

**A Summary Report Detailing the Results
of the 2017 Arkansas Collection Trip for
Procurement of Seed of *Quercus acerifolia* (maple-leaf oak)**

Introduction

In March of 2017, The Dawes Arboretum, Newark, Ohio, was awarded a grant through the U.S. Forest Service and The American Public Gardens Association (APGA) for the purpose of collecting seeds of *Quercus acerifolia* (maple-leaf oak), a rare tree endemic to just four counties in Arkansas. The Arboretum's staff successfully completed the initial goal of this mission during September and October 2017. Approximately 2,300 seeds were wild collected from native populations on three sites, and these are slated for propagation and ultimately ex situ conservation.

We were fortunate to have the insightful assistance of Kris Bachtell, Vice President of Collections and Facilities, The Morton Arboretum, Lisle, Illinois. Kris not only assisted with collecting herbarium samples and seeds, but also created a useful collections book to record accompanying field notes and comments from our excursions. Much of the responsibility of note taking and vouchering fell upon the shoulders of my colleague, Hunter Ardrey, Landscape Technician, The Dawes Arboretum.

For personal reasons, Hunter and I drove to northwest Arkansas September 6, returning to Ohio on the 16th. On September 10, we picked up Kris Bachtell, the third member of our group, at the Bentonville/Fayetteville Airport. The actual collecting aspect of the trip to Mount Magazine, Porter and Pryor Mountains occurred from September 11 through 13.

Coordinated Effort

The Dawes Arboretum is heavily indebted to the cooperative effort of several agencies and individuals. To begin with, we thank Pam Allenstein, Plant Collections Network Manager, APGA, for alerting The Dawes Arboretum to the existence of this grant and assistance in drafting our proposal. We are equally grateful to Susan Hooks, Forest Botanist/Ecologist, U.S. Forest Service, who approved our permit to collect in the Ouachita National Forest. Don Simons, Certified Heritage Interpreter, Arkansas State Parks System, showed us the native populations at Mount Magazine State Park and shared with us his longtime experience with this species. Two highly qualified botanists, Theo Witsell and Brent Baker, Arkansas Natural Heritage Commission, were instrumental to our success in collecting maple-leaf oak seeds on Porter and Pryor Mountains. Brent Baker guided us to both populations through trail-less maneuvers, and without his help we most likely could not have located these populations.

Materials and Methods

The following materials were used during the collection process:

1. Rope pruners and extensions; hand pruners
2. A light field press and conventional herbarium presses
3. Plastic bags and ties, envelopes, markers and labels
4. GPS receiver
5. Digital camera
6. Silica gel

Rope pruners were only employed at the Mount Magazine site to facilitate seed collection from a few of the larger trees. Because of the remoteness of the Porter and Pryor Mountain populations and challenging terrain, a light field press was used in favor of a heavier, conventional plant press. We took seven herbarium samples from each distinct population. Some of these samples, when mounted and processed, will be retained at The Dawes Arboretum while other samples will be sent to the National Arboretum. All distinct populations were recorded with GPS coordinates, and numerous digital images were taken of specific trees, surrounding vegetation and notable topographical features. Silica gel was used to store foliar samples for eventual DNA analysis. An average of 3-4 foliar samples were taken at each collection site of both maple-leaf oak as well as associated species in the red oak group.

Collection Sites

Mount Magazine – September 11

Of the four documented populations of *Q. acerifolia*,* Mount Magazine State Park, Logan Co., Arkansas (within the Ozark National Forest), is the most visited and easiest to access (see Map 1). On the morning of September 11, we met Don Simons at the apex of Mount Magazine (elevation 2800 ft.) and proceeded to harvest seeds from 11 trees from two areas within the park. The first site, most proximal to the visitor center, harbored the largest and most mature trees. In fact, Mr. Simons has contemplated nominating one tree, approximately 20 ft. in height with DBH of 18", to be the largest of its type. A second, more exposed area, about 1/2 mile north of our first stop, contained several, 12-15 ft., low-branched trees. We harvested a total of 435 seeds from Mount Magazine and divided this total among four separate accessions.

Porter Mountain – September 12

Porter Mountain lies within the Caney Wilderness Area of the Ouachita National Forest, rising to around 1800-1900 ft.; it is broadly based and appears rounded to knobby in outline (see Map 2). The apex of Porter Mountain was exposed and more or less level or gently sloped. Joining maple-leaf oak were scattered, small trees of chinkapin oak (*Q. muehlenbergii*) and post oak (*Q. stellata*). Depauperate black locust (*Robinia pseudoacacia*), clusters of chittamwood (*Sideroxylon lanuginosum*) and American fringe-tree (*Chionanthus virginicus*) were observed as well. Other red oak species were absent from the summit. Does this imply that seedlings from this population will be true-to-type? DNA samples should shed some light upon this question.

An old fire lookout station marked the beginning of our ascent to the Porter Mountain population. This required 1-2 hours of strenuous hiking up along 45 degree slopes, not always successfully dodging a ubiquitous understory of cat-briar (*Smilax*). Footing was tenuous and we constantly slipped and slid on a layer of crushed novaculite, a form of silica-rich chert endemic to the Ouachita Mountains of Arkansas and Oklahoma. Our efforts were rewarded when we collected the highest quantity of seeds (503) from a single population of maple-leaf oak during the trip.

Pryor Mountain – September 13

Pryor Mountain lies roughly 70 miles east of Porter Mountain in Montgomery Co., Arkansas (see Map 2), and as with the latter, one has to overcome a steep climb before reaching its 1800 ft. summit. We began hiking around mid-morning, first traveling westerly along an old logging road for about one-third of a mile and then eventually veering northward straight up a 45 degree slope. The floral composition of

* The fourth is located on private property.

Pryor Mountain was somewhat different from that of Porter Mountain with large shortleaf pines (*Pinus echinata*) at lower elevations, as well as yaupon (*Ilex vomitoria*), southern blackhaw viburnum (*Viburnum rufidulum*) and, at the summit, a seemingly out of place ericad, deerberry (*Vaccinium stamineum*). Unlike Porter Mountain, other red oak group species were proximal to maple-leaf oaks including blackjack oak (*Q. marilandica*) and black oak (*Q. velutina*). Because of the promiscuity of oaks, a greater possibility of hybridization between maple-leaf oak and associated red oaks seemed a possibility.

Results and Discussion

The overwhelming success of the collection team in harvesting seeds was truly remarkable considering that the seed production of maple-leaf oak is historically poor. The deleterious effects of Cynipid Gall Wasps upon embryo development, the alternate-bearing of red oaks and the proneness of these mountain-top sites to excessive heat and drought are factors most often cited for low fertility.

However, in 2017 central Arkansas experienced unusually heavy rains and more moderate weather than normal. It was the consensus of the collection team that trees from all sites displayed excellent vigor judging by recent growth increments. We observed a lack of vigor in some specimens at the Mount Magazine site as evidenced by considerable dieback in the upper crowns. We attributed this non-vigorous condition to heavy shade from overtopping vegetation.

Our preliminary field observations suggested trees from Mount Magazine produced smaller acorns than those on Porter and Pryor Mountains. However, after we conducted random measurements of the acorns from all populations, only marginal differences were noted. The diameter of seeds from each population fell within acceptable sizes as referenced in the literature (10-20mm). The acorn cups (involucres) of seeds on all accessions also agreed with reported descriptions, ranging from (6.3mm-8.3mm) wide or approximately one-third the length of the seed. Foliar samples taken from maple-leaf oaks were sometimes outwardly similar to other species such as black oak, Shumard oak, and northern red oak. This may have been the result of taking most samples from juvenile portions or shade leaves of the trees but it seems, nevertheless, that further taxonomic evaluation is warranted. A DNA analysis of foliar tissue of surrounding red oak group species juxtaposed to those samples taken from maple-leaf oak may give valuable insight.

Part of our mission's goal was to distribute seeds or seedlings to interested gardens that will in turn conduct conservation of this rare species. To date, 22 gardens have received surplus seeds from one or more of these sites. In addition to preservation through ex situ cultivation, living materials of maple-leaf oak will be available for future investigations. For example, Dr. Valerie Pence at the Center for Conservation and Research of Endangered Wildlife (Cincinnati Zoo and Botanical Garden) is using cutting-edge techniques to preserve oak germplasm. Traditional seed banking is not possible for the recalcitrant seeds of oaks, and Dr. Pence has developed an alternative method of ex situ germplasm storage that involves in vitro culture of shoot tips (from germinated seedlings of *Q. acerifolia*) with subsequent long-term storage liquid nitrogen storage.

Respectfully submitted,

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