Conservation Gap Analysis of Native

Mesoamerican Oaks

Species profile: ***Quercus runcinatifolia***

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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

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Global Conservation Consortium Oak
CSS TREES Center for Species Survival
Franklinia Foundation

Quercus runcinatifolia Trel. & C.H.Müll.

IUCN Red List Category and Criteria: Endangered B1ab(iii)+2ab(iii)

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DISTRIBUTION AND BIOLOGY

Quercus runcinatifolia, is endemic to Mexico where it occurs primarily in Nuevo Léon, with a majority of known occurrences just south of the city of Monterrey (Figure 1). This species has also been identified as recently as 2010 further south in Tamaulipas, near Ciudad Victoria. The Tamaulipas occurrences require further taxonomic review (Pérez Mojica and Valencia-A, 2017). *Quercus runcinatifolia* is a little known species that is restricted to humid mountainous areas in the Sierra Madre Oriental and the Sierra de San Carlos in Tamaulipas (García Morales, 2016). Known occurrences of *Q. runcinatifolia* are in two Holdridge life zones: subtropical dry forest and warm temperate dry forest (Figure 2). This species is typically found in scattered subpopulations of 10–15 mature individuals (Jerome, 2020). *Quercus runcinatifolia* is a moderately sized tree, 5–15 m tall, with spreading branches and dark bark (García Morales, 2016). Leaves are oblong, glabrous, and 5–7 X 9–14 cm (Muller, 1934). Fruit is biennial.

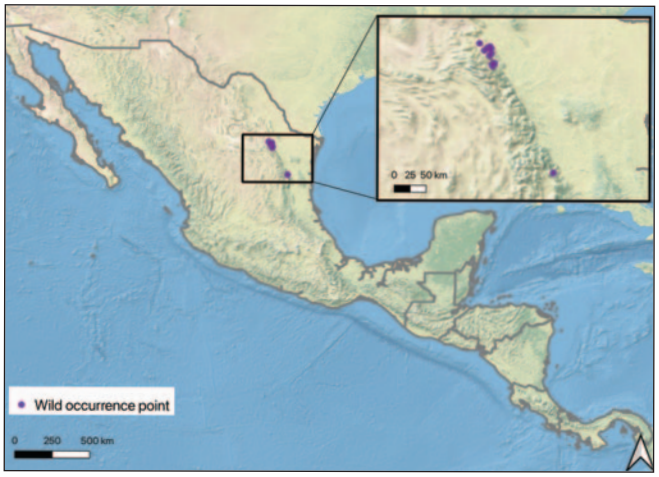

Figure 1. Wild (i.e., *in situ*) occurrence points for *Quercus runcinatifolia*.

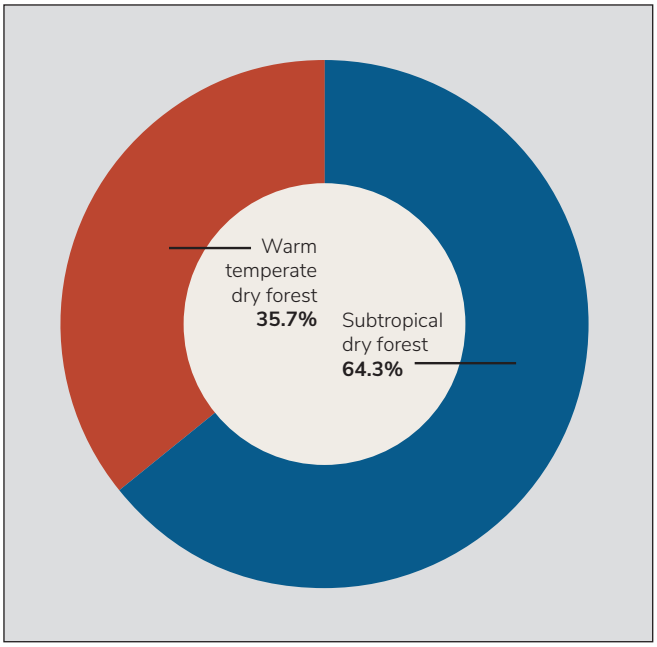

Figure 2. The percentage of wild occurrence points in each Holdridge life zone in which *Quercus runcinatifolia* is distributed.

THREATS TO WILD POPULATIONS

Human use of species — wild harvesting: Unknown.

Human use of landscape — agriculture, silviculture, ranching, and/or grazing: The habitat has faced changes in land use for grazing and agriculture.

Human use of landscape — residential/commercial development, mining, and/or roads: Due to its proximity to the urban/metropolitan area in Monterrey, *Q. runcinatifolia* habitat is threatened by development. Dirt roads and paths cut through the habitat, resulting in fragmentation of populations of this species.

Human use of landscape — tourism and/or recreation: There is ecotourism and hiking in the region.

Human modification of natural systems — altered fire regime, pollution, eradication: This is not currently considered to be a threat. This species is located within a protected zone, so it's not typically affected by pollution and is protected from eradication.

Human modification of natural systems — invasive species competition/disturbance: Within the species range, there is a site called Chipinque. At this site, the invasive tree *Ligustrum lucidum* (an escapee from cultivation) competes with oaks. In some cases, small groves of this invasive have been documented. There are 24 additional invasive species that have been identified within the national park Cumbres de Monterrey (CONAP, 2020). More work is needed to determine if they impact oaks.

Climate change — habitat shifting, drought, temperature extremes, and/or flooding: Within the inferred native range of *Q. runcinatifolia*, the subtropical dry forest is expected to decrease in area by an average of 32% by the years 2061–2080 relative to current conditions (Good et al., 2024). This species has also been impacted by recent droughts.

Genetic material loss — inbreeding and/or introgression: Some experts consider this species to be a hybrid. As of 2024, Juan Encina Domínguez along with Susana Valencia-A are performing taxonomic studies focusing on this species, and verifying if *Q. runcinatifolia* is a good species or a variation of *Q. canbyi*.

Pests and/or pathogens: Because of the drought, insects have taken advantage of the trees and there are sections of oak groves that have completely dried out and died.

Extremely small and/or restricted population: Populations of this species are quite small and restricted to a few locations.

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. runcinatifolia* (Table 1, Figure 2). 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	1
Number of plants in ex *situ* collections	1
Average number of plants per institution	1
Percent of ex *situ* plants of wild origin	0%
Percent of wild origin plants with known locality	0%

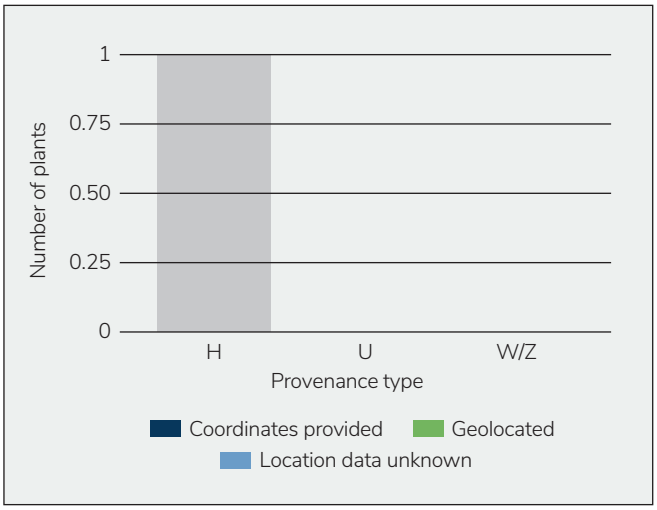

Figure 3. Number and origin of *Quercus runcinatifolia* plants in ex *situ* collections. Provenance types: H = horticultural; U = unknown; W = wild; Z = propagated from wild.

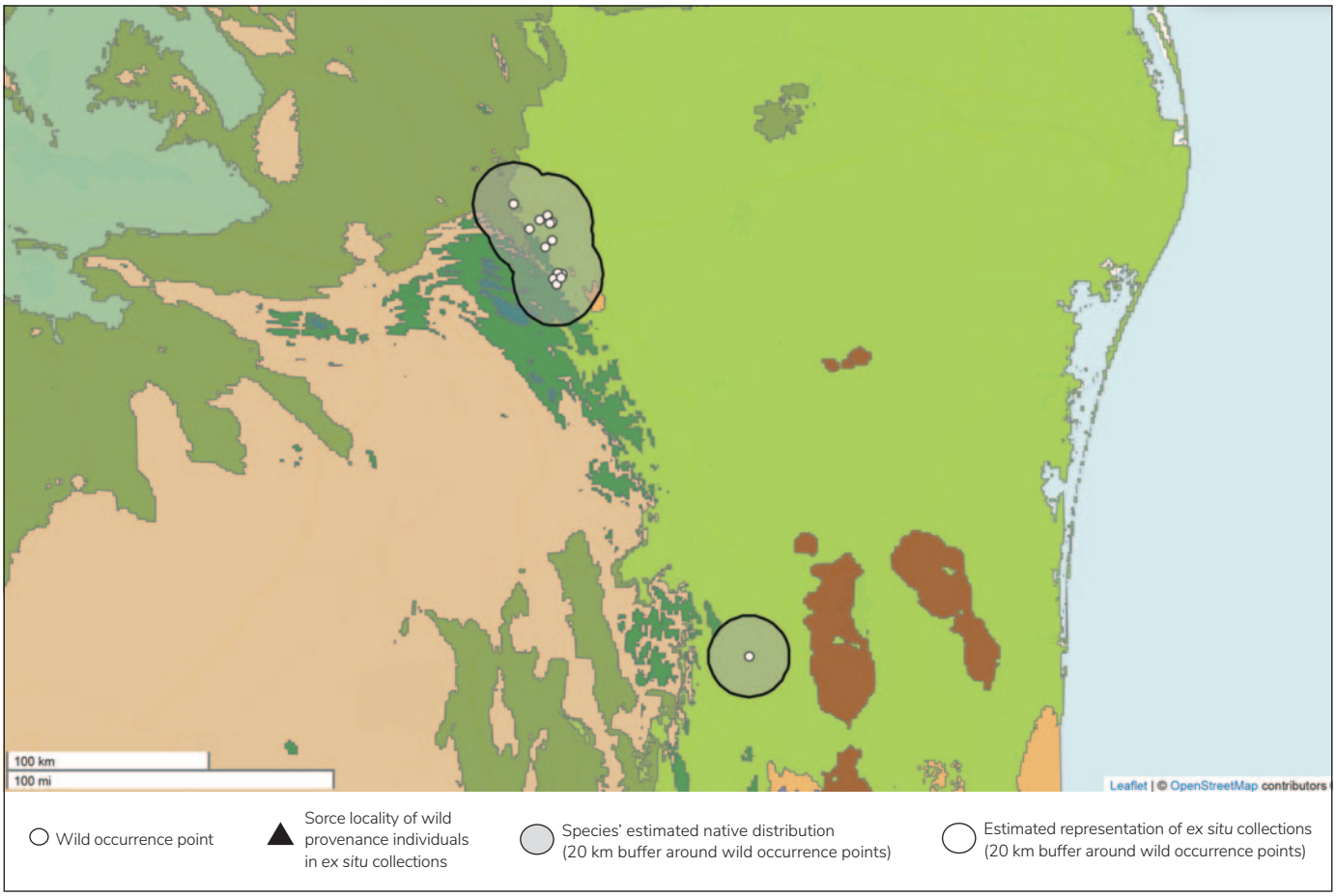

Figure 4. *Quercus runcinatifolia* wild occurrence points and *ex situ* collection source localities. Colored regions are Holdridge life zones. All *ex situ* collection source localities are also wild occurrence points.

Using methods adapted from Khoury et al. (2020), we estimated the degree of representation of *Q. runcinatifolia* 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.

Table 2. *Ex situ* conservation scores for *Quercus runcinatifolia* 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*	0
Ecological coverage *ex situ*	0
Representation in *ex situ* collections	0
Final *ex situ* conservation score	0

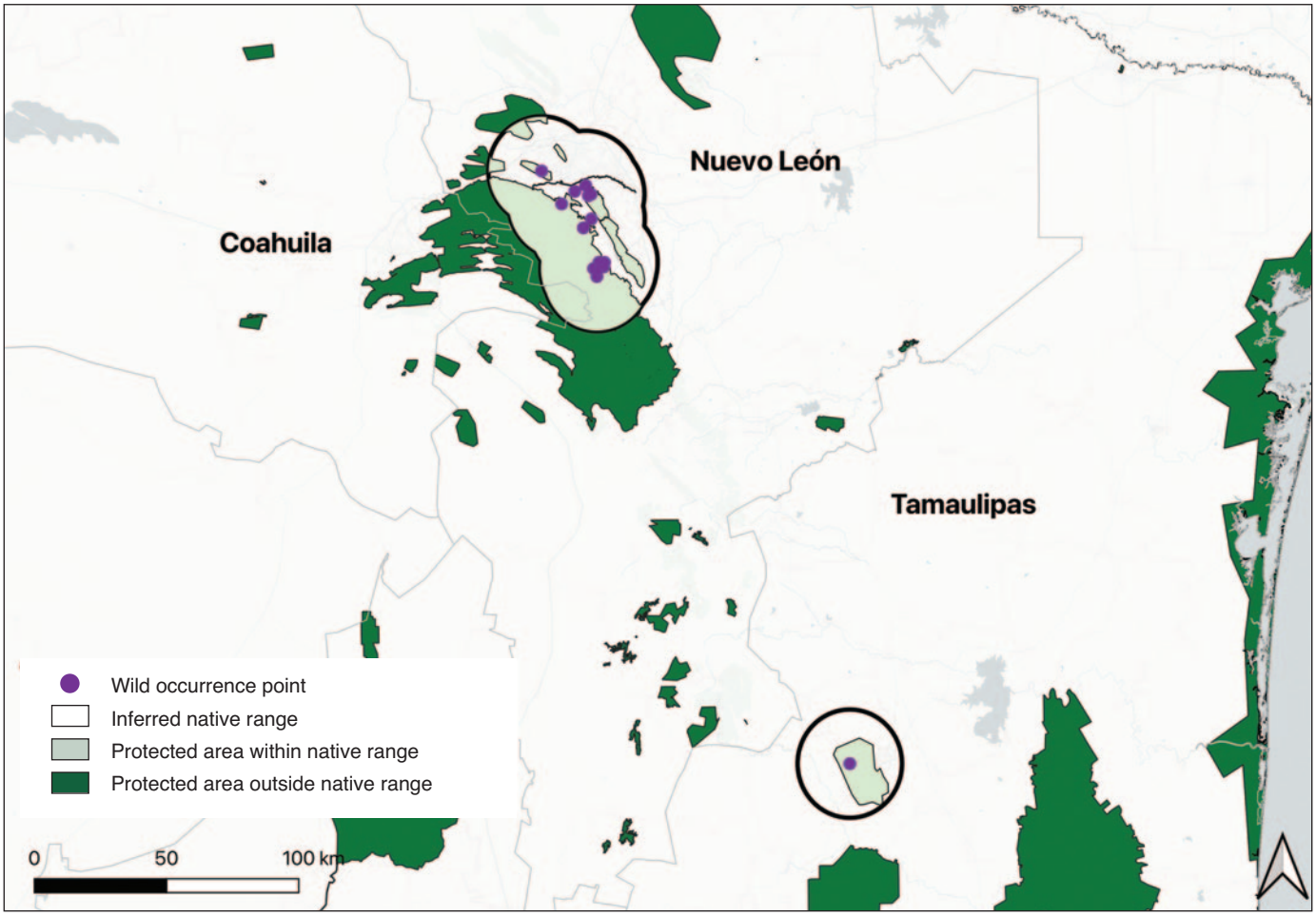

Figure 5. Wild occurrence points and inferred native range of *Quercus runcinatifolia* in relation to protected areas. Protected areas are from Protected Planet (UNEP-WCMC and IUCN, 2023.

Table 3. *In situ* conservation scores for *Quercus runcinatifolia* 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*	44
Ecological coverage *in situ*	100
Species representation in *in situ* collections	79
Final *in situ* conservation score	74

Land protection: Within the species' inferred native range, 44% is covered by protected areas (Figure 5). *Quercus runcinatifolia* is known to occur within the Cumbres de Monterrey Biosphere Reserve.

Sustainable management of land: This is not a conservation activity at the time of publication. However, there is a general understanding that the national park has to protect the habitat.

Population monitoring and/or occurrence surveys: This is not a conservation activity at the time of publication. A proposal is being submitted in 2024 by researchers at UAAAN to conduct field work in the region in order to collect acorns for a propagation trial.

Wild collecting and/or *ex situ* curation: According to the results of our *ex situ* surveys, this species is currently held in one *ex situ* collection. However, it is not of wild origin.

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 specifically on this species. Currently, the taxonomy is being studied in order to better define this species, and there is a need for further botanical exploration.

Education, outreach, and/or training: There are environmental education programs in the ecological park Chipinque. However, it is unknown if *Q. runcinatifolia* is discussed specifically.

Species protection policies: There are no specific protections for this species. There is only general conservation of the habitat within the protected park.

PRIORITY CONSERVATION ACTIONS

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

Population monitoring and/or occurrence surveys

There are few known occurrences of Q. runcinatifolia, and more population monitoring and survey work is needed. This is especially true in the region between the Nuevo Leon population and the recently discovered Tamaulipas location. All occurrence points from iNaturalist should be verified.

Research

There is a need for further taxonomic research on *Q. runcinatifolia* to determine if this species is a hybrid.

Propagation and/or breeding programs

Wild collecting of acorns and the establishment of a propagation trial have been proposed for this species, with plans for both in 2024.

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