



Conservation Gap Analysis of Native U.S. Oaks

Species profile: *Quercus laceyi*

Emily Beckman, Chuck Cannon, Abby Meyer, Murphy Westwood

SPECIES OF CONSERVATION CONCERN

CALIFORNIA

Channel Island endemics:
Quercus pacifica, *Quercus tomentella*

Southern region:
Quercus cedrosensis, *Quercus dumosa*,
Quercus engelmannii

Northern region and /
or broad distribution:
Quercus lobata, *Quercus parvula*,
Quercus sadleriana

SOUTHWESTERN U.S.

Texas limited-range endemics
Quercus carmenensis,
Quercus graciliformis, *Quercus hinckleyi*,
Quercus robusta, *Quercus tardifolia*

Concentrated in Arizona:
Quercus ajoensis, *Quercus palmeri*,
Quercus toumeyi

Broad distribution:
Quercus havardii, ***Quercus laceyi***

SOUTHEASTERN U.S.

State endemics:
Quercus acerifolia, *Quercus boyntonii*

Concentrated in Florida:
Quercus chapmanii, *Quercus inopina*,
Quercus pumila

Broad distribution:
Quercus arkansana, *Quercus austrina*,
Quercus georgiana,
Quercus oglethorpensis, *Quercus similis*



Quercus laceyi Small

Synonyms: *Quercus breviloba* subsp. *laceyi* (Small) A.Camus, *Q. glaucoides* auct. non Mart. & Gal., *Q. microlepis* Trel. & C.H.Müll., *Q. porphyrogenita* Trel. **Common Names:** Lacey oak, Texas blue oak

Species profile co-authors: **Chuck Cannon**, The Morton Arboretum

Suggested citation: Beckman, E., Cannon, C., Meyer, A., & Westwood, M. (2019). *Quercus laceyi* Small. 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. 140-145). Lisle, IL: The Morton Arboretum. Retrieved from <https://www.mortonarb.org/files/species-profile-quercus-laceyi.pdf>



Adam Black

DISTRIBUTION AND ECOLOGY

Quercus laceyi, or Lacey oak, is restricted to southern and southwestern parts of the Edwards Plateau in Texas, U.S., and mountainous regions in the Mexican states of Coahuila, Nuevo León, and Tamaulipas. Lacey oak is known to be associated with limestone outcrops, along with other flora unique to the ecosystem. It is found among woodland and riparian zones with mixed stands of ash, basswood and other oaks.¹ Lacey oak has been noted horticulturally for its leathery blue-gray mature leaves, light reddish-pink new growth, and fall color ranging from peach to gold. Its leaves can also be lobed or unlobed.² In Texas, *Q. laceyi* usually occurs at elevations between 350–600 meters above sea level, while its Mexican distribution occurs at higher elevations between 1,830-2,500 meters. It is a component of the pine-juniper-madrone-oak forest type of northern Mexico. *Quercus laceyi* is a small to medium tree, reaching a maximum height of 18 to 19 meters.^{1,3,4}

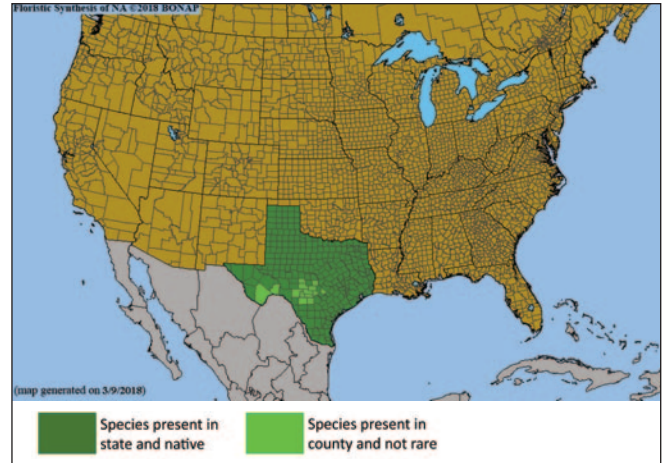


Figure 1. County-level distribution map for the U.S. distribution of *Quercus laceyi*. Source: Biota of North America Program (BONAP).⁵

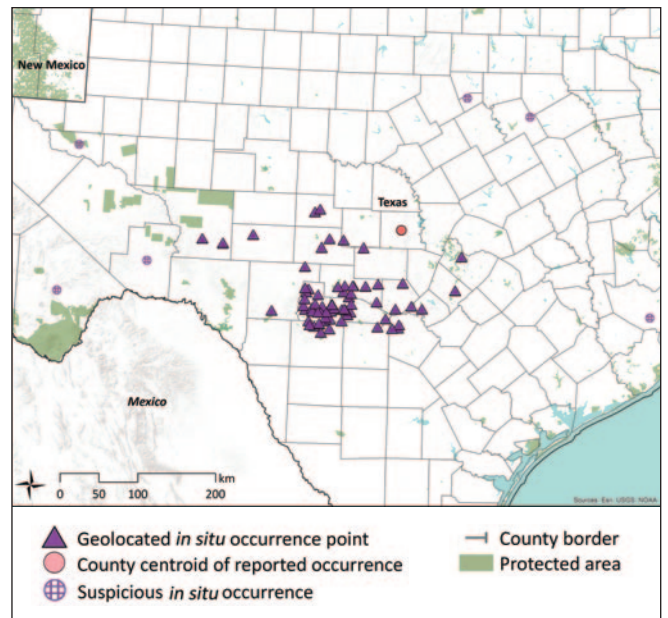


Figure 2. Documented *in situ* occurrence points for the U.S. distribution of *Quercus laceyi*. Protected areas layer from U.S. Geological Survey Gap Analysis Program (GAP) 2016 Protected Areas Database of the U.S. (PAD-US).⁶

VULNERABILITY OF WILD POPULATIONS

Table 1. Scoring matrix identifying the most severe demographic issues affecting *Quercus laceyi*. Cells are highlighted when the species meets the respective vulnerability threshold for each demographic indicator. Average vulnerability score is calculated using only those demographic indicators with sufficient data (i.e., excluding unknown indicators).

Demographic indicators	Level of vulnerability						Score
	Emergency Score = 40	High Score = 20	Moderate Score = 10	Low Score = 5	None Score = 0	Unknown No score	
Population size	< 50	< 250	< 2,500	< 10,000	> 10,000	Unknown	0
Range/endemism	Extremely small range or 1 location	E00 < 100 km ² or A00 < 10 km ² or 2-4 locations	E00 < 5,000 km ² or A00 < 500 km ² or 5-9 locations	E00 < 20,000 km ² or A00 < 2,000 km ² or 10+ locations	E00 > 20,000 km ² or A00 > 2,000 km ²	Unknown	0
Population decline	Extreme	>= 80% decline	>= 50% decline	>= 30% decline	None	Unknown	10
Fragmentation	Severe fragmentation	Isolated populations	Somewhat isolated populations	Relatively connected populations	Connected populations	Unknown	5
Regeneration/recruitment	No regeneration or recruitment	Decline of >50% predicted in next generation	Insufficient to maintain current population size	Sufficient to maintain current population size	Sufficient to increase population size	Unknown	-
Genetic variation/integrity	Extremely low	Low	Medium	High	Very high	Unknown	-
Average vulnerability score							3.8
Rank relative to all U.S. oak species of concern (out of 19)							18

THREATS TO WILD POPULATIONS

High Impact Threats

Climate change — habitat shifting, drought, temperature extremes, and/or flooding: Threats to *Q. laceyi* are not well known, but climate change modeling has recently brought potential concern. In 2016 a 25.61% decrease in suitable range area was projected for *Q. laceyi* by 2050 using the Hadley global climate model and B1 (Lower) emissions scenario.⁷ A recent analysis of U.S. tree vulnerability to climate change used species-specific intrinsic traits to assess trees' 1) exposure to climate change, including projected area change by 2050 and distance to future habitat; 2) sensitivity to threat, including rarity, area of distribution, dispersal ability, and disturbance tolerance; and 3) adaptability to threat, including regeneration, genetic variability, and ecological requirements. *Quercus laceyi* was found to have high vulnerability in all three categories.⁸

Moderate Impact Threats

Human use of landscape — agriculture, silviculture, ranching, and/or grazing: *Quercus laceyi* is a common component of habitat vital to the federally endangered Black-capped vireo, which is known to face habitat loss through land use conversion and browsing by livestock. Though, it is noted that most of these threats have “decreased in magnitude or are adequately managed.”⁹

CONSERVATION ACTIVITIES

In 2017 *Quercus* accessions data were requested from *ex situ* collections. A total of 162 institutions from 26 countries submitted data for native U.S. oaks (Figures 3 and 4). Past, present, and planned conservation activities for U.S. oak species of concern were also examined through literature review, expert consultation, and conduction of a questionnaire. Questionnaire respondents totaled 328 individuals from 252 organizations, including 78 institutions reporting on species of concern (Figure 6).

Results of 2017 *ex situ* survey

Number of <i>ex situ</i> collections reporting this species:	17
Number of plants in <i>ex situ</i> collections:	47
Average number of plants per institution:	3
Percent of <i>ex situ</i> plants of wild origin:	62%
Percent of wild origin plants with known locality:	66%

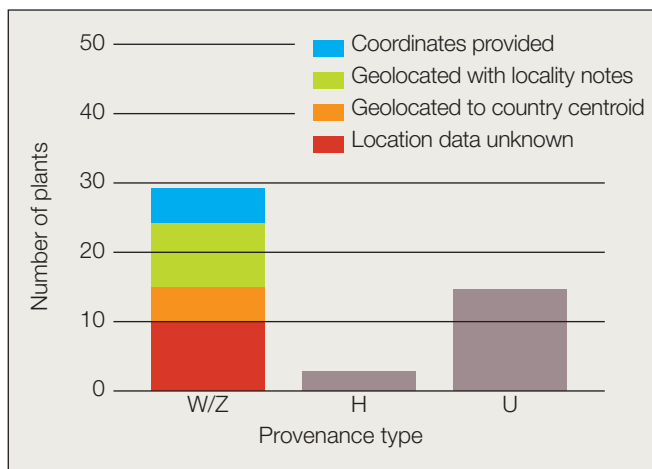


Figure 3. Number and origin of *Quercus laceyi* plants in *ex situ* collections. Provenance types: W = wild; Z = indirect wild; H = horticultural; U = unknown.

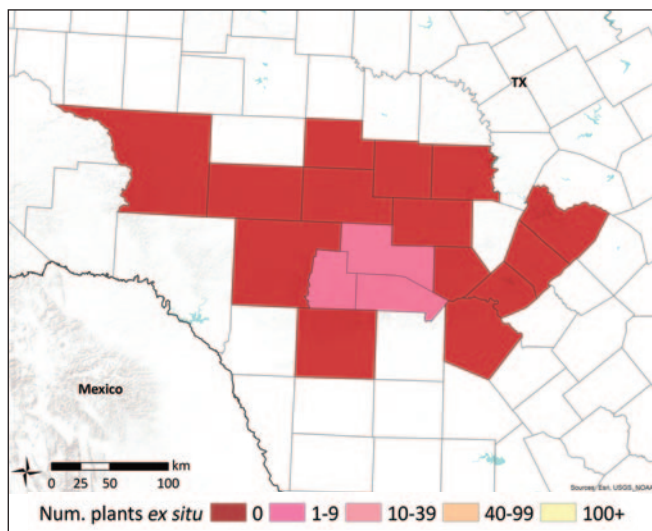


Figure 4. *Quercus laceyi* counties of *in situ* occurrence, reflecting the number of plants from each county in *ex situ* collections.

A spatial analysis was conducted to estimate the geographic and ecological coverage of *ex situ* collections (Figure 5). Only the native U.S. distribution of the species was considered in this analysis, due to availability of ecoregion maps. Fifty-kilometer buffers were placed around each *in situ* occurrence point and the source locality of each plant living in *ex situ* collections. Collectively, the *in situ* buffer area serves as the inferred native range of the species, or “combined area *in situ*” (CAI50). The *ex situ* buffer area represents the native range “captured” in *ex situ* collections, or “combined area *ex situ*” (CAE50). Geographic coverage of *ex situ* collections was estimated by dividing CAI50 by CAE50. Ecological coverage was estimated by dividing the number of EPA Level IV Ecoregions present in CAE50 by the number of ecoregions in CAI50.

Estimated *ex situ* representation

Geographic coverage:	20%
Ecological coverage:	27%

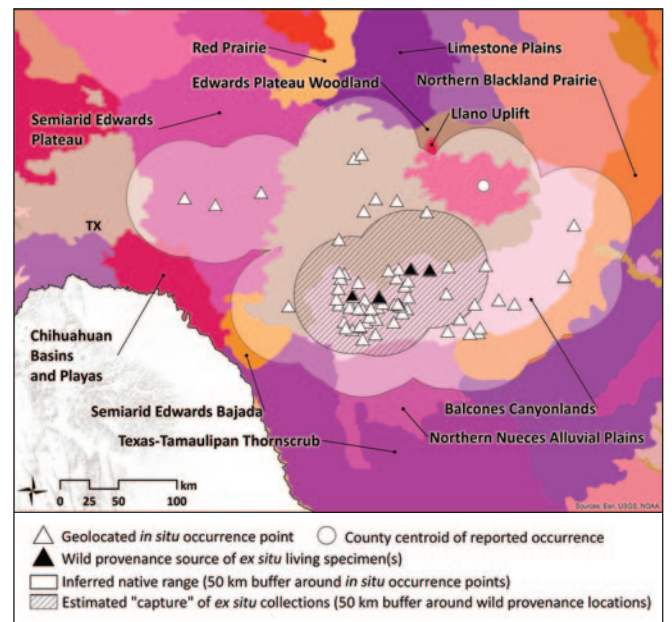


Figure 5. *Quercus laceyi* *in situ* occurrence points and *ex situ* collection source localities within the United States. U.S. EPA Level IV Ecoregions are colored and labeled.¹⁰ County centroid is shown if no precise locality data exist for that county of occurrence. Email treeconservation@mortonarb.org for information regarding specific coordinates.



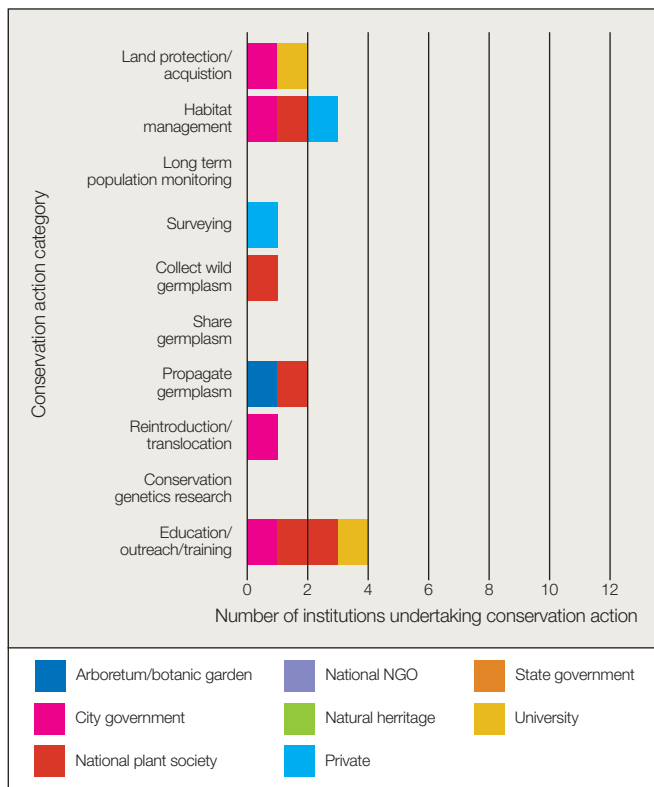


Figure 6. Number of institutions reporting conservation activities for *Quercus laceyi* grouped by organization type. Six of 252 institutions reported activities focused on *Q. laceyi* (see Appendix D for a list of all responding institutions).

Land protection: Within the inferred native range of *Q. laceyi* in the U.S., 3% of the land is covered by protected areas (Figure 7). There is very little protected land in eastern Texas, rather the vast majority is privately owned and utilized as rangeland or cropland.

Quercus laceyi is a common component of habitat vital to the federally Endangered Black-capped vireo. This songbird underwent a thorough review by the U.S. Fish and Wildlife Service in 2016, which assessed health and ongoing conservation needs. The review determined that the majority of the Black-capped vireo’s U.S. range covers privately owned land, and the small portion distributed on public land or land under a conservation easement do not generally experience threatening land use changes. This is likely the case through most of Lacey oak’s U.S. range.⁹

Sustainable management of land: In general, land managed by federal, state, county or municipal entities, or under conservation easement for the purpose of managing other rare species, are thought to have stable land management practices.⁹

Population monitoring and/or occurrence surveys: One institution reported this activity in the conservation action questionnaire, but no other details are currently known.

Wild collecting and/or ex situ curation: One institution reported this activity in the conservation action questionnaire, but no other details are currently known.

Propagation and/or breeding programs: Although Lacey oak is not widely propagated in nurseries, some do offer the species, and it is gaining attention as a good choice for lawns and other suburban landscapes. It’s noted for “blue-green mature foliage, peach-colored new growth and similar fall color.”²

Reintroduction, reinforcement, and/or translocation: One institution reported this activity in the conservation action questionnaire, but no other details are currently known.

Research: No known initiatives at the time of publication.

Education, outreach, and/or training: The Native Plant Society of Texas created the Operation NICE! (Natives Insead of Common Exotics) program to help nurseries offer natives that are right for the local environment. Lists of appropriate species have been compiled, including specific care instructions that are easy to access online.¹¹ The Boerne Chapter of the Native Plant Society of Texas selected Lacey oak as the NICE! Plant of the Month for October in both 2007 and 2011. Other chapters list *Q. laceyi* within their recommended plant lists.¹²

Species protection policies: No known initiatives at the time of publication.

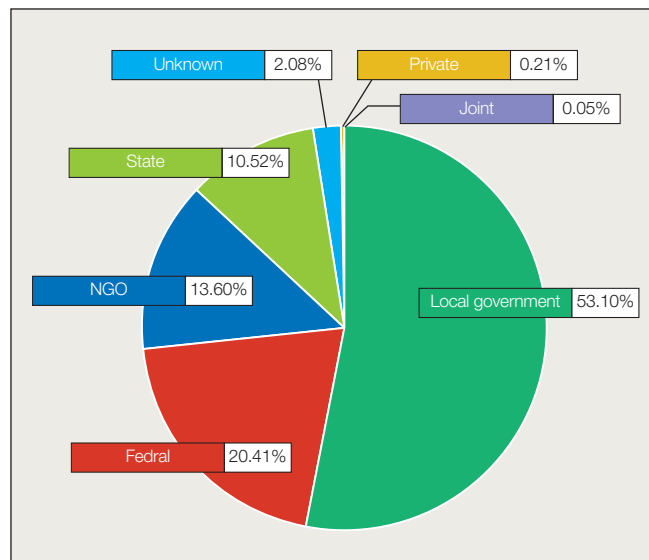


Figure 7. Management type of protected areas within the inferred native range of *Quercus laceyi*. Protected areas data from the U.S. Geological Survey Gap Analysis Program (GAP) 2016 Protected Areas Database of the U.S. (PAD-US).⁶



Adam Black

PRIORITY CONSERVATION ACTIONS

While Lacey oak is currently not threatened, it does have a relatively narrow geographic distribution and is found most commonly in a specialized habitat with limestone-derived soils. Only a small fraction of its distribution has protected status and it occurs overwhelmingly on private land. These factors make the species especially vulnerable to climate change and/or changes in land use patterns in the region. The specialization of the species on limestone soils will greatly limit its ability to migrate and adapt to environmental conditions elsewhere, indicating that the best strategy will be conservation approaches that involve local *in situ* conservation. An increase in protected area coverage could be pursued through collaborations with landowners, for example establishing conservation easements. Land owners and managers could also be engaged regarding the importance of *Q. laceyi* in its ecosystem, its unique aesthetic qualities, and land management needs.

Quercus laceyi remains a poorly known species with few individuals found in *ex situ* living collections, capturing a small fraction of the natural genetic diversity. Few conservation activities directly focus on this tree species. More effort to bring wild seed into well-managed and documented collections should be made. Because of its current low conservation profile but ecological characteristics making it potentially vulnerable to rapid change in viability, continued monitoring and awareness of the status of common populations and their response to climate conditions in the future should be maintained; this will prevent Lacey oak from declining substantially without any conservation action.



Conservation recommendations for *Quercus laceyi*

Highest Priority

- Land protection
- Wild collecting and/or *ex situ* curation
- Education, outreach, and/or training

Recommended

- Population monitoring and/or occurrence surveys
- Research (climate change modeling)

REFERENCES

1. **Nixon KC, Müller CH. (1992).** The taxonomic resurrection of *Quercus laceyi* Small (Fagaceae). *SIDA, contributions to botany*, 15, 57–69. Retrieved from <https://www.jstor.org/stable/41967538>
2. **Garrett, H. (2017, August).** These two oak trees should be used more often in North Texas yards. *The Dallas Morning News*. Retrieved from <https://www.dallasnews.com/life/gardening/2017/08/01/two-oak-trees-used-often-north-texas-yards>
3. **Flora of North America Editorial Committee (Eds.). (1997).** *Flora of North America north of Mexico* (Vol. 3). New York and Oxford.
4. **Stein, J., Binion, D., & Acciavatti, R. (2003).** *Field guide to native oak species of eastern North America*. Forest Service, U.S. Department of Agriculture.
5. **Kartesz, J. T. (2018).** The Biota of North America Program (BONAP). Taxonomic Data Center, Floristic Synthesis of North America, Version 1.0. Chapel Hill, NC. Retrieved from <http://www.bonap.net/tdc>
6. **U.S. Geological Survey, Gap Analysis Program (GAP). (2016, May).** Protected Areas Database of the United States (PAD-US). Version 1.4 Combined Feature Class. Retrieved from <https://gapanalysis.usgs.gov/padus/data/download/>
7. **Hargrove, W. W., & Potter, K. M. (2016).** The ForeCASTS project: Forecasts of climate-associated shifts in tree species. Version 5 Tree Atlas. Retrieved from <https://www.geobabble.org/ForeCASTS/index.html>
8. **Potter, K. M., Crane, B. S., & Hargrove, W. W. (2017).** A United States national prioritization framework for tree species vulnerability to climate change. *New Forests*, 48(2), 275–300. doi:10.1007/s11056-017-9569-5
9. **U.S. Fish and Wildlife Service. (2016, July).** *Species status assessment report for the Black-capped vireo* (*Vireo atricapilla*). Arlington, Texas: Ecological Services Field Office. Retrieved from [https://www.fws.gov/southwest/es/ArlingtonTexas/pdf/Final BCVI SSA revised 2_03302018.pdf](https://www.fws.gov/southwest/es/ArlingtonTexas/pdf/Final%20BCVI%20SSA%20revised%2003302018.pdf)
10. **U.S. EPA Office of Research & Development. (2013, April).** Ecoregions of the Conterminous United States. National Health and Environmental Effects Research Laboratory (NHEERL). Retrieved from ftp://ftp.epa.gov/wed/ecoregions/us/us_eco_l4.zip
11. **Native Plant Society of Texas. (n.d.).** Operation NICE!. Retrieved from <https://npsot.org/wp/resources/nice/>
12. **Cain, D. (2011, October 7).** Lacey oak, a NICE! little tree for Hill Country yards. TX: Boerne Chapter, Native Plant Society of Texas. Retrieved from <https://npsot.org/wp/boerne/publications/native-grown-articles/lacey-oak-revisited/>



Adam Black