Conservation Gap Analysis of Native

Mesoamerican Oaks

Species profile: ***Quercus vicentensis***

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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 vicentensis Trel.

Common name(s), Spanish: roble, roble negro, roble blanco
IUCN Red List Category and Criteria: Vulnerable A2bc

Species profile expert: José Gabriel Cerén López, Museo de Historia Natural de El Salvador, San Salvador (MUHNES)

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DISTRIBUTION AND BIOLOGY

Quercus vicentensis occurs in Mexico (Chiapas), El Salvador, and Guatemala (Figure 1). Originally thought to be restricted to El Salvador and Mexico, *Q. vicentensis* was recently added to an updated list of *Quercus* species in Guatemala, where it is restricted to humid regions in the central mountain range of the country (Quezada et al., 2017). This species' range also reportedly includes Honduras, although we do not have any occurrences from this country. It inhabits pine-oak forests at an elevation between 1,200 and 1,900 m in association with *Q. sapotifolia* and *Q. purulhana* (Carrero and UCN SSC Global Tree Specialist Group, 2020; Duarte, 2020). Known occurrences primarily occur within three Holdridge life zones: subtropical moist forest, warm temperate moist forest, and subtropical wet forest (Figure 2). *Quercus vicentensis* is a shrub or small tree, typically 4–12 m tall. Leaves are oblong to lanceolate or oblanceolate, 7–10 (15) cm long and 2–3.5 (6) cm wide (Muller, 1942).

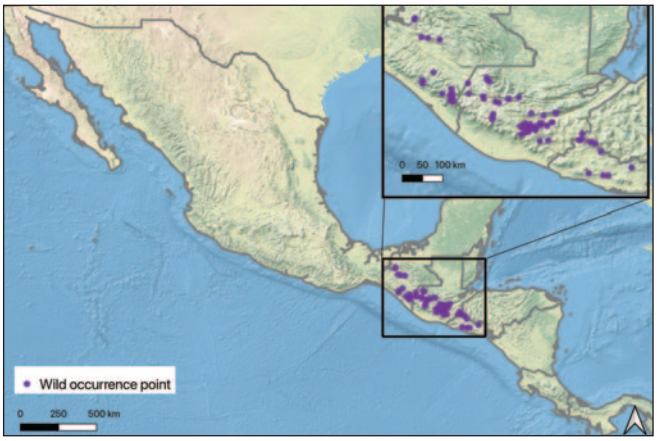

Figure 1. Wild (i.e., *in situ*) occurrence points for *Quercus vicentensis*.

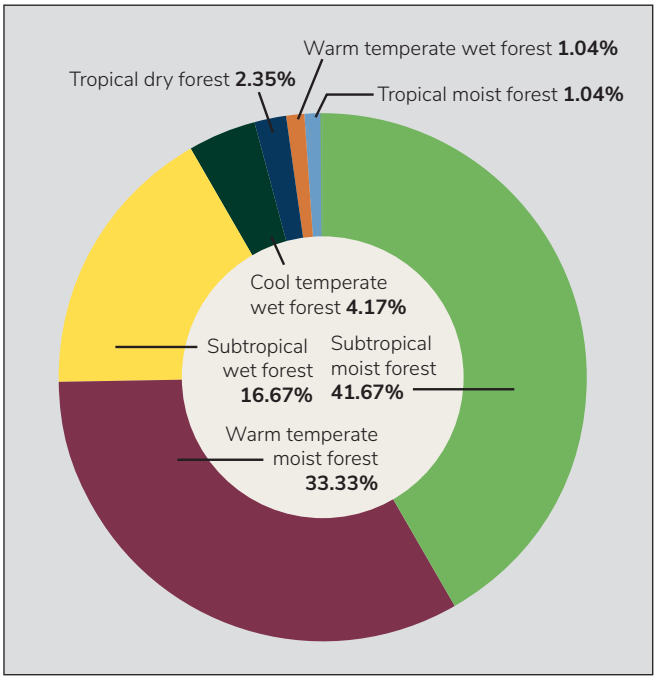

Figure 2. The percentage of wild occurrence points in each Holdridge life zone in which *Quercus vicentensis* is distributed.

THREATS TO WILD POPULATIONS

Human use of species — wild harvesting: Unknown.

Human use of landscape — agriculture, silviculture, ranching, and/or grazing: In the northern areas of El Salvador, a major threat to this species is deforestation due to the development of agricultural land, greenhouses and avocado cultivation. The undergrowth is also modified in some areas for the planting of coffee or cocoa.

Human use of landscape — residential/commercial development, mining, and/or roads: This is not currently considered a threat.

José Gabriel Cerén López

Human use of landscape — tourism and/or recreation: Uncontrolled tourism has developed within the region, especially at areas of high elevation. In the northern area of El Salvador, specifically in the mountains of the municipalities of San Ignacio, La Palma and San Fernando, ecotourism cabins have been developed that change the landscape and tear down native vegetation

Human modification of natural systems — fire regime modification, pollution, eradication: This is not currently considered a threat.

Human modification of natural systems — invasive species competition/disturbance: Unknown.

Climate change — habitat shifting, drought, temperature extremes, and/or flooding: Within the inferred native range of *Q. vicentensis*, the subtropical moist forest is predicted to increase in area by an average of 46% by the years 2061–2080 relative to current conditions (Good et al., 2024). However, this species is also commonly found in the warm temperate moist forest, which is expected to experience a reduction in habitat due to climate change throughout Mesoamerica (Good et al., 2024). A study looking at recent (1990–2016) climate change trends in the Sierra Madre de Chiapas found in general wetter wet seasons and drier dry seasons (Wootton et al., 2023), both of which would impact *Q. vicentensis* in the region.

Genetic material loss — inbreeding and/or introgression: Unknown.

Pests and/or pathogens: Unknown.

Extremely small and/or restricted population: This is not currently considered a threat.

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. vicentensis* (Table 1, Figure 3). Past, present, and planned conservation activities for Mesoamerican oak species of concern were also examined through a 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	3
Number of plants in *ex situ* collections	9
Average number of plants per institution	3
Percent of *ex situ* plants of wild origin	100%
Percent of wild origin plants with known locality	56%

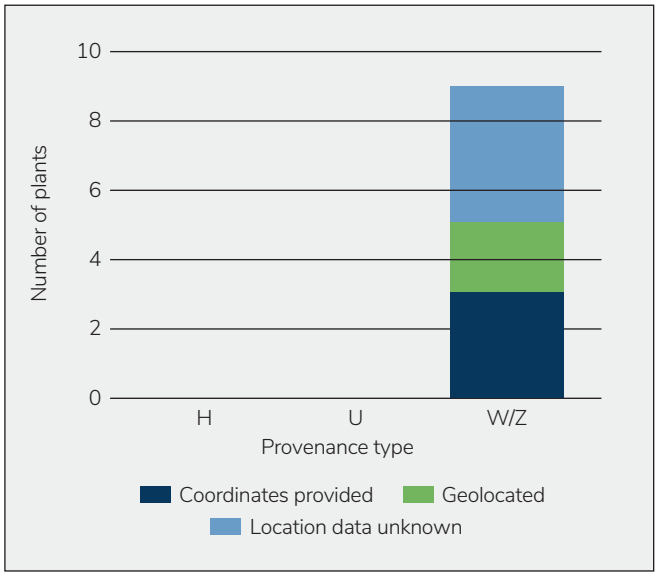

Figure 3. Number and origin of *Quercus vicentensis* plants in *ex situ* collections. Provenance types: H = horticultural; U = unknown; W = wild; Z = propagated from wild.

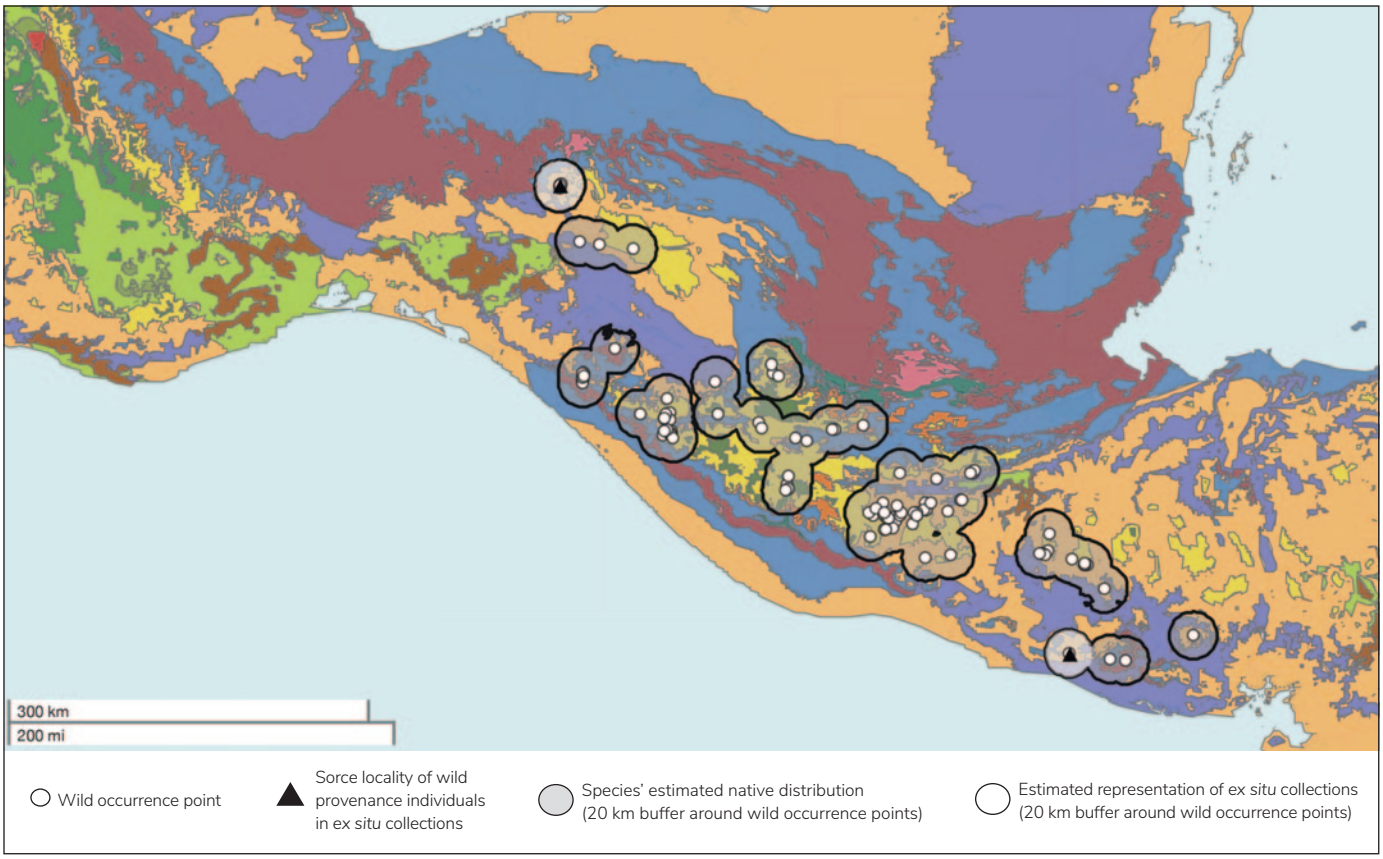

Figure 4. *Quercus vicentensis* wild occurrence points and *ex situ* collection source localities. Colored regions are Holdridge life zones. All *ex situ* collection source localities are also wild occurrence points.

Table 2. *Ex situ* conservation scores for *Quercus vicentensis* 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*	6
Ecological coverage *ex situ*	60
Representation in *ex situ* collections	30
Final *ex situ* conservation score	32

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

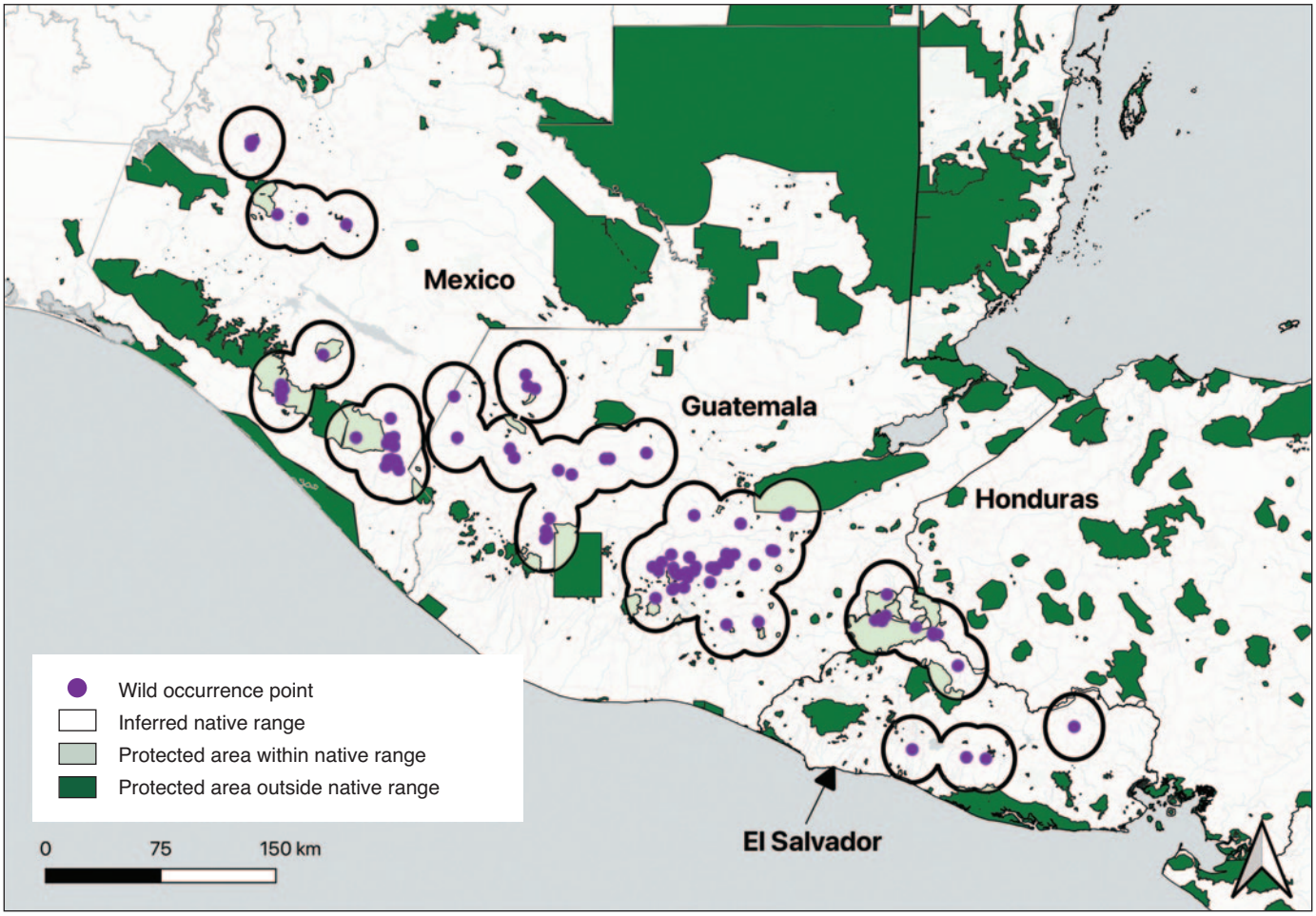

Figure 5. Wild occurrence points and inferred native range of *Quercus vicentensis* in relation to protected areas. Protected areas are from Protected Planet (UNEP-WCMC and IUCN, 2023.

Table 3. *In situ* conservation scores for *Quercus vicentensis* 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*	13
Ecological coverage *in situ*	100
Species representation in *in situ* collections	20
Final *in situ* conservation score	44

Land protection: Within the inferred native range of *Q. vicentensis*, 13% is within protected areas (Figure 5). Protected areas include the Biosphere Reserves "El Triunfo" in Mexico and "Trifinio-Fraternidad" in El Salvador.

Sustainable management of land: Unknown.

Population monitoring and/or occurrence surveys: In 2022 an inventory of the flora of Cerro Negro in San Fernando, Chalatenango, El Salvador was carried out, where five individuals were recorded in three of the 10 plots (each plot of 0.1 ha) established at random for said inventory (Cerén et al., 2022). A 2022 project funded via the Global Botanic Garden Fund by ArbNet resulted in expeditions in Guatemala that produced new collections of *Q. vicentensis* (BGCI, 2022).

Wild collecting and/or *ex situ* curation: According to the results of our *ex situ* surveys, this species is currently reported to be held in three *ex situ* collections.

Propagation and/or breeding programs: This is currently not a conservation activity at the time of publication. However, the National Forest Institute of Guatemala has identified *Q. vicentensis* as an important species for reforestation and propagation efforts (Instituto Nacional de Bosques, 2023).

Reintroduction, reinforcement, and/or translocation: Unknown.

Research: To the best of our knowledge, there is little to no research focused on *Q. vicentensis* at the time of publication.

Education, outreach, and/or training: Unknown.

Species protection policies: In El Salvador, *Q. vicentensis* is on the official list of threatened or endangered wildlife (MARN, 2023) under the Threatened category, which provides this species with some protection.

PRIORITY CONSERVATION ACTIONS

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

Population monitoring and/or occurrence surveys

Additional population studies throughout the species' range are needed to better understand and characterize the habitat, area of occurrence, number of individuals present, and their health status.

Propagation and/or breeding programs

Wild collecting and the establishment of a propagation program for this species should be a priority.

Reintroduction, reinforcement, and/or translocation

Reintroduction of this species into its natural environment is necessary to stabilize wild populations. The promotion of this species as an ornamental should also be considered.

Research

There is a need for genetic studies of populations throughout the distribution of *Q. vicentensis*. In addition, ethnobotanical and phytochemical studies should be performed that document the human uses of this species in order to promote conservation activities and its sustainable use.

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