifolia* exists in Baja California; *Q. benthami*, *Q. bogueroanae* and *Q. crispifolia* can be found in Chiapas State; the environmental conditions in Nuevo Leon State are adequate to grow *Q. cupreata* and *Q. durani*; *Q. undulata* exists in Coahuila State; *Q. ocarpa* is found in Jalisco State; *Q. brandegei*, *Q. devia* and *Q. cendrocencis* are found in Baja California; *Q. duratifolia*, *Q. monserratisensis* and *Q. paxtalensis* are documented as endemic species of the Chiapas State.

<sup>1</sup>This paper was presented at the Symposium on Ecology and Management of Oak and Associated Woodlands: Perspectives in the Southwestern United States and Northern Mexico, April 27-30, 1992, Sierra Vista, Arizona, United States.

<sup>2</sup>Centro de Desarrollo Forestal, A.C., Durango, Durango, Mexico.

In contrast, some states exhibit a great variability of oak species. For example, Jalisco State has the highest species diversity. It has been determined that this state has the environmental conditions to grow 41 oak species. Michoacan State follows in number of species with 31 oak species. The states of Durango and Veracruz have 30 and 28 species, respectively. In each one of the states of Chiapas, Mexico, Hidalgo and San Luis Potosi exist 26 oak species.

Studies in Nuevo Leon and Oaxaca States reported 25 oak species. And the states with more than 20 oak species documented are Chihuahua, Puebla, Guerrero and Sonora. In contrast, the states of Tabasco, Campeche and Quintana Roo have only *Q. oleoides* (white oak). At the same time in the state of Tlaxcala have been found seven oak species.

Zavala, Z. R. (1991) mentions that in Durango State the most common oak species are *Q. arizonica*, *Q. intricata*, *Q. crassifolia*, *Q. hartwegii*, *Q. chihuahuensis*, *Q. cordifolia*, *Q. grisea*, *Q. emoryi* and *Q. juniperus*. These species are associated with pine species such as: *Pinus cooperi*, *P. durnaguensis*, *P. chihuahuana*, *P. teocote*, *P. leiophylla*, *P. engelmannii*, *P. herrerae*, *P. cembroides*, among other species.

### Climate and Soil Condition of Oak Woodlands

The soil where these species are established is podsollic, brown and 20-25 cm deep. The humus is grey and the pH is strongly acid. In general, these soils have lower amounts of nitrogen, phosphorus and potassium. In addition, Perez O. de las Paz C. (1982) mentions that in Durango are found *Q. convallata*, *Q. sideroxyla*, *Q. potosina* and *Q. obtusata* (red oak). These species exist in association with other genera such as *Pinus*, *Alnus* or *Juniperus*. These species are found at altitudes from 2400m - 2600m. The temperature varies from 14°C to 18°C.

The state of Michoacan is very important from the point of view of forest production. A great diversity of forest species can be found in this state. The *Quercus* spp. that grow in this forest range are *Q. crassifolia*, *Q. candicans*, *Q. rugosa*, *Q. castanea*, *Q. obtusata*, *Q. laurina*, *Q. conspersa*, and *Q. resinosa*. These oaks are found in mixed stands or pure stands with *Pinus michoacana*, *P. pseudostrobus*, *P. douglasiana*, *P. lawsonii*, *P. pringleyi*, *Alnus firmifolia*, *Carpinus caroliniana*, *Clethra mexicana*, *Arbutus xalapensis*, *Acacia pennatula* and other species. The soils where these species are growing are volcanic andosols and podsollic, with 6.7 to 6.92 pH. The climatic conditions are semiarid and subhumid with abundant rain in the summer season. The annual precipitation mean is 1335 mm and the average temperature is 16°C. The altitude is 1700m to above 2000m (Bello, G. MA. and Bejar, M. G., 1982).

Valdez, T.V. and A. E. Ma. L. (1983) reported that in the state of Nuevo Leon are established the following oak species: *Q. fulva*, *Q. gregii*, *Q. hypoxantha* and *Q. sideroxyla*. These species are found associated with *Pseudotsuga* spp., *Abies* spp., *Juniperus* spp., *Cupressus* spp., *Populus* spp. and other genera. These oak species are found in other states. For example *Q. fulva* is found in Nayarit, Chihuahua, Durango and Sinaloa, also *Q. gregii* grows in Coahuila, Tamaulipas, San Luis Potosi, Durango and Hidalgo. At the same time, *Q. hypoxantha* grows in Coahuila and San Luis Potosi. *Q. sideroxyla* is found in Chihuahua, Durango, Zacatecas, Aguascalientes, Guanajuato and San Luis Potosi.

These oak species grow at altitudes from 2500 m to 3470 m. The mean precipitation is above 1000 mm per year. The temperature is from 5.8°C to 10.8°C.

In summary, the high oak species diversity in Mexico requires detailed studies in order to know the best management practices for the oak woodlands nationwide.

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*Quercus canbyi* Chipinique Park, Nuevo Leon, Mexico- Elevation 3000'  
Photograph © Guy & Edith Sternberg

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*excerpts from* **MEXICAN MAGIC**  
by John G. Fairey and Carl M. Schoenfeld

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**Quercus (evergreen oak, zone 7)**

As a result of Lynn Lowrey's foresight and tireless efforts for over 25 years, numerous evergreen oaks from northeastern Mexico are now well-established in the Texas landscape. Most noteworthy are *Q. risophylla*, *Q. canbyi* and *Q. polymorpha*.

The ability of these trees to adapt to adverse growing conditions is amazing. *Q. risophylla* performs best in neutral or slightly acidic soil, but *Q. canbyi* and *Q. polymorpha* will adapt to almost any soil. All of them, once established, are extremely drought-tolerant. Any tree that can survive and grow in the generally poor soil and scorching heat of our Texas cities has to be tough.

Many of these fine oaks have been established for over 20 years and are growing into magnificent specimens. Each has a distinctly different form, leaf color and texture, thus introducing a whole new aesthetic dimension to the landscape -- a welcome relief from the countless numbers of *Q. virginiana* that have been overused in Southern landscapes for years.

In central Texas, oak decline has been increasing and is destroying entire colonies of large *Q. fusiformis* trees, the dominant evergreen oak species in the Hill Country. Fortunately, *Q. polyphorma* and *Q. canbyi* are proving much more resistant to this fungus and can be used to help replace the much-needed source of shade that is being lost.

Reportedly, over 400 species of oak exist in Mexico. Therefore, untold numbers of species have yet to be tested in the U.S. and we are always on the lookout for those with landscape potential. During the past five years, we have collected acorns from many colonies of oaks with widely varying characteristics.

The following selections from Mexico each have unique qualities to distinguish them from others. All are handsome, sturdy trees that add much-needed diversity of color, texture and form to our landscapes. However, many of these oaks have not yet been identified, so their species remains a mystery.

**Quercus (La Encantada oak, zones 7 to 9)**

In 1991, J.C. Raulston joined us on an expedition that included exploring a high mountain range in the southeast corner of Nuevo Leon. Near the small village of La Encantada, at 7,000 feet altitude, we encountered a large colony of very stately evergreen oaks. J.C. thought these to be the finest oaks he had ever seen in northeastern Mexico, and he collected some cuttings.

At maturity, this oak will reach a height of 100 feet; its form is dense and cylindrical. The gray, slightly furrowed trunks are a stunning support for the compact limb structure. Leaves

are 1 1/2 inches long by 1/2 inch wide, glossy dark green and sharply pointed at the tips. In early spring, the tree sheds its leaves and the new foliage emerges a showy bronze and remains this color for several weeks.

To propagate this oak, lay the acorns horizontally on top of the soil. If kept moist, they germinate quickly. As a result of our extreme summer heat in Texas, young trees are difficult to grow in containers. But once planted in the ground, they catch on and grow 2 to 3 feet each year.

### Quercus (Spinoza oak, zones 7 to 9)

In 1989, we noticed this unusual evergreen oak growing in a deep canyon, approximately 30 miles south of Monterrey in Nuevo Leon at 5,200 feet altitude. Thus far, we have located only one specimen of this plant. It is well over 80 feet tall, and its form, leaf color and texture make it stand out as very special.

The other oaks in the immediate vicinity are *Q. risophylla* and *Q. sartorii*; several botanists have suggested that Spinoza oak is possibly a natural hybrid of these two species. Whatever its origin, it is an exceptionally fine tree that merits attention.

The leaves of Spinoza oak are 6 to 8 inches long by 3 inches wide, glossy, bright olive green and of medium texture. The size, color and texture of the leaves are similar to those of *Q. risophylla*, but the border of the leaf is different. The leaves of *Q. risophylla* have an almost smooth edge with only an occasional 1/4-inch-long arista at the end of each leaf. Spinoza oak's leaves, on the other hand, have undulating edges lobed with 1/2-inch-long aristas, similar to the leaf edge of *Q. sartorii*.

Another striking feature of Spinoza oak is its bright red-purple flush of foliage in spring, which continues off and on during the growing season. This tree is easily propagated from acorns collected in fall and planted immediately. Plants will come true to type from acorns. From our 1989 collection trip, we have trees that have reached 10 feet in height.

### Quercus (Zaragoza oak, zones 7 to 9)

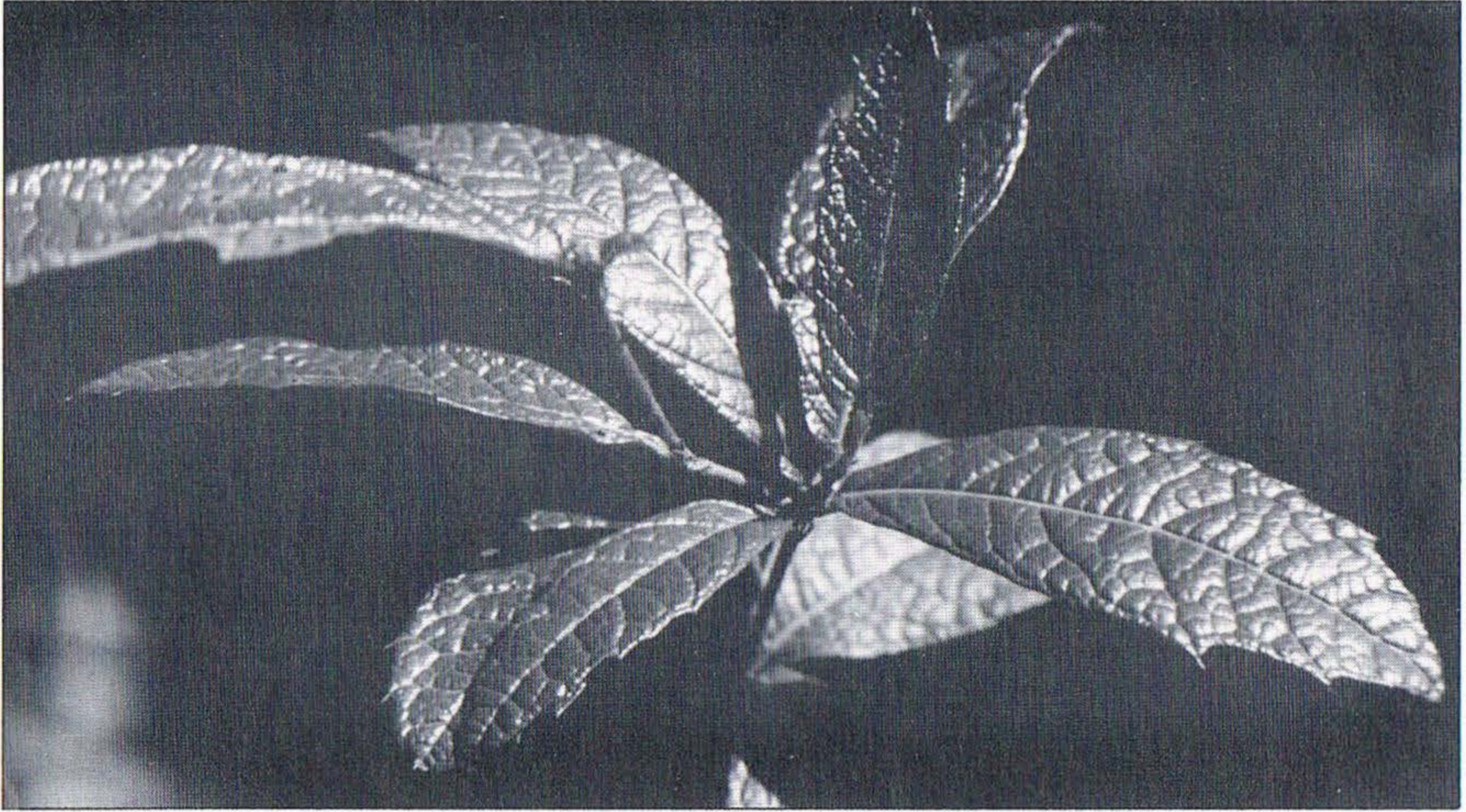
In 1992, we showed this tree to Brett Hall, Manager of the Arboretum of the University of California, Santa Cruz. Brett was amazed at this oak's simialrity to *Q. tomentella*, which is found on an island off the coast of California.

This high-altitude oak exhibits an unforgettable display of color when it flushes spring growth. The slightly scalloped leaves emerge woolly and maroon, slowly turn brilliant red, and eventually change to olive green with pink edges. The upper leaf surface is beautifully accented by the silvery tan of the heavy tomentum on the underside. The soft, colorful foliage is inviting to the touch.

The mature leaves are dark green, of heavy substance and 6 to 8 inches long by 3 inches wide. The tomentum on the underside of the leaf evolves to a rich yellow-ocher. The gray-white mottled bark of the saplings is also striking, as is this plant's form. As an understory tree, Zaragoza oak develops an open habit. In open spaces, it reaches 40 to 50 feet in height and develops into an impressive tree with a distinctly cylindrical form and dense foliage.

The acorns of Zaragoza oak are easily germinated but difficult to grow in containers. Once planted in the ground, the trees do well but grow only a few inches each year.

*This article was reproduced from the December 15, 1993 issue of American Nurseryman magazine with the kind permission of the editor of American Nurseryman magazine and John G. Fairey.*



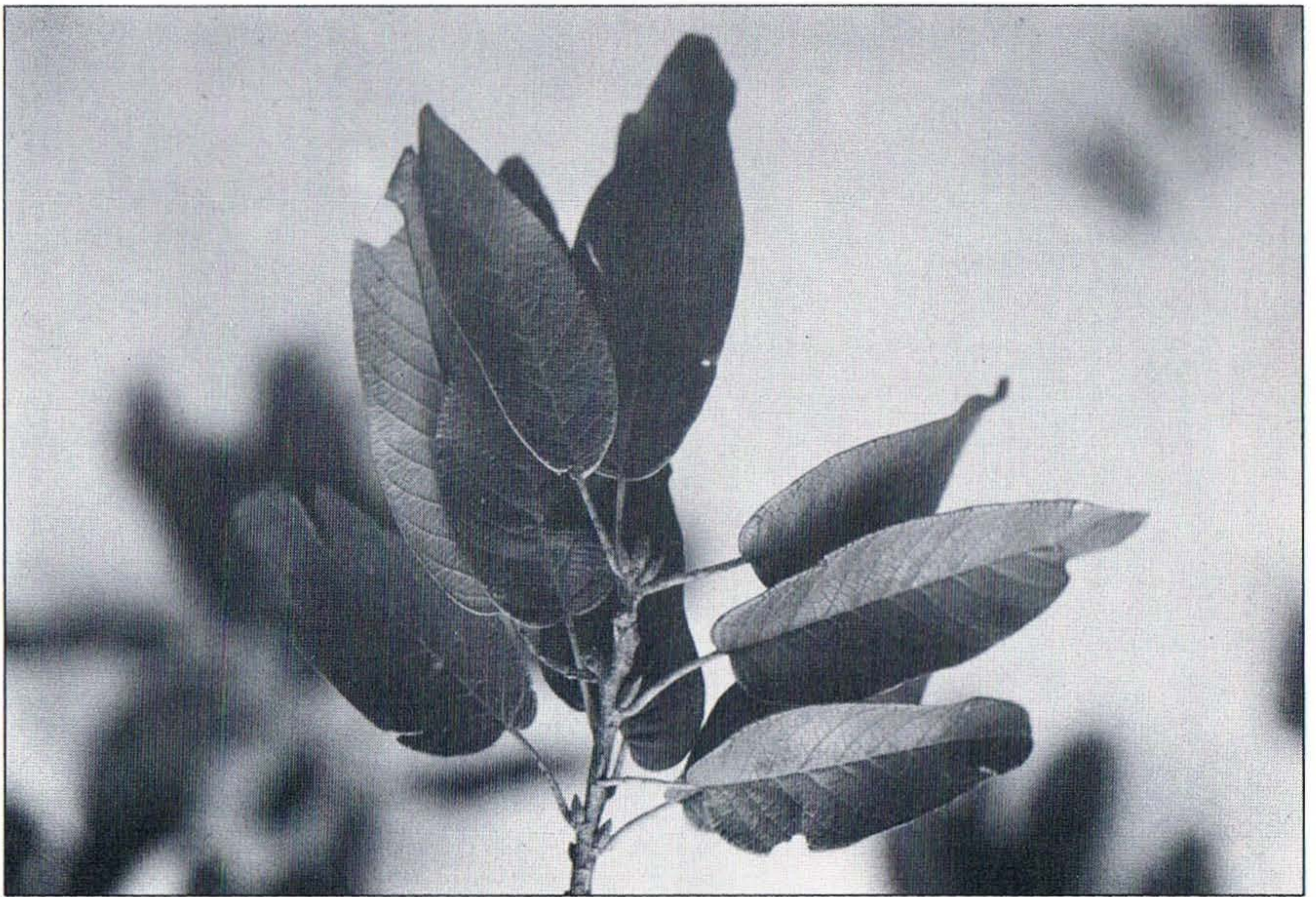
*Quercus risophylla* (seedling) Chipinque Park, Monterrey, Mexico  
Photograph © Guy & Edith Sternberg



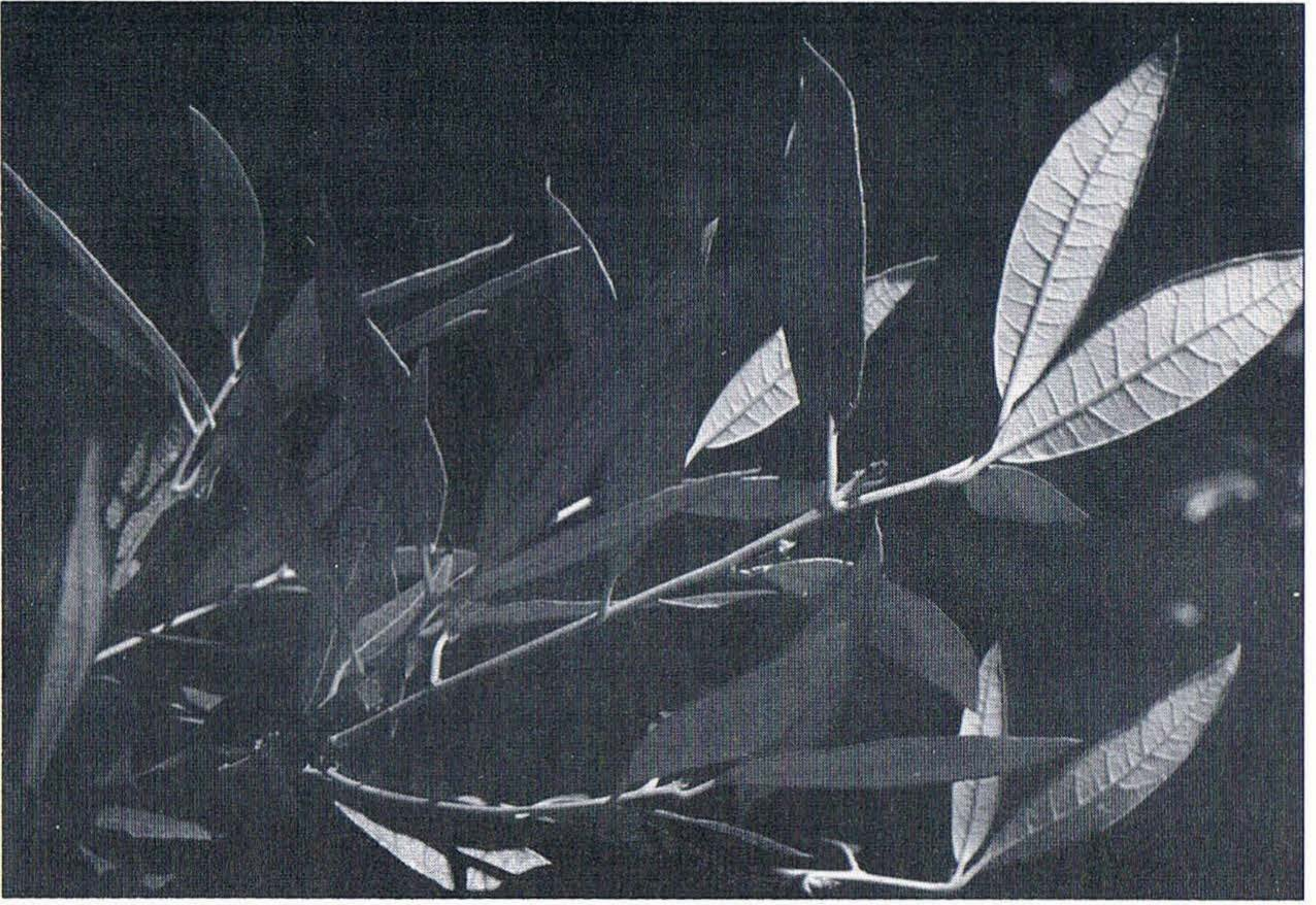
*Quercus satorii* Past Cola de Cabello, N.L. Mexico. Elevation 5000'  
Photograph © Guy & Edith Sternberg



*Quercus polymorpha* Chipinque Park, Monterrey, Mexico. Elevation 3000'  
Photograph © Guy & Edith Sternberg



*Quercus polymorpha* Bufa el Diente, Sierra San Carlos, Tamps., Mexico  
Photograph © Guy & Edith Sternberg



*Quercus hypoleucoides*  
Photograph © Guy & Edith Sternberg



*Quercus greggii*  
Photograph © Guy & Edith Sternberg





*Quercus laeta* Laguna de Sanchez, N.L. Mexico. Elevation 6200'  
Photograph © Guy & Edith Sternberg



*Quercus canbyi* Chipinque Park, Monterey, Mexico. Elevation 3000'  
Photograph © Guy & Edith Sternberg



*Quercus obtusata* Starhill Forest Arboretum  
Photograph © Guy & Edith Sternberg

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## CHINKAPIN OAK: SATISFACTION FOR THE HOMEOWNER, SKULDUGGERY FOR THE BOTANIST

by

Ross C. Clark of The Morton Arboretum, Lisle, Illinois, USA

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One of the noteworthy plants offered in this spring's Member's Cooperative Research Program is chinkapin oak, *Quercus prinoides* var. *acuminata* or *Quercus muhlenbergii*. We feel that it has outstanding possibilities as a landscape tree in the Chicago region, and would like our readers to know more about it.

### A Good Tree for Midwestern Landscapes

Plants of the chinkapin oak are widespread in nature. The main geographic range of the species is from southern Ontario, south to the Florida panhandle, westward through east-central Texas and eastern Oklahoma, northward through the southeastern half of Iowa, and eastward through southern Wisconsin and southern Michigan. Numerous outlying populations extend as far as northern Mexico, eastern New Mexico, and western and southern New England.

In nature, chinkapin oaks show wide ecological tolerances. They are known to do well on upland, calcareous sites ("calcareous" implies a soil underlain by limestone or dolomite that produces an alkaline soil), but are also found in acid soil, on slopes that are not overly dry, and even occasionally on creek terraces where drainage is adequate. In short, they are quite soil pH-tolerant. Because of this, they do not develop the mineral deficiency symptoms that some plants do (pin oaks and birches, for example) when planted in our heavy clay soils. Stock selected from the upper Midwest should tolerate most conditions on uplands in the Chicago region. [The Morton] Arboretum specimens show no susceptibility problems whatsoever with hardiness, pests, mineral nutrition, or drought, and are tough and suitable in size for urban and suburban situations.

At maturity, chinkapin oaks usually are respectable, but not massive trees. Even though they have known to attain heights of 160 feet and trunk diameters of 4 feet, they are usually medium-sized, by comparison to bur and white oaks. The Arboretum's best chinkapin oaks were all started from seed in 1946. These trees are now 35 to 40 feet tall, have single trunks ranging from 12 to 16 inches in diameter (measured at 5 feet off the ground), and have crown spreads of 20 to 35 feet. Though ours are still short of full maturity, they are broadly oval in shape, with spreading lower limbs, similar in outline to open-grown lindens or basswoods.

The grayish bark of Midwestern chinkapin oaks tends to exfoliate in elongated plates on young and medium-aged trunks. In appearance, the bark is about midway between that of white oak (*Quercus alba*) and swamp white oak (*Q. bicolor*); plants from further south often have bark that is indistinguishable from that of common white oak. Acorns of chinkapin oak also somewhat resemble those of white oak, though they are consistently smaller and have much thinner cup rims. Chinkapin oak leaves are coarsely toothed and not lobed, and superficially resemble the leaves of common chinkapin (*Castanea pumila*), though on chinkapin oak leaves, bristle tips on the leaf margin teeth are much shorter or practically lacking, and the pubescence (hairiness) on lower leaf surfaces is much less obvious. Fall

foliage color often is yellow, perhaps the origin of the common name of "yellow oak" in some places.

As is the case with most oaks, growth rate is moderate. However, established young plants will respond with faster growth if they are protected from turf grass competition by mulch, and are given a balanced fertilizer in spring just before their buds open and a bit of extra water during extended dry periods early in the growing season.

Dr. George Ware of The Morton Arboretum suspects that chinkapin oak's rarity as a landscape tree is due to the fact that mature acorns have a high sugar content and are quickly eaten by squirrels and birds. He also notes that native American peoples also prized chinkapin oak acorns for the same reason. In order to obtain the acorns from which we grew this spring's Members' Cooperative Research trees, they were collected straight off the tree, before they could disappear into the natural food web.

### **But What Should We Call It?**

Even the most widely used common name raises a question -- How do you spell it? Most of us have seen it spelled "chinkapin" and "chinquapin" is probably used just as often. The word was adapted (or corrupted) from a native American name for true chinkapin and the Oxford English Dictionary lists these additional spellings: chincapin, chechinquamin, chincopine, chicopin -- so, take your choice!

### **To Umlaut Or Not To Umlaut?**

There is also a problem with the spelling of the scientific name. If you consider chinkapin oak to be a species, is the correct spelling of its name *Quercus muhlenbergii* or *Quercus muehlenbergii*? Both spelling have been used by very reputable people.

George Engelmann named the species for Dr. Gotthilf Henry Ernest Muhlenberg (who, perhaps understandably, called himself "Henry"). When Engelmann named the species, he spelled it with an umlaut on the "u." Under the provisions of the *International Code of Botanical Nomenclature*, which includes the rules for forming scientific names, a "ü" is automatically changed to "ue" in forming a scientific name.

That sounds straightforward, doesn't it? But wait. There seems to have been a problem with the spelling of Dr. Henry's name even in his lifetime. The Sterling Morton Library has an original and several copies of different letters written by Henry, and in each of them he spells his name "Muhlenberg," without the umlaut. On the other hand, many other people of the day, especially the Germans with whom Henry and other family members corresponded, spelled the name "Möhlenberg." Even Henry's tombstone is spelled "Möhlenberg," though his brother's tombstone inscription -- in the same cemetery -- lacks the umlaut. (One can almost imagine an old, Pennsylvania Dutch tombstone engraver punching the two dots over the u in Henry's name, and George Engelmann, himself a German, adding an umlaut to make the name more "correct!")

So, it seems clear that Henry Muhlenberg spelled his name without the umlaut, and that Engelmann simply misspelled Henry's name when naming the species. The *Code* allows us to correct such spelling errors without penalty, so *Quercus muhlenbergii* must be considered the correct spelling. Come to think of it, haven't we all had our name misspelled

by others once in a while? There is certainly no reason why such errors should live forever.

Incidentally, Henry was a versatile fellow. His father, Henry M. Muhlenberg, was a founder of the Lutheran Church of America. Henry the younger was also a Lutheran minister who had an avocational passion for botany, and built the largest herbarium in North America. One of his special interests was grasses, and the grass genus *Muhlenbergia* was named for him. Henry also became the first President of Franklin College, now Franklin & Marshall College. One of his brothers, Peter, became a Revolutionary War general for the Colonies. If you'd like to know about the Muhlenbergs, *The Muhlenbergs of Pennsylvania* by P.A.W. Wallace contains some fascinating reading. The Arboretum's Sterling Morton Library has a copy.

### Species Or Variety?

There is a more fundamental problem here than how to spell names. In nature, there are two closely related entities that one could include in the species we're considering. One of them is large and tree-like, as described above. The other is much smaller in all respects, shrubby, with smaller acorns and fewer teeth on the leaves. This smaller entity has been called *Quercus prinoides*, the dwarf chinkapin oak.

There are some nice specimens of *Quercus prinoides* in the Arboretum's oak collection, near the main east-side road. Dating from the early 1950's, these plants vary from true shrubs to multi-stemmed semitree-like plants taller than an adult human. Besides their smaller, multi-stemmed form, these plants resemble *Quercus muhlenbergii* in almost all other respects, but can be distinguished from "muhlenbergii" plants by the appearance of their leaves -- they are smaller, with fewer teeth, and are less tapered at their tips.

Should we consider the *Quercus muhlenbergii* and *Quercus prinoides* forms to be separate species, or not? Good botanists differ on the subject. Here is one side of the issue, based on some years of field experience in many parts of the geographic range of chinkapin oak, supplemented by examination of quite a few herbarium specimens.

The "prinoides" phase is much less common than the tree form, but occurs occasionally throughout the range of chinkapin oak on drier sites, most commonly near the edges of the range of the species (where conditions presumably are more stressful for the plants). There is no doubt that the "prinoides" phase is genetically different, because it maintains its characteristics even when grown from seed or moved out of natural habitats into cultivation. Either the "muhlenbergii" or "prinoides" form can occur by itself -- without the other form -- in nature. On the other hand, it is not uncommon for populations that occupy habitats with strong gradients in topography or soil moisture conditions to have individuals that approach both the single-trunked large form and the small, multi-trunked form. (This is the case at one of the best-known localities for *Quercus prinoides*, known to Drs. George Ware, Bill Hess and myself, on a calcareous bluff on Alabama's Tombigbee River near a place called Epes.) And even in less dry sites near the edge of the species' range, chinkapin oak is often a multi-trunked tree. So, from personal experience, the "prinoides" phase seems merely to be an extreme form that can be approached in many chinkapin oak populations if environmental conditions favor it.

This general kind of variation is not uncommon in eastern North American woody plants.

To give a few examples, it also occurs in bald cypress (*Taxodium distichum*), mountain holly (the *Ilex ambigua* complex), black or sour gum (*Nyssa sylvatica*), sugar maples (the *Acer saccharum* complex) and southern pin oak (*Quercus durandii*). And, invariably, wherever this type of variation occurs, it causes taxonomic confusion and difference of opinion -- part of the fun of taxonomy!

Exactly how this type of variation arises is not always understood, but it appears that the potential for a considerable range of variation is probably present in many populations, and that only certain subsets of the genetic makeup (which give rise to plants of only certain appearances, or phenotypes) can survive under certain microenvironmental conditions. Obviously, for a widespread species to contain this genetic flexibility would probably give it some adaptive advantages.

If *Quercus prinoides* and *Quercus muhlenbergii* are really so closely related genetically, it would be logical to consider them as belonging to the same species, but we should still recognize the differences between the two extremes, since they obviously are somewhat genetically different. One common way to do this is to call them varieties of the same species. In 1952, Henry Gleason, one of America's most respected botanists, "bit the chinkapin oak bullet" and did just that. However, since the species *Quercus prinoides* had been described before *Quercus muhlenbergii*, the former is the name that he had to use when he combined the two species. So, according to Gleason, the dwarf chinkapin oak should be called *Quercus prinoides* Willd. var. *prinoides*, and the tree-like phase of the species, the chinkapin oak that the Arboretum distributed in April, is *Quercus prinoides* var. *acuminata* (Michx.) Gleason. Incidentally, Dr. Paul Thomson, who completed a research project on oaks at Southern Illinois University several years ago, reached this same conclusion. Dr. Bill Hess, Curator of the Arboretum's herbarium, is also following this interpretation. So, a consensus is growing that evidence over a wide geographic area supports the concept of two varieties better than it supports the concept of two species.

Unfortunately, this reinterpretation of the evidence means that we will no longer be using *Quercus muhlenbergii* as the name of the tree that has gone by the name for so long. Instead, *Quercus muhlenbergii* becomes a synonym for the new name that we feel reflects the evidence better -- *Quercus prinoides* var. *acuminata*.

By the way, did you know that chinkapin oak often appears to hybridize with its close southern relative, swamp chestnut oak (*Quercus michauxii*), and that there is a problem with the name of swamp chestnut oak? Here's an interesting thought: could swamp chestnut oak be just another phase of chinkapin oak? Well, that's another story for another day. . .



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## THE ACORN ODYSSEY\*

by Len Stubbs, Warragul, Australia

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### Oak Morphology

The requirements needed in the Southern hemisphere to establish an oak lawn or oak arboretum are much more exacting than is the case in the Northern hemisphere where the genus is native. A few oaks are found below the equator in the high mountain areas of New Guinea and some high up in the Andes into Colombia, but they might properly be classed under the hard-shelled acorn genus *Lithocarpus*.

The terms white and black oak originated in Europe where a distinction between the two roburs needed to be made. This naming was carried over to America although the reasons for the differentiation were not the same.

The flowers of oaks differ between the two classifications. The white oaks (section *Quercus*) flowers are impregnated and mature in the first year while the red oaks (including the red oaks, section *Lobatae*) produce undeveloped flowers which do not become fertile until the second year by the maturation of the ovaries. Upon fertilization only one ovary develops and the others abort and become incorporated within the acorn. With the white oaks, these aborted ovaries cluster at the hilum or scar end; with the red oaks they cluster at the embryo end.

### Acorn Handling and Treatment

All acorns are live seed and moist internally until germination, so all seed must be kept this way. In some white oak species germination begins almost immediately while others do delay for varying periods. Red oaks have dormancy which is usually only broken by stratification (maintained under moist conditions at temperatures 1° to 4°C for periods up to two months -- not less than five weeks). Some scientific work and theory suggests that the acorn has a balance of hormones giburellin and dormin. The latter gradually disappears under the prolonged cold moist conditions when the growth hormone giberellin takes over and begins the germination process.

Species of oak are not uniform in their ripening process both on the tree and afterwards. Some roburs can be harvested off the tree as soon as they begin changing color to brown and can be removed easily from the cup. They continue to ripen and will begin germination in moist conditions at the same time as if naturally dropped.

Seed which fall to the ground is almost immediately infected with fungi, mostly at the embryo end which can seriously reduce germination and the strength of the tree as it emerges.

Commercial suppliers of seed sell only commercial quantities (i.e. in pounds or kilograms, 1000 to 5000 acorns, useless for small collectors). Larger orders receive priority so that small orders are end-of-season dregs. Germination rate is poor. No explanation is given if seed is unavailable or sold out. No research is done to ensure best possible and cheapest form of delivery. No follow-up ever occurs to find the outcome and no guarantee is given as to the true nature of the seed, whether as to species or likelihood of hybridization (i.e. seed is gathered without regard to its situation in regard to other trees).

*\*Edited for the I.O.S. Journal*

## Quarantine Practices in Australia

Quarantine services are strictly enforced in Australia, thank goodness, but officers do not handle exclusively one set of rules for each type of seed, but a general procedure is drawn up for all those incoming. This is if disease is present even in one seed in 100, then the consignment is destroyed or treated with methyl bromide. This is warranted for dry dormant seed but not for live moist seeds, like acorns, which absorb the methyl bromide at the embryo and destroy the whole consignment. Some officers are sympathetic and they notify by phone when a package has arrived provided there is advance notice. They will then allow the outer husks to be removed individually and only infested acorns or grubs destroyed. This is a concession to me by several officers and is not acceptable or even considered by "by the book" conservatives.

Air freight express from the U.S. guarantees 3 days delivery but this doesn't happen in practice. If the acorns are sent on late Monday or Tuesday, they arrive Melbourne say Thursday night or Friday at the airport. They are then taken to Melbourne Mail Exchange. Quarantine officers cannot take delivery at any point except to redirect to the Quarantine stations. No deliveries are made Friday to the sorting room on Friday even though it is only 400 yards from the Quarantine Office. On Monday delivery takes place to the Quarantine Office but not usually until after the examining officers have gone home. (They start at 7:30 a.m.). So the first contact can take place on the Tuesday but commercial larger quantities receive instant attention so that it is common for the first inspection to take place on the Wednesday. If I'm lucky, I am informed and I reach there on early Thursday morning.

It takes a good part of the day to remove the outercoat of every acorn (under supervision) and I am allowed to remove those considered sound enough to be viable. Other than this concession, based solely on long acquaintance and trust, the result is usually zilch and costly.

With this period of delay white oaks can develop roots, exhaust the total moisture supply and die. Infestations of weevils almost invariably in USA consignments, fortunately, are found within this extended period but it would be preferable if a pre-consignment treatment was available and guaranteed on all consignments. Hot water at 50° C for 30 minutes is effective but the difficulty of overseas accreditation and reliability makes it almost impossible to be practical.

Some time ago I was asked by Quarantine Executives what I thought about allowing commercial importation of chestnuts from Italy. I spoke out strongly. However, the importer was a very wealthy organization and received permission to import as long as the nuts were heat treated under supervision and certification. The nuts arrived and were distributed commercially at a time to beat the locally grown (at the highest retail price). They had been kept in cool storage overseas to make this possible. I bought some seed and although considered dead by Quarantine officers I grew them within three weeks by which they showed stem lesions from fungus infection. I reported it to the Head of Quarantine in our capital city, Canberra, and then the rush started. Cans were rushed 60 miles to me and a friend. Lorries [trucks] began picking up all chestnuts in supermarkets all over Australia on information from the distributor. Eventually they were all destroyed and the matter was not made public but the importer lost three container loads (about 90 tons with a probable loss of up to half million dollars). The company has not imported any since and cannot. I was told off the record that the nuts had come out of refrigeration and had been dumped into 50°C water, half a tone at a time, left for the requisite 30 minutes as specified. But the requirements



did not mention that the temperature had to be maintained. Everyone carried out the laid down procedure but how do you police the enforcement overseas on the word of an inspector who doesn't know what he is doing and why -- just for the benefit of some far away land -- Australia. I have made requests for heat treatment of acorns on arrival across the board -- as a necessary condition of entry in place of methyl bromide. I have been refused even though the equipment is present, because the senior officers cannot trust their own officers who cannot be expected to know what they are doing and why.

## **Recommendations**

With acorns which have gone through this whole handling process for the small collector, like myself, and arriving out of season to their normal ripening period up to germination, some special techniques have to be evolved:

### **Seed Treatment**

1. The acorns must be gathered off the tree.
2. The tree must be sufficiently separated from other whites or other reds as the case may be to eliminate cross pollination.
3. The trees should be identified correctly, their situation recorded and protected in the wild (acorns from arboreta or botanical gardens are useless)
4. Each tree must be harvested and set off to their destination as soon as ready. Do not wait till several species are collected and sent as a joint consignment.
5. All orders should be taken up to perhaps August and then the list closed off.
6. Orders to be from an arranged list at prefixed prices according to crop estimates.
7. The same definable person to collect and remit seed with properly established reward plus expenses.
8. For Australia, do not mark customs declaration certificates \$100 Aust or higher. This makes them commercial and liable to duty of 25 percent.
9. In addition to address of recipient show clearly an instruction: Quarantine, Please notify addressee upon arrival at - telephone number. This can save several days.
10. Pre-treat acorns at 50° C for 30 minutes. This kills weevils and fungus before leaving and eliminates the possibility of seed being destroyed outright or by methyl bromide treatment. Weevil treatment must be immediate on collection as the period between egg laying and emergence can be as low as 14 days. This can coincide with arrival in Australia so prevention is the better alternative.
11. A network of preferably amateur accredited collectors should be established not only in the USA, but in Mexico (which has the largest range of species) and in Eastern Europe as well as China and Japan.
12. Lists should show whether species sent are red or white (treatment for germination is different); source of seed; approximate growth habit -- scrubby, bush, small or large tree, uses of acorns as food and timber -- eventual value, etc. For Australia, stress that oaks are fireproof and fire resistant.
13. Encourage insurance companies to reduce premiums where houses, etc., are surrounded by oaks in preference to eucalyptus in all country areas (California). Also for forest plantations with oaks surrounding squares of Eucalyptus from which back burning can commence for fire control within a minimal time from outbreak.

## Growing Practices

For germination (in order to speed up growth, the trees must reach a degree of maturity before autumn) I use the following procedure:

All acorns, whether white or red, are placed flat on a wooden board, and with a very short very sharp knife cut through -- removing the hilum. The coat down to the seed is peeled off towards the embryo end and all removed making sure the embryo is not split or damaged. I prepare a large plate with a layer of some woolen or water-holding material, and place upon it two layers of cotton material such as bed sheeting and then another layer of thick woolen or water-holding material on top. The acorns are then placed separated but closed between the layers of cotton material. The whole plate is then saturated under a tap and excess water drained off by laying the plate at about 45°. The plate and contents are then put in a warm spot. As long as the top layer is damp to the touch, no water-adding is needed. Examination of the acorns can be made at any time by peeling back the two top layers and replaced without disturbance. Acorns usually show signs of germination in about a week.

I use milk cartons for growth, puncturing six holes in the bottom, filling with a tightly packed potting mix to the brim, and laced with slow release (6 to 9 months) fertilizer granules. Litre cartons hold 1 to 2 acorns in opposite corners and 4 or sometimes 5 in 2 litre cartons. The cartons are filled to the top and acorns placed in a finger hole, flat, no more than 1/4" deep. Emergence varies between species and ambient temperature. The cartons are usually stood on concrete not on soil which allows excess water, upon re-watering to disappear. For a relatively short period of time, the depth of the carton is sufficient for a tap root without turning at the bottom but trees must not exceed one year's growth before planting out. With single trees the carton is torn off and the whole tree and mixture is planted. With multiples the carton is removed and all potting mix is hosed off and the plants separated very carefully to disentangle any side roots without tearing. The trees are kept in a bucket of water until immediate planting with the soil turned below its planting depth. With red oaks the procedure is exactly the same except for one detail: the embryo receives a treatment of gibberellin (less than a drop), strength .005% Potassium gibberellate (inert ingredients alcohol).

I used this process on the assumption of the theoretical balance between gibberellin and dormin so that an excess of gibberellin at the embryo would break the dormancy. It has worked. Red oak germination is reduced to about a week or so. The above treatments are, of course, only for amateurs with limited access to seed, but in terms of final supply of healthy trees the system is well warranted. I have even used it in the vegetable garden with pomsipo (very slow to germinate) just for the fun of the trial using tweezers to transfer the seed after germination and obtaining an even-row spaced crop.

On the assumption that except for bushy scrubby species all the holes will be used, all trees are pruned each winter judiciously according to the last seasons growth and vigor up to a height of 8 to 10 feet (i.e. within reach). They are then let go. Support is needed because boles width is suppressed in favour of height. However, they quickly develop straight smooth boles enlarging quickly ahead of upward growth. I am well protected from wind, or this procedure may not have been successful.

# I|ST International



SOCIETY CONFERENCE 1994  
October 17-18 • Lisle, Illinois • USA

## **Seminar by the International Oak Society Sponsored and Hosted by the Morton Arboretum**

### List of Events

**Saturday, October 15th and Sunday, October 16th---*Early Arrivals***

- Self-Guided Tours of the Morton Arboretum Oak Collections

or

- National Savanna/Barrens Conference (separate registration, *see page 28*) held at Illinois State University, Bloomington, Illinois.

**Monday, October 17th**

- Special Oak Plant Sale *concurrent during seminar.*  
(Oak donations by I.O.S. Members; clerked by Arboretum Staff-  
Open to all registered attendees. )

I.O.S. Sale Coordinators:

Curt Hanson, Crintonic Gardens, Ohio.  
Mike Spravka, The Morton Arboretum.

(continued over)

## List of Events *continued*

### Monday, October 17- Morning OAK SEMINAR

7:45      Registration

8:30      Welcome

8:35      Announcements

Morning Moderator - Kris Bachtell, Director of Plant  
Collections at The Morton Arboretum

8:40      Keynote Address: The Re-Oaking of America

George Ware, Research Fellow, The Morton Arboretum

9:00      Oak Images from Temperate North America - An Introduction  
to the Genus

Guy Sternberg, Owner  
Starhill Forest, Petersburg, Illinois  
(National Temperate-Zone Oak Collection, NAPPC)

9:35      Hardy Oaks from the American Southwest

Michael Melendrez, Owner  
Trees that Please, Los Lunas, New Mexico

10:00      • Break

10:10      Oaks of Europe and Asia-  
Occurrence, Ecology, Forestry and Amenity Values

Stelian Radu, Director  
Arboretum Simeria, Romania  
- and -  
Aytekin Ertas, PhD Graduate Student  
University of Istanbul, Turkey

11:00      The Value of a Scientifically Aesthetic Oak Collection-  
The Scott Arboretum at Swarthmore College

Andrew Bunting, Curator  
Scott Arboretum, Swarthmore, Pennsylvania

11:30      Oaks at the Morton Arboretum-  
Past, Present and Future

Peter van der Linden, Curator of Plant Collections  
The Morton Arboretum

12:00      • **Lunch:** Visit Plant Sale and Exhibits

## List of Events *continued*

### Monday, October 17- Afternoon OAK SEMINAR CONTINUED

- 1:10      Identifying Oaks - The Practical Oak Taxonomy
- Kevin Nixon, Taxonomist  
L.H. Bailey Hortorium, Cornell University, Ithaca, New York  
(*Quercus* author, Flora of North America)
- 1:35      Natural Hybridization in the Red Oak Complex
- J.G. Isebrands, Physiologist  
US Forest Service, Wisconsin
- 2:00      Horticulture and Aesthetics of Hybrid Oaks
- Ken Asmus, Owner  
Oikos Nursery, Kalamazoo, Michigan
- 2:25      Dynamics of Selected Eastern North American Oaks
- Curt Hanson, Owner  
Crintonic Gardens, Gates Mills, Ohio
- 2:50      • **Break**
- 3:00      Understanding APHIS - Simplified Acorn Import and Export
- Anthony Drobnik, State Officer in Charge, Emeritus  
USDA/APHIS Plant Protection/Quarantine, Rosemont, Illinois
- 3:25      Oak Propagation Techniques
- Mark Coggeshall, Indiana DNR Tree Improvement Specialist  
Vallonia Stae Nursery, Indiana
- 3:50      Growing Oaks on the Great Plains
- John Pair, Research Horticulturist  
Kansas State University, Wichita, Kansas
- 4:15      Maintaining and Restoring Oak Groves -  
Community Efforts with *Quercus garryana*
- Michael Reichenbach, Urban Forestry Consultant  
Arboreal Enterprises, West Linn, Oregon
- 4:40      Summary
- George Ware, Research Fellow  
The Morton Arboretum
- 5:00      Announcements and Adjournment



For more information on the Conference and hotel listings please contact:

William N. Carvell  
Curator of Adult Education  
The Morton Arboretum  
Lisle, IL 60532  
Telephone: 708-719-2400

This logo design was conceived by Curt Hanson,  
Nigel Wright and Guy Sternberg

## **NORTH AMERICAN SAVANNAS AND BARRENS CONFERENCE:** *Living in the Edge*

Saturday, October 15, 1994 Bone Student Center, Illinois State University,  
Normal, Illinois

**Topics:** Savanna and Barrens Types of North America  
Ecology of Savannas and Barrens  
Management Practices  
Recovery Plans for Savannas and Barrens  
Flora and Fauna of Savannas and Barrens  
Human/Landscape Interactions

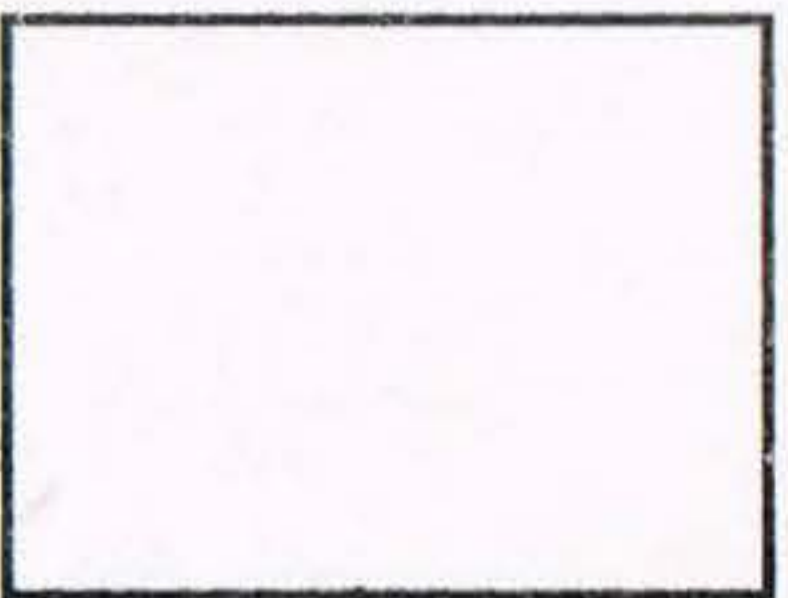
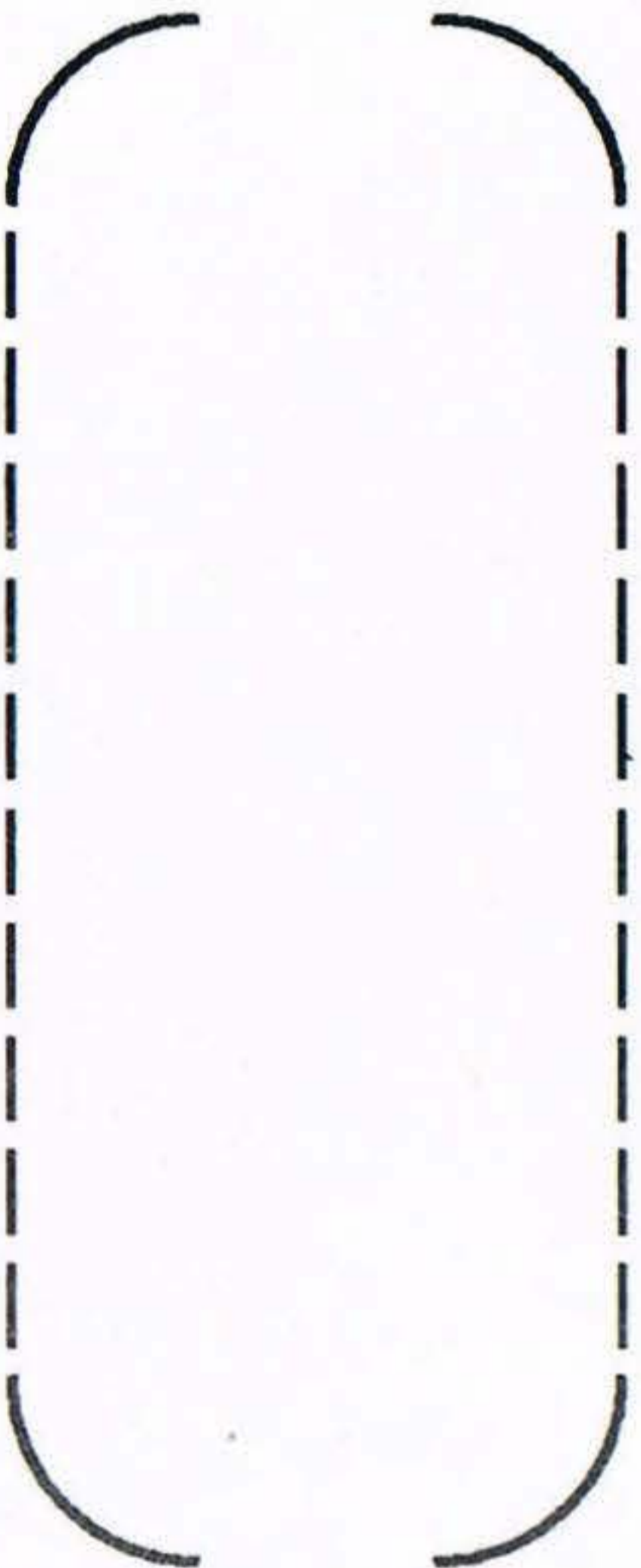
Sunday, October 16, 1994 Field Trips: will leave at 9:00 a.m. from the Bone  
Student Center, ISU, Normal, IL

**Trips:** Sand Prairie-Scrub Oak Nature Preserve  
Iroquois County-Hooper Branch Savanna  
Argyle Hollow Barrens  
Funks Grove-Parklands  
Sand Ridge State Forest

### **For More Information:**

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