



Quercus austrina Conservation Action Plan

This plan followed the IUCN CPSG Principles and Steps.

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Figure 1. *Quercus austrina* in habitat. Photo: Ron Lance

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REVIEWERS (if applicable)

All workshop participants reviewed the document. Thank you to all involved!

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Acronyms

- BGCI - Botanic Gardens Conservation International
- CPSG - Conservation Planning Specialist Group
- GCCO - Global Conservation Consortium for Oak
- IUCN - International Union for the Conservation of Nature
- USFS - US Forest Service

EXECUTIVE SUMMARY

Quercus austrina is assessed as vulnerable according to the IUCN Red List. It is also one of the 29 species of conservation concern identified in the Conservation Gap Analysis of Native US Oaks (Beckman et al., 2019), which are the species of focus for the US region of the Global Conservation Consortium for Oak (GCCO). Due to questions surrounding its taxonomy and known occurrences, often getting mixed up with other white oak species, and impending development projects and natural disasters, it could be and will be that the species is less well-represented throughout the southeast. Therefore, we need to strategically prioritize conserving this species and its known populations.

A lot of baseline information has been gathered and analyzed during the development of the Conservation Gap Analysis of Native US Oaks (Beckman et al., 2019) publication, and after. Ron Lance and partners have spearheaded efforts in resolving the occurrences of the species to narrow down the known distribution, as it has been confused with other white oaks, as well as gathering leaf material for further phylogenetic analysis. Therefore, given this new information and more information to surface in the coming years, and with collaborative coordination through the GCCO network, we have the opportunity to discuss in more detail the conservation gaps, challenges, and next steps to take to actively conserve this important oak species. In doing so, we will establish a foundation of trust and knowledge as a group, helping us to achieve our goals laid out in the plan.

Following the IUCN CPSG's Principles and Steps, Process design and facilitation document, by the end of the workshop meetings, we will have a species conservation action plan. This conservation action plan will be a guiding reference for *Q. austrina* conservation and research over the years. It will outline the species threats, gaps in conservation efforts, and where/how/when as a network of stakeholders can we start to implement action. Also, we will continue to meet virtually and in-person to review the final action plan and to discuss which activities are currently being implemented, what we can focus on in the near future, and prioritize and leverage funding support.

This plan covers the entire range of *Quercus austrina* and was developed in collaboration with stakeholders from a variety of sectors. This plan is open to feedback from other collaborators who were not involved in the conservation action plan workshops.

Our vision

Vision Statements

1. With a better understanding of the conservation status*, genetic diversity, evolutionary story*, ecological traits*, and distribution* of *Quercus austrina*, the species name will be fully resolved and awareness and acceptance of the species will grow within the

botanic garden, forestry, government, private and public community sectors, which will garner further support for the species protection and conservation, *in situ* and *ex situ*.

*conservation status: this is referring to the species threat status; once the genetic diversity and distribution questions are resolved we can submit an accurate threat assessment for the species through the IUCN Red List and NatureServe threat ranking databases

*evolutionary story: this includes the species ecological genetics and phylogenetics

*ecological traits: this includes species auto-ecology and silvics

*distribution: this includes the species biogeography and demography

*IUCN and NatureServe rankings

Our Goals (summary)

Through the implementation of this action plan, we will meet/attempt to meet the following goals outlined below.

1. We will conduct *in situ* analytical work, such as habitat evaluations, for a variety of bluff oak populations to better understand the species habitat preferences and further differentiate it from other species such as *Q. durandii*.
2. With improved documentation of *in situ* occurrences, we will prioritize conservation action by advocating for further protective regulations.
3. Increase representation of bluff oak in *ex situ* collections, capturing sufficient genetic diversity across the full, known native range of the species, as well as utilizing the collection sites for research opportunities to monitor the health and vigor in different cultivated site conditions to better understand the species tolerance.
4. Fully resolve the species taxonomy and nomenclature so that it is fully accepted and widely known by the greater oak community and prioritized for additional protection, conservation and research.

INTRODUCTION

Importance of Oaks

Comprising around 450 species, oaks are found in forest and shrubland ecosystems throughout the northern hemisphere. As keystone species, they exhibit an astonishing array of morphological and ecological diversity, thriving in the subtropical forests of southeast Asia,

the deserts of Mexico, and the temperate hardwood forests of North America. Their two centers of diversity are in Mexico and eastern Asia, both of which harbor nearly 200 native species.

Oaks are prized for their sturdy timber and are valuable sources of wood for building ships, wine barrels, and fine furniture. They are the source of many other non-timber products such as cork, tannins and nutritious acorns for feeding livestock. These iconic trees grace the flags of many nations and states and hold cultural and religious value for people around the world.

Despite their great economic, ecological, and cultural value, many oaks are under threat of extinction. The Red List of Oaks (Carrero et al., 2020) reveals that at least one-third of the world's oak species are at risk of extinction. Species identified as at risk of extinction require conservation action to ensure that they not only survive but are also resilient to the threats they face. This entails protection of threatened wild populations of plants in their natural habitats, and *ex situ* conservation in botanic gardens and seed banks. Because oaks are “exceptional species” – their acorns do not survive the low temperature and humidity conditions of a standard seed bank – these species require alternative methods for effective *ex situ* conservation of genetic diversity. Living collections of trees and cryopreservation of embryos and vegetative (growth) tissues are two solutions to this challenge, but these require more time, expertise, and management than standard seed banking. Thus, oaks are in urgent need of a coordinated, global effort to efficiently and effectively preserve species and populations both in their native habitats and in *ex situ* collections.

Given the large, global distribution of oaks and their myriad of threats, the Global Conservation Consortium for Oak (GCCO), which falls under Botanic Gardens Conservation International (BGCI), was launched to coordinate a network of institutions and experts to collaboratively implement comprehensive conservation strategies to prevent extinction of the world's oak species. The GCCO is led by The Morton Arboretum and has successfully established the network in the US, Mexico and Central America, China and Southeast Asia. In the US specifically, the GCCO is focusing on conservation efforts for 29 priority threatened species, as a result of the Conservation Gap Analysis of Native US Oaks (Beckman et al., 2019). The US region for the GCCO is divided into three sub-regions, based on where the species are distributed geographically. There is the Eastern US, Texas Southwest and the Western US sub-regions, all of which focus on 10, nine, and 10 priority species, respectively.

Species name and description

Species name: *Quercus austrina* Small, Flora of the Southeastern U.S., 353. 1903.

Synonyms: *Quercus durandii* var. *austrina* (Small) E.J. Palmer, Am. Midl. Nat. 33: 518. 1945.

Common names: Bluff oak, Bastard White Oak

Description: Trees to 35m tall and 12 dm diameter. Bark gray or brownish gray, scaly, sometimes thickened into ridges on the lower portion of trunk. Twigs brown or reddish brown, 1.5-4 mm diam., glabrous. Buds brown, ovoid, 3-6 mm long, distally acute, bud scales brown, puberulent or glabrate. Leaves deciduous, petiole 3-10 mm, blade narrowly elliptic, oblanceolate or obovate, (3-) 6-18 (-24) cm long × (1.5) 3-9 (-12) cm wide, base cuneate or short-attenuate, apex obtuse or rounded, margins lobed or sinuate, rarely unlobed,

lobes usually 1-3 on each side and ascending, with obtuse or rounded apex and sinuses extending 30-50% to midrib, or to 80% in higher crown leaves, primary veins 4-6 on each side, adaxial surface dark green, glabrous when mature, abaxial surface light green, remotely hairy when young, glabrous when mature. Acorns 1-4 per axil, peduncle 0-2 cm long; cup hemispheric or turbinate, 10-14 mm long, 6-10 mm deep, 1-2.5 mm thick, enclosing $\frac{1}{3}$ to $\frac{1}{2}$ of nut, scales thin, appressed, gray or brown, canescent; nut ovoid or elliptic, 12-20 mm, hilum 4-7 mm diameter, or 38-50 % of nut diameter. Flowering Mar-Apr, fruiting Oct-Nov.

Eco-geographical information

- *Quercus austrina*, or Bluff oak, is limited to the Southeastern U.S. coastal plain, predominately in sandy soils of river banks and bluffs, maritime forests, mesic hardwood forests and hardwood hammocks from Mississippi eastward to coastal South Carolina and northern peninsular Florida. Field studies to date suggest a correlation of aerated, sandy soil overlying an accessible water table may be a habitat requirement for this oak.
- To date, >130 verified occurrences are known in 5 states, including: MS, AL, GA, SC, FL. Records from NC appear to be misidentifications.
- The majority of population occurrences consist of only 1-5 mature *Quercus austrina*. Populations consisting of more than 5 mature trees are known from less than 20 of the >130 occurrences.
- Soil evaluations for *Quercus austrina* sites identified 115 soil series; sand comprised a major component for 86% of these, including 39% sands, 30% sandy loams, 17% loamy sands. Loam composed 9% and silt loam 5% of the total soil series.

Research and knowledge gaps

Knowledge gaps in these areas pose challenges to *Q. austrina* conservation. More information needs to be gathered to answer these questions. The goals, objectives and activities outlined in this action plan aim to address these knowledge and research gaps.

- Field evaluation of populations, their extent, recruitment and ecological preferences, including:
 - Species hardiness
 - Species phenology
 - Water table dynamics of native habitats
 -
 - Species hardiness/tolerance (e.g. does it perform well in high salinity levels post hurricanes?, synchronous masting?)
 - Predation rate for acorns/seedlings by deer, rodents and hogs
 - Competition with other species
 - Cultivated populations of *Q. austrina* and the genetic diversity within these populations; low representation in cultivated collections
- Community awareness of the species
 - Misidentification
 - Restricted access to *in situ* populations for collecting

- Lack of federal/local regulations and protections
- Logging and removal by private landowners

THREATS AND THEIR DRIVERS

Threats to *Quercus austrina* have been classified into three groups: High Impact Threats, Moderate Impact Threats, and Low Impact Threats. See [this mural board](#) for more information.

High Impact Threats:

1. Small population sizes are highly susceptible to extirpation due to development, natural disasters or logging
2. Hurricane or storm damage can fell mature trees
3. Genetic material loss- death of solitary trees with no natural recruitment
4. Human residential, commercial, and recreational development (especially in the Gainesville, FL population, coastal plain and riparian zones, and in riverine habitats)

Moderate Impact Threats:

1. Habitat sensitivity; linear riverine and coastal populations in sandy alluvium and scattered trees in mesic hardwood forests may be prone to disturbance or damage
2. Climate change that may introduce changing water tables or rainfall, higher air temperatures, increase of storms and wildfires; putting further stress on populations and having more of an impact on the more sensitive populations (e.g. small, isolated populations, and populations on the coast or along rivers)

Low Impact Threats:

1. Human use of species- can be used for firewood, lumber
2. Invasive species competition
3. Known/unknown insect pests and fungal pathogens (e.g. spongy moth (*Lymantria dispar*),, oak wilt (*Bretziella fagacearum*), chestnut blight (*Cryphonectria parasitica*), Bot Canker (*Diplodia corticola*)
4. Vertebrate pests (e.g. deer, feral hogs)
5. Inbreeding and/or hybridization could be a genetic threat in many cases of isolated trees and small populations

PAST AND CURRENT CONSERVATION ACTIONS

A summary of past and current conservation actions and by whom. This concerns previous and ongoing work undertaken by several individuals and organizations, relating to Quercus austrina.

Herbarium image examinations commenced in 2021 for comparison of *Q. austrina*, *Q. durandii*, *Q. sinuata* and *Q. breviloba* specimens. R. Lance estimated that out of 1600 specimens of these oaks examined, approximately 600 were labeled as *Q. austrina* and only about 47% of those appeared to be authentic *Q. austrina*. Field verification and fertile material vouchering began in 2021 and is ongoing. The verification of field occurrences is part of research to better delineate these oaks morphologically, ecologically, and taxonomically. New range mapping of these oaks is intended for a later publication by T. Arbour and R. Lance. A paper revising the taxonomic and nomenclatural issues of *Q. austrina* will be prepared by Dr. Brian Keener and R. Lance. Foliar samples collected in 2021 were utilized by Andrew Hipp and Marlene Haan of the Morton Arboretum for determining phylogeny of *Q. austrina* and *Q. durandii* (the two taxa shown not to be closely related). A field data form has been compiled to aid in gathering pertinent population and ecological details that may aid future management of *Q. austrina*.

Seed (acorns) gathered from significant *Q. austrina* populations have been used for *ex situ* cultivation by the Holden Arboretum, Polly Hill Arboretum, Bartlett Arboretum, and for a U.S. Forest Service seed orchard in South Carolina. Seed collections were made in 2021, 2023 and 2024, representing 38 *Q. austrina* sites in MS, AL, GA, FL and SC. Scionwood collection from 12 trees at 7 sites in South Carolina was done in February 2025, for use in compatibility testing and grafting experimentation on other White oak rootstocks. Continued collection of propagules of *Q. austrina* populations and significant individual trees is planned for 2025 and future years.

STRATEGY FOR CONSERVATION

Vision

With a better understanding of the conservation status*, genetic diversity, evolutionary story*, ecological traits*, and distribution* of *Quercus austrina*, the species name will be fully resolved and awareness and acceptance of the species will grow within the botanic garden, forestry, government, private and public community sectors, which will garner further support for the species protection and conservation, *in situ* and *ex situ*, including .

*conservation status: this is referring to the species threat status; once the genetic diversity and distribution questions are resolved we can submit an accurate threat assessment for the species through the IUCN Red List and NatureServe threat ranking databases

*evolutionary story: this includes the species ecological genetics and phylogenetics

*ecological traits: this includes species auto-ecology and silvics

*distribution: this includes the species biogeography and demography

Goals

The overall goals (both short and long-term) for the effective conservation of this species and a set of indicators to demonstrate when the targets have been achieved.

Goals
1. We will conduct <i>in situ</i> analytical work, such as habitat evaluations, for a variety of bluff oak populations to better understand the species habitat preferences and further differentiate it from other species such as <i>Q. durandii</i> .
2. With improved documentation of <i>in situ</i> occurrences, we will prioritize conservation action by advocating for further protective regulations.
3. Increase representation of bluff oak in <i>ex situ</i> collections, capturing sufficient genetic diversity across the full, known native range of the species, as well as utilizing the collection sites for research opportunities to monitor the health and vigor in different cultivated site conditions to better understand the species tolerance.
4. Fully resolve the species taxonomy and nomenclature so that it is fully accepted and widely known by the greater oak community and prioritized for additional protection, conservation and research.

Actions

These action tables outline the activities we plan to take that align with the identified threats and the goals listed above. These actions will be tracked and monitored for progress made on a quarterly basis. Progress will be documented in a separate document; if you would like to access this document, please contact one of the work plan participants.

Action #1				
Threat(s)/challenges: field data not being collected/recorded accurately in the past (see mural)				
Goal: We will conduct <i>in situ</i> analytical work, assessing demography, genetics, ecological preferences, and management regimes (past and current regimes) to inform future conservation and management.				
Objectives	Actions	Costs/risks	Benefits	Indicators of success
1. Survey <i>Q. austrina</i> populations to collect data to	A. Initiate stakeholder engagement in <i>in situ</i> monitoring/data collection of selected populations across	<ul style="list-style-type: none"> Not having enough people to collect data on populations 	<ul style="list-style-type: none"> Creating a standardized data collection form will be a useful template to 	<ul style="list-style-type: none"> Robust dataset of <i>in situ</i> populations that could inform future restoration/<i>ex situ</i>

<p>know more about where these species grow to preserve and restore these sites</p>	<p>the range. Stakeholders to contact, include:</p> <ul style="list-style-type: none"> a. Landowners of significant trees or populations for collaboration; State Agencies (Dept of Natural Resources, Management areas, preserves, state parks, DOT right of ways); US Govt Agencies (US Corps of Engineers, US Fish & Wildlife Service, USFS, US Park Service); Municipalities (city parks, boat landings, cemeteries, greenways); Private Entities (timberlands, hunting preserves, conservation easements) b. Prioritize sites having landowner agreement or assistance in data collection <p>B. Engage the USFS to include bluff oak in their systematic forest inventorying process</p> <p>C. Engage stakeholders listed above in identification training to learn how to properly identify the species in the field and inform them on what data to collect; share identification and data</p>	<ul style="list-style-type: none"> ● Incorrect data is collected 	<p>implement for data collection of other oak species</p> <ul style="list-style-type: none"> ● Learning how to obtain a condition assessment score will be a useful practice to implement for other oak species 	<p>projects</p> <ul style="list-style-type: none"> ● Identified a central location that receives all herbarium and leaf specimens for future phylogenetic, population genetic and other research studies ● Increase in the number of people trained in identifying the species in the field ● Increase in records being documented on online databases (e.g. iNaturalist) accurately ● Soil data and depth to water table data is collected, analyzed and added as a data layer to an updated GIS map for Q. austrina
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	<p>documentation resources</p> <p>D. Promote using online services to collect distribution data (e.g. iNaturalist)</p> <p>E. Conduct more field work: prioritize 5-10 populations per state to collect data on soils the depth to the water table, associated species, potential threats, acorn production, and regeneration</p> <ul style="list-style-type: none"> a. (soil samples collected 6-12 inches in depth), b. depth to water table (select 3-5 populations to measure and monitor the depth to water table), c. Identify someone in each state (AL, MS, GA, SC, FL) to collect this data from these populations d. Visit populations twice a year, summer and fall to collect this data. e. Collect the same data from a neighboring white oak species to compare and contrast between the two <p>F. Create standardized data collection fields to fill out when documenting <i>in situ</i> occurrences</p> <p>G. Conduct condition assessment score for the</p>			
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	<p>trees (have pre-determined set criteria to rank the trees condition)</p> <p>H. Collect herbarium specimens from across the species range, sharing duplicates with other institutions</p> <p>I. Create a digital photo library- to capture the species phenology at different times throughout the year</p>			
<p>2. Identify new occurrences and/or areas where <i>Q. austrina</i> may be able to grow for restoration purposes and developing quality and sustainable planting plans following sound science and data</p>	<p>A. Species distribution modeling (SDM): identifying sites that have not been surveyed yet but the species may occur based on habitat data, such as looking at depth to water, and depth to bedrock– this data may tell us more about the root growth of the species</p> <p>a. With the SDM data, the group will conduct surveying trips to verify if the locations that the distribution model identified are new populations of <i>Q. austrina</i> and will confirm if these populations are continuous or are disjunct</p> <p>b. Conduct Multispectral drone imagery surveys to identify</p>	<ul style="list-style-type: none"> SDM is a costly task and may not lead to fruitful results (e.g. identifying new sites that actually have <i>Q. austrina</i> occur there) 	<ul style="list-style-type: none"> SDM will ultimately inform us where <i>Q. austrina</i> occurs, and where it does not occur in areas that were not surveyed before 	<ul style="list-style-type: none"> Identify >5 sites for quality and sustainable <i>ex situ, in situ, near situ</i> plantings Verified from modeling and drone surveys, we have an accurate distribution for the species (confirming whether or not there are populations of the species that have not been located before)

	<p>populations and individual trees</p> <p>B. Using coordinates and elevation data from <i>Q. austrina</i> occurrences, conduct climate modeling to identify habitats for restoration</p> <p>C. Ensure the species is on protected lands/can be included on protected lands (whether it is state, federal, or private easements)</p> <p>D. Considering other data outside of climate, such as soil for site selection for possible outplanting</p>			
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Responsible parties: Ron Lance (objective 1,); Natural Heritage Program State Botanists (objective 1,); Tom Arbour (objective 2,); Patrick Thompson (Objective 1); Marcus Warwell/USFS Region 8 (Objective 2B); Adam Black, The Bartlett Tree Research Laboratories and Arboretum (Objective 1);

Collaborators: Tom Austin, South of Carolina Association of Naturalists (Objective 1E); Emily Ellingson, Polly Hill Arboretum (Objective 1)

Action #2				
Threat(s)/challenges: development threats/challenges; Lack of awareness of the species from public stakeholders, private landowners (see mural)				
Goal: We will prioritize education and outreach for a broader audience, including messaging for private and public stakeholders to increase awareness of the species to decrease population loss.				
Objectives	Actions	Costs/risks	Benefits	Indicators of success
1. Identify landowners that have easements	A. Plant trees at the landowner sites, and/or manage the trees	<ul style="list-style-type: none"> Building relationships with private 	<ul style="list-style-type: none"> Creating a long-lasting, fruitful relationship with one 	<ul style="list-style-type: none"> >3 landowners in support of conserving <i>Q. austrina</i> and are

<p>on their property or are open to implementing an easement on their land</p>	<p>on the site to keep the population healthy and thriving</p> <p>B. Informational handout provided to educate landowners on the species</p> <p>a. Include habitat management in the handout and workshops with landowners</p> <p>C. Build connections/relationships with landowners</p> <p>a. Have a rep for each state or portion of the state to build these connections (similar to in situ data collection)</p> <p>D. Promote conservation easements for habitats rather than for specific species; some landowners may not be interested in conserving one species rather they want to conserve the habitat for the benefit of numerous plant and animal species. This way <i>Q. austrina</i> will be conserved as a result</p>	<p>landowners takes a long time and may not lead to the outcome we hope (e.g. conservation easement)</p> <ul style="list-style-type: none"> • If the land is passed on to another member of the family or a new owner, the commitment to an easement may fall apart if it is not an interest of theirs 	<p>landowner could lead to getting support from other landowners over time</p>	<p>working towards making their land a conservation easement for the benefit of <i>Q. austrina</i> and other species</p>
<p>2. Update threat status for the species such as S-ranks and G-ranks to increase awareness and</p>	<p>A. Informational workshops to educate on the species to botanists, state forestry personnel, and landowners</p> <p>B. Work with state natural heritage programs to re-rank <i>Q. austrina</i></p>		<ul style="list-style-type: none"> • Re-ranking allows state botanists to evaluate the species populations and can get everyone on the same page about the species in each state 	<ul style="list-style-type: none"> • S-rank and G-rank evaluated and updated accordingly for each state the species occurs in

<p>further protection of the species</p>	<p>in NatureServe's database, updating the species threats</p> <ul style="list-style-type: none"> a. Identify rep to work with botanists in SC, GA, MS, AL, FL, NC 		<ul style="list-style-type: none"> ● Ranking will help with protection ● Ranking could leverage additional funding 	
<p>3. Increased recognition and awareness of the species</p>	<ul style="list-style-type: none"> A. Increase education opportunities for numerous stakeholders to learn more about the species and why it is important to conserve. Key stakeholders to reach include: public stakeholders, private landowners, government agencies, riparian focused organizations and recreation departments <ul style="list-style-type: none"> b. Messaging could focus on how the species may not be as rare as other plant species, but could be rare over time if we do not conserve the habitat it occurs in c. Promoting mutualism benefits with other species, such as insects d. Learning about past, cultural uses, if any, about the tree to share with the key stakeholders 	<ul style="list-style-type: none"> ● Ensuring that the education and outreach materials reach the different stakeholders can be tricky; may require creating custom materials for each stakeholder group 	<ul style="list-style-type: none"> ● The materials created can serve as templates for other oak species education and outreach 	<ul style="list-style-type: none"> ● >5 workshops are hosted with the key stakeholder groups to educate on the species ● >5 sites where <i>Q. austrina</i> occurs has some sort of signage or brochure or hand-out that provides an overview of the species and its importance ● Receive >2 grants to support the creation of education and outreach materials

	<ul style="list-style-type: none"> e. Share compelling pictures of people with the trees in education and outreach materials <p>B. Educate the key stakeholders about where the trees are so that we can protect them.</p> <p>Ideas include:</p> <ul style="list-style-type: none"> a. Create and put up signs in places where the tree occurs, like in parks, and include a little blurb about the tree including pictures, common name, and facts about the tree <ul style="list-style-type: none"> i. Contacting different government agencies to get funding for this 			
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Responsible parties: Ron Lance (objective 1, 2Ba, 3); Natural Heritage Program, State Botanists (objective 2, 3)
Collaborators:

Action #3
Threat(s)/challenges: low representation in ex situ collections (see mural)
Goal: Increase representation of bluff oak in ex situ collections, capturing sufficient genetic diversity across the full, known native range of the species, as well as utilizing the collection sites for research opportunities to monitor the health and vigor of the species in different cultivated site conditions to better understand the species tolerance.

Objectives	Actions	Costs	Benefits	Indicators of success
<p>1. Develop a robust metacollection plan</p>	<p>A. Increase capture of seeds across populations and duplicating plants at multiple <i>ex situ</i> collections for sufficient genetic diversity capture</p> <p style="padding-left: 20px;">a. Acorn crop evaluation should be inspected locally in August or early September each year and acorns should be collected from October to mid-November each year, depending on the region</p> <p>B. Conservation orchard establishment- seed and/or grafted</p> <p style="padding-left: 20px;">a. USFS seed orchard plantings; evaluate success of Francis Marion 2023 planting and establish plans for additional seedlings to plant in future</p> <p>C. Graft scions from lone specimens before their mortality, particularly in sites most prone to impact by development</p>	<ul style="list-style-type: none"> ● Concerns around mixing populations and genetic drift, space limitations to have a robust metacollection; things to consider when setting up metacollection sites 	<ul style="list-style-type: none"> ● For grafting: Putting <i>Q. austrina</i> scion on to more generalized rootstock (<i>Q. stellata</i>, <i>Q. lyrata</i>, <i>Q. durandii</i>, <i>Q. similis</i>, <i>Q. michauxii</i>), you don't have as many concerns about the soil type they are planted in, so can have more options for conservation orchard establishment ● Back up the known, healthy individuals through clonal propagation- reducing having hybrids in collections 	<ul style="list-style-type: none"> ● Propagative material collected from 10 individuals from each known population ● Genetic diversity capture in collections has increased ● Rare individuals/populations are replicated across multiple sites

	<ul style="list-style-type: none"> a. Identify organizations/people to help with grafting b. Collecting scion wood and grafting from trees, especially from mature trees that do not produce acorns; collect during the winter months each year c. Identify climbing arborists to collect scion material from large trees d. Identify scionwood recipients for grafting and later dispersion <p>D. <i>Ex situ</i> sites collecting data on soil type, growth rates, flowering times, and vigor and then share it with institutions in the southeast US</p> <ul style="list-style-type: none"> a. Using the information from phenology to get the species more well-represented in seed orchards/garden collections <p>E. Conduct common garden analysis</p> <p>F. Conduct population genetic analysis to confirm sufficient</p>			
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	genetic diversity capture in collections			
2. solidifying its status in botanic gardens/arboreta	<p>A. verifying current <i>ex situ</i> accessions in gardens/arboreta</p> <p>a. For the verified accessions, collect data on specimen vitality, soil, and site conditions</p> <p>B. Distribute germplasm widely across botanic gardens and arboreta that are well-suited for hosting <i>Q. austrina</i></p>		<ul style="list-style-type: none"> Multiple institutions acting as back-up collections to seed orchards, etc. 	<ul style="list-style-type: none"> >10 institutions hosting a living collection for <i>Q. austrina</i> (have 5 or more plants of <i>Q. austrina</i>)
<p>Responsible parties: Ron Lance (Objective 1, 2); Marcus Warwell, USFS Region 8 (Objective 1Ba); Adam Black, The Bartlett Tree Research Laboratories and Arboretum (Objective 1A, 1B); Ryan Russell, Stephen's Lake Park Arboretum (Objective 1C); The Morton Arboretum (Objective 1D)</p> <p>Collaborators: Tom Arbour, Holden Forests and Gardens (Objective 1, 2); Emily Ellingson, Polly Hill Arboretum (Objective 1, 2)</p>				

Action #4				
Threat(s)/challenges: lack of government status/protections (e.g. not included in SWAP) (see mural)				
Goal: Resolve the in species taxonomy and nomenclature to support conservation ranking and priority actions.				
Objectives	Actions	Costs	Benefits	Indicators of success
1. Everyone is on the same page with the taxonomy	<p>A. Production of a formal publication</p> <p>B. DNA analysis - phylogenetic analysis</p>	<ul style="list-style-type: none"> We won't get everyone to accept the name 	<ul style="list-style-type: none"> The name and taxonomy will be formally published in 	<ul style="list-style-type: none"> Formal publication published Herbaria and other

<p>of the species, everyone calls it the same name; they know what they are conserving/what they should conserve</p>	<p>C. Collect DNA samples for lab work for understanding the hybridization in natural populations D. Identification- separating species from <i>Q. durandii</i>, getting the species name resolved E. Taxonomy resolved, documentation/data collection from <i>in situ</i> occurrences</p>	<p>or taxonomy of the species</p>	<p>a peer-reviewed publication</p>	<p>occurrence databases are up to date with their <i>Q. austrina</i> occurrences</p>
<p>2. Concrete information on the species identification to share with landowners and other key stakeholders on the species</p>	<p>A. Observations on iNat resolved; develop iNat project page for the species to incorporate the research grade observations and point people to this page to refer to those observations for future documentation B. Host informational workshops/webinars</p>	<ul style="list-style-type: none"> Misidentifications included in iNat, confusing more people on how to accurately identify the species; it will take time for someone to remove inaccurate observations and to upgrade observations to research grade 	<ul style="list-style-type: none"> Documentation of the species is a community-wide effort 	<ul style="list-style-type: none"> A community-science project is implemented and shared with key stakeholders for their involvement in understanding and conserving the species >5 workshops are organized to share the iNat project
<p>3. Establish the accurate distribution of the species</p>	<p>A. Extensive herbarium annotations to establish the accurate distribution of the species. a. This annotation should follow any publication that better defines the taxonomy and nomenclature. B. Identification: identifying the species limits, where it</p>	<ul style="list-style-type: none"> Herbarium annotations will take a very long time and not all herbaria may agree to do this 	<ul style="list-style-type: none"> Accurate distribution data, species information for the entire botanical community 	<ul style="list-style-type: none"> Updated map of the known, native range broadly shared

	<p>differentiates from other species</p> <p>a. Develop a similar map of <i>Q. durandii</i> to compare between the two species</p> <p>C. Updated map of the known, native range of the species; the phylogenetics and taxonomy brought together to resolve this</p>			
<p>Responsible parties: Ron Lance (Objective 1, 2, 3); Tom Arbour, Holden Forests and Gardens (Objective 3C); Collaborators: Brian Keener, University of West Alabama (Objective 1);</p>				

Next steps

This is a living document and was started in 2023 as a result of the *Quercus austrina* conservation action plan workshop (virtual and in-person). This plan is following a 10 year timeline but will be reviewed annually through communication via email and meetings, and annual workshops will be held to assess the overall plan, discuss changes to be made to the plan and update one another on accomplishments, as well as gaps in our efforts. Additional information can be added at any time, given it is reviewed and accepted by all who were a part of the workshops and those who will be conducting activities laid out in the plan. Plans will be published on the Global Conservation Consortia website (including in draft format).

Each action table will have identified responsible parties and collaborators—ultimately, a formed working group who will meet and communicate on a quarterly basis to ensure the activities are executed over the given timeframe. Overall, further support through collaborations, resources, and funding will be critical to the implementation and success of these activities. For more information on how to get involved/support these efforts, please contact the [GCCO Coordinator](#).

References and further materials related to the species

Beckman, E. 2017. *Quercus austrina*. The IUCN Red List of Threatened Species 2017: e.T194067A2296028.
<https://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T194067A2296028.en>. Accessed on 23 August 2024.

Beckman, E., Lance, R., Meyer, A., & Westwood, M. (2019). *Quercus austrina* Sarg. In Beckman, E., Meyer, A., Man, G., Pivorunas, D., Denvir, A., Gill, D., Shaw, K., & Westwood, M. Conservation Gap Analysis of Native U.S. Oaks (pp. 68-73). Lisle, IL: The Morton Arboretum. Retrieved from <https://www.mortonarb.org/files/species-profile-quercus-austrina.pdf>