Conservation Gap Analysis of Native

Mesoamerican Oaks


Beatrice Chassé

Species profile: ***Quercus hintoniorum***

Kate Good, Maricela Rodríguez-Acosta, Allen Coombes, Silvia Alvarez-Clare

CRITICALLY ENDANGERED

Quercus graciliformis
Quercus mulleri

ENDANGERED

Quercus brandegeei
Quercus carmenensis
Quercus cualensis
Quercus cupreata
Quercus delgadoana
Quercus devia
Quercus diversifolia
Quercus dumosa
Quercus engelmannii
Quercus flocculenta
Quercus galeanensis
Quercus hintonii
Quercus hirtifolia
Quercus insignis
Quercus macdougallii
Quercus miquihuanensis
Quercus nixoniana
Quercus radiata
Quercus runcinatifolia
Quercus tomentella

VULNERABLE

Quercus acutifolia
Quercus ajoensis
Quercus cedrosensis
Quercus costaricensis
Quercus gulielmi-treleasei
Quercus hintoniorum
Quercus meavei
Quercus rubramenta
Quercus tuitensis
Quercus vicentensis

The Morton Arboretum | THE CHAMPION of TREES

Global Conservation Consortium Oak

CSS TREES Center for Species Survival

Franklinia Foundation

Quercus hintoniorum Nixon & C.H.Müll.

IUCN Red List Category and Criteria: Vulnerable: B2ab(iii)

Species profile experts: Maricela Rodríguez-Acosta, Global Conservation Consortium for Oak (GCCO) Coordinator for Mexico and Central America; Allen J. Coombes, Benemérita Universidad Autónoma de Puebla, Puebla (BUAP)

Suggested citation: Good, K., Rodríguez-Acosta, M., Coombes, A. J., and Alvarez-Clare, S. (2024). *Quercus hintoniorum* C.H.Müll. In Good, K., Coombes, A. J., Valencia-A, S., Rodríguez-Acosta, M., Beckman Bruns, E., and Alvarez-Clare, S. *Conservation Gap Analysis of Native Mesoamerican Oaks*. (pp. 213-220). Lisle, IL: The Morton Arboretum.

DISTRIBUTION AND BIOLOGY

Quercus hintoniorum is endemic to Mexico in the northern Sierra Madre Oriental (Figure 1). It occurs primarily along the southeast border between Coahuila and Nuevo León and as far south as Tamaulipas. The Tamaulipas occurrence deserves further investigation. Pérez Mojica and Valencia-A (2017) note that the description of this species in Tamaulipas was only made from one observation that shares some, but not all, of the typical characteristics of *Q. hintoniorum*. This species occurs in the pine-oak forest and Oyamel (Abies) forest at elevations between 2,600 and 3,300 m asl (Valencia-A, 2004). On medium to high elevation slopes of north or northeastern exposure, *Q. hintoniorum* can form dense thickets with *Q. greggii* (Encina and Villarreal, 2002; Villarreal et al., 2008). It occurs primarily in three Holdridge life zones: cool temperate moist forest, warm temperate dry forest, and warm temperate thorn scrub (Figure 2).


Maricela Rodriguez

Quercus hintoniorum is a shrub or small tree up to 5 m tall. At the highest elevations of this species' range, *Q. hintoniorum* is typically found as a low, rhizomatous shrub. Leaves are broadly elliptic or obovate, (2–)3–6 cm long x 2–4 cm broad, with irregularly spaced teeth on each side. (Nixon and Muller, 1993)


Béatrice Chassé

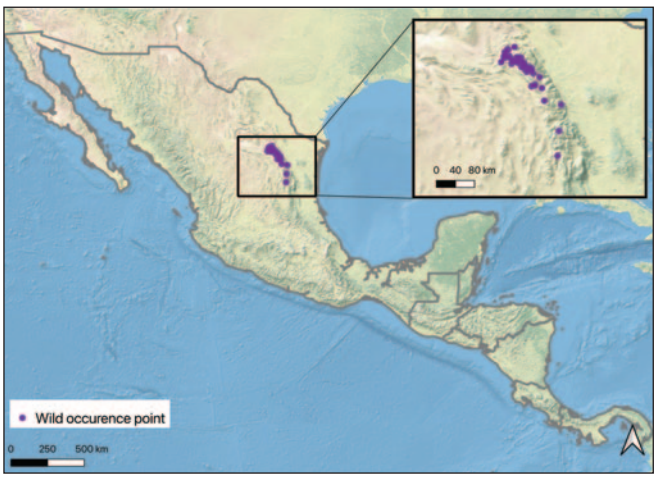

Figure 1. Wild (i.e., *in situ*) occurrence points for *Quercus hintoniorum*.

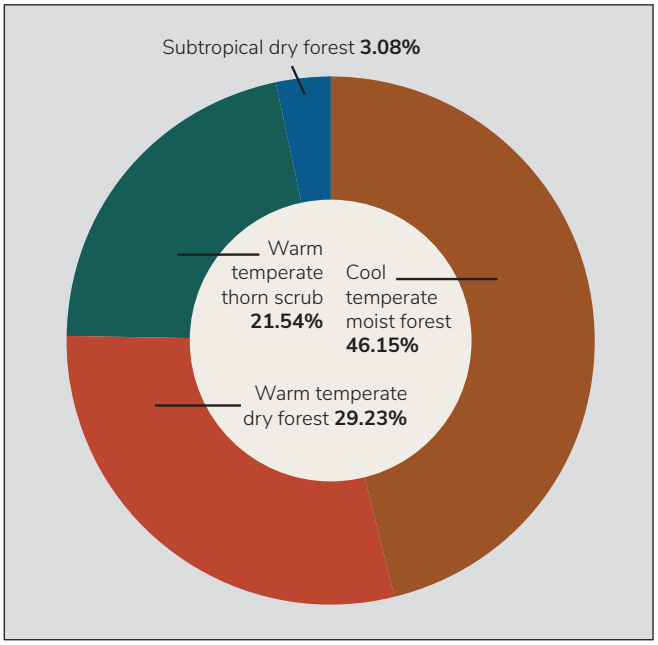

Figure 2. The percentage of wild occurrence points in each Holdridge life zone in which *Quercus hintoniorum* is distributed.

THREATS TO WILD POPULATIONS

Human use of species — wild harvesting: There is no known use of *Q. hintoniorum*. It is likely that there is some collection of dry branches for fuelwood but this would be on a small scale as the biomass production is very low in the dry areas where this species grows. In more humid areas individuals tend to be taller, but do not produce many branches. In colder and higher areas it is a low shrub.

Human use of landscape — agriculture, silviculture, ranching, and/or grazing: In some of the areas where this species grows there are ranching activities, but this is unlikely to affect this species.

Human use of landscape — residential/commercial development, mining, and/or roads: While not currently a major threat, the mountains in Arteaga, Coahuila are likely to be a popular location to develop country residential areas in the future.

Human use of landscape — tourism and/or recreation: There is recreation in the area, however there is no noticeable infrastructure as a result, and it is not considered a major threat.

Human modification of natural systems — altered fire regime, pollution, eradication: This species grows in contrasting habitats: dry and hot, and temperate and cold. The dry area especially is susceptible to natural or induced fires.

Human modification of natural systems — invasive species competition/disturbance: This is not currently considered a threat.

Climate change — habitat shifting, drought, temperature extremes, and/or flooding: Within the inferred native range of *Q. hintoniorum*, the cool temperate moist forest is expected to decrease in area by an average of 99.8% by the years 2061–2080 relative to current conditions (Good et al., 2024).

Genetic material loss — inbreeding and/or introgression: This is not currently considered a threat.

Pests and/or pathogens: This is not currently considered a threat.

Extremely small and/or restricted population: Populations observed are typically small and scattered but more work is necessary to verify this.


Maricela Rodriguez

CONSERVATION ACTIVITIES

Once per year between 2017 and 2022 *Quercus* accessions data were requested from ex *situ* collections globally. A total of 197 institutions from 27 countries submitted data for Mesoamerican oak species, including Q. *hintoniorum* (Table 1, Figure 3). Past, present, and planned conservation activities for Mesoamerican oak species of concern were also examined through literature review and expert consultation.

A spatial analysis was conducted to estimate the geographic and ecological coverage of ex *situ* collections using methods adapted from Khoury et al. (2020; Figure 4). Twenty-kilometer buffers were placed around each wild occurrence point as well as the source locality of each plant living in ex *situ* collections. Collectively, the buffer area around the wild occurrence points represents the inferred native range of the species. The buffer area around ex *situ* points serves as the native range represented in ex *situ* collections. Geographic coverage of ex *situ* collections was estimated by dividing the ex *situ* buffer area by the area of the inferred native range. Ecological coverage of ex *situ* collections was estimated by dividing the number of Holdridge life zones present under the ex *situ* buffer by the number of Holdridge life zones under the inferred native range. The species representativeness ex *situ* was calculated by counting the number of ex *situ* institutions that currently have one or more living individuals of wild provenance in their collections, up to a maximum of ten. In order to maintain a consistent scale across all scores, this number was multiplied by ten. All three scores range from 0–100. A final ex *situ* conservation score was calculated by taking an average of the three scores above. Final scores range from 0–100, with scores near 100 indicating comprehensive ex *situ* conservation, and scores near 0 indicating poor ex *situ* conservation (Table 2). As a reference, the threatened Mesoamerican oaks with the highest ex *situ* conservation scores are Q. *engelmannii* with a score of 76/100, and Q. *brandegeei* with a score of 74/100. There are 10 threatened oaks with final ex *situ* scores of 10 or less.

Table 1. Results of 2017–2022 ex *situ* surveys.

Number of ex *situ* collections reporting this species	10
Number of plants in ex *situ* collections	21
Average number of plants per institution	2
Percent of ex *situ* plants of wild origin	57%
Percent of wild origin plants with known locality	83%

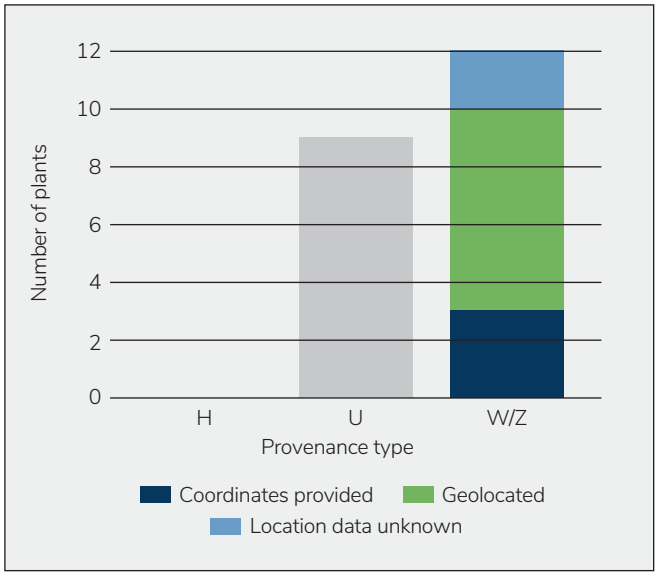

Figure 3. Number and origin of *Quercus hintoniorum* plants in ex *situ* collections. Provenance types: H = horticultural; U = unknown; W = wild; Z = propagated from wild.

Table 2. Ex *situ* conservation scores for *Quercus hintoniorum* with all scores ranging from 0–100. A final score of 100 indicates comprehensive ex *situ* conservation, and a score of 0 represents poor ex *situ* conservation.

Geographic coverage ex *situ*	23
Ecological coverage ex *situ*	100
Representation in ex *situ* collections	40
Final ex *situ* conservation score	54

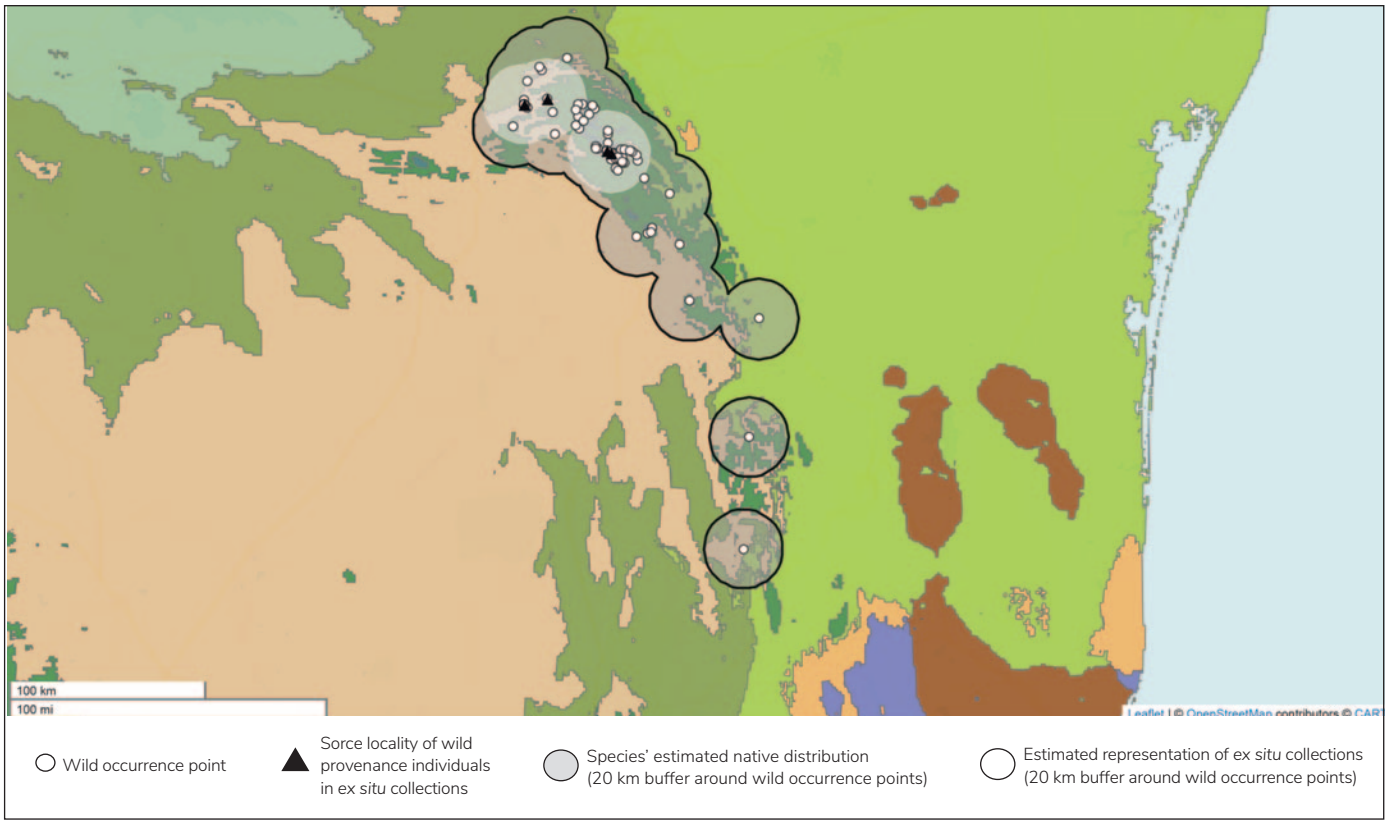

Figure 4. *Quercus hintoniorum* wild occurrence points and *ex situ* collection source localities. Colored regions are Holdridge life zones. All *ex situ* collection source localities are also wild occurrence points.


Béatrice Chassé

Using methods adapted from Khoury et al. (2020), we estimated the degree of representation of *Q. hintoniorum* in protected areas in order to identify *in situ* conservation gaps. Wild occurrence points were mapped and overlaid with protected areas from the World Database on Protected Areas (Figure 5; UNEP-WCMC and IUCN, 2023). A twenty-kilometer buffer was placed around each occurrence point to represent the species inferred native range. Geographic coverage *in situ* was estimated by calculating the proportion of a species inferred native range that is covered by protected areas. Ecological coverage *in situ* was estimated by identifying the Holdridge life zones in the inferred native range as well as the Holdridge life zones in protected areas within the inferred native range and calculating the percentage of life zones that are conserved in protected areas. Species representativeness *in situ* was estimated by calculating the percentage of known occurrence points within the species inferred native range that fall inside protected areas. All three scores range from 0–100. A final conservation score *in situ* was calculated by taking an average of the three scores above. Final scores range from 0–100, with scores near 100 indicating comprehensive *in situ* conservation, and scores near 0 indicating poor *in situ* conservation (Table 3). As a reference, the threatened Mesoamerican oaks with the highest in situ conservation scores are *Q. carmenensis* with a score of 99/100, and *Q. costaricensis* with a score of 94/100. There are two threatened oaks with final in situ scores of 10 or less.

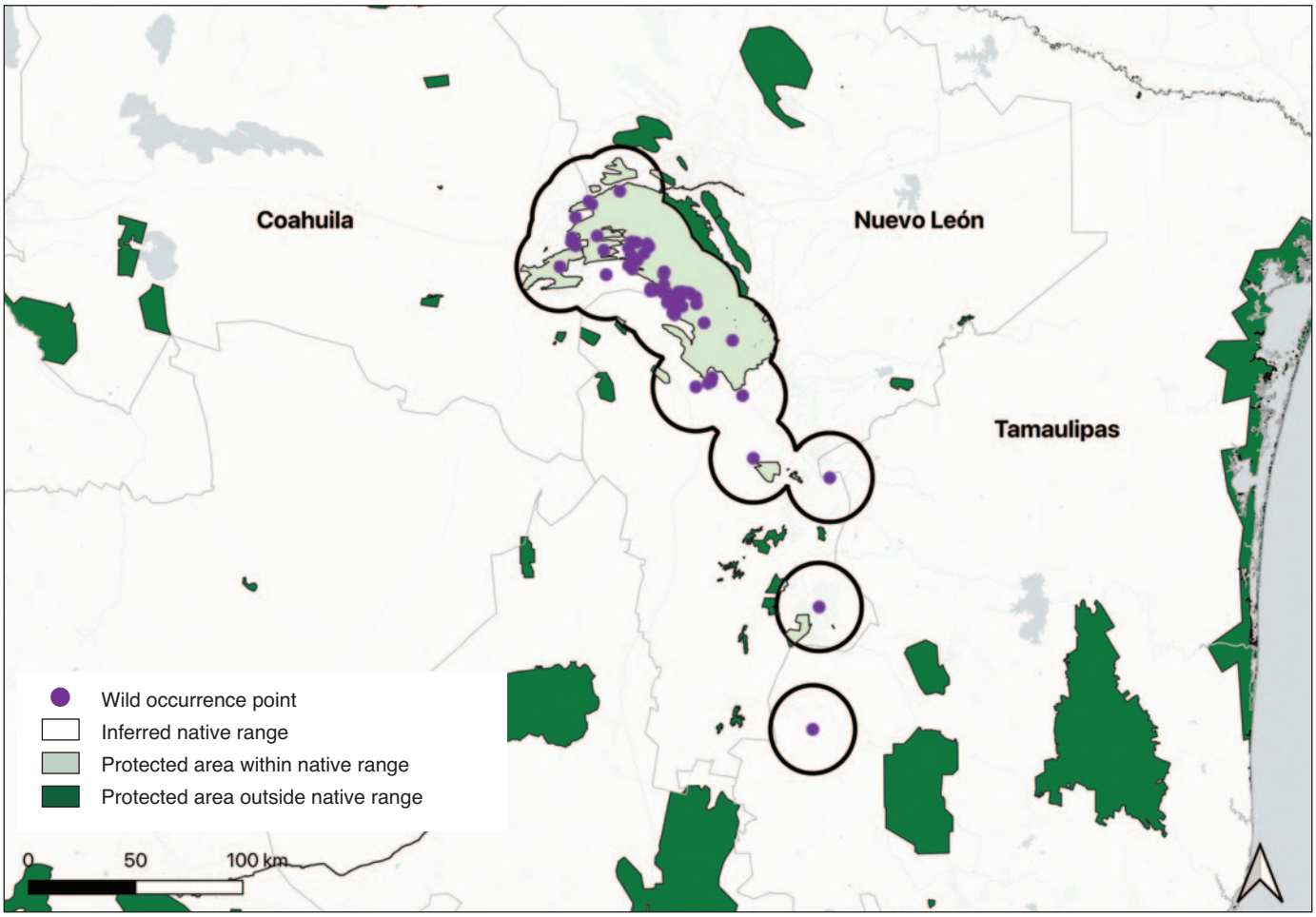

Figure 5. Wild occurrence points and inferred native range of *Quercus hintoniorum* in relation to protected areas. Protected areas are from Protected Planet (UNEP-WCMC and IUCN, 2023.

Table 3. *In situ* conservation scores for *Quercus hintoniorum* with all scores ranging from 0–100. A final score of 100 indicates comprehensive *in situ* conservation, and a score of 0 represents poor *in situ* conservation.

Geographic coverage *in situ*	30
Ecological coverage *in situ*	100
Species representation in *in situ* collections	56
Final *in situ* conservation score	62

Land protection: Within the inferred native range of *Q. hintoniorum*, 30% is within protected areas (Figure 5). An important protected area is the C.A.D.N.R.026 Bajo Río San Juan, a Natural Resources Protection Area.

Sustainable management of land: This is not a conservation activity at the time of publication.

Population monitoring and/or occurrence surveys: Initial survey work has been completed, but more work is needed.

Wild collecting and/or *ex situ* curation: A small amount of seed has been collected and two young plants are at BUAP in Puebla. According to the results of our *ex situ* survey, this species is in 10 *ex situ* collections.

Propagation and/or breeding programs: This is not a conservation activity at the time of publication.

Reintroduction, reinforcement, and/or translocation: This is not a conservation activity at the time of publication.

Research: There is little to no research focused on *Q. hintoniorum* at the time of publication.

Education, outreach, and/or training: This is not a conservation activity at the time of publication.

Species protection policies: There are no species protection policies for *Q. hintoniorum*.

PRIORITY CONSERVATION ACTIONS

In order to conserve *Q. hintoniorum*, the conservation activities that should be given the highest priority are:

Population monitoring and/or occurrence surveys

Further survey work to evaluate the full distribution of *Q. hintoniorum* is needed.

Wild collecting and/or ex situ curation

There are currently no propagation or breeding programs for *Q. hintoniorum*, and additional wild collecting of seed is a necessary first step in order to support such programs.

Reintroduction, reinforcement, and/or translocation

The limited survey work that has been done for this species has identified populations that are small and scattered. Population reinforcement, especially in protected areas, may aid in conserving this threatened species.

REFERENCES

Encina D., J. A., and Villarreal Q., J. A. 2002. Distribución y aspectos ecológicos del género *Quercus* (Fagaceae), en el estado de Coahuila, México. *Polibotánica* 13:1–23.

Good, K., Coombes, A. J., Valencia-A, S., Rodríguez-Acosta, M., Beckman Bruns, E., and Alvarez-Clare, S. 2024. *Conservation Gap Analysis of Native Mesoamerican Oaks*. Lisle, IL: The Morton Arboretum.

Khoury, C. K, Carver, D., Greene, S. L., and Frances, A. 2020. Crop wild relatives of the United States require urgent conservation action. *PNAS* 117(52): 33351–33357. https://doi.org/10.1073/pnas.2007029117

Nixon, K. C., and Muller, C. H. 1993. The *Quercus* hypoxantha complex (Fagaceae) in northeastern Mexico. *Brittonia*, 45: 146–153.

Pérez Mojica, E. and Valencia-A., S. 2017. Estudio preliminar del género *Quercus* (Fagaceae) en Tamaulipas, México. *Acta Botanica Mexicana* 120: 59–111. https://doi.org/10.21829/abm120.2017.1264

UNEP-WCMC and IUCN. 2023. Protected Planet: The World Database on Protected Areas (WDPA) [Online] Cambridge, UK. Available at www.protectedplanet.net. Accessed 2023.

Valencia-A, S. 2004. Diversidad del género *Quercus* (Fagaceae) en México. *Botanical sciences* (75): 33–53. https://doi.org/10.17129/botsci.1692

Villarreal Q., J. A., Encina D., J. A., and Carranza P., M. A. 2008. Los encinos (*Quercus*: Fagaceae) de Coahuila, México. *Journal of the Botanical Research Institute of Texas*: 1235–1278. http://www.jstor.org/stable/41971768