

Conservation Gap Analysis of Select Native Asian Oaks



Species profile: *Quercus nivea*

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CRITICALLY ENDANGERED

<i>Quercus baniensis</i>	<i>Quercus donnaiensis</i>
<i>Quercus baolamensis</i>	<i>Quercus honbaensis</i>
<i>Quercus bidoupensis</i>	<i>Quercus mangdenensis</i>
<i>Quercus blaoensis</i>	<i>Quercus ngochoaensis</i>
<i>Quercus cambodiensis</i>	<i>Quercus pseudoverticillata</i>
<i>Quercus camusiae</i>	<i>Quercus sontraensis</i>
<i>Quercus dankiaensis</i>	<i>Quercus trungkhanhensis</i>
<i>Quercus dilacerata</i>	<i>Quercus xuanlienensis</i>

ENDANGERED

<i>Quercus arbutifolia</i>	<i>Quercus lodicosa</i>
<i>Quercus asymmetrica</i>	<i>Quercus nivea</i>
<i>Quercus bambusifolia</i>	<i>Quercus percoriacea</i>
<i>Quercus chrysotricha</i>	<i>Quercus petelotii</i>
<i>Quercus disciformis</i>	<i>Quercus ramsbottomii</i>
<i>Quercus edithiae</i>	<i>Quercus rupestris</i>
<i>Quercus kinabaluensis</i>	<i>Quercus steenisii</i>
<i>Quercus kingiana</i>	<i>Quercus xanthotricha</i>
<i>Quercus lenticellata</i>	

VULNERABLE

<i>Quercus austrocochinchinensis</i>
<i>Quercus braianensis</i>
<i>Quercus gaharuensis</i>
<i>Quercus hondae</i>
<i>Quercus kerangasensis</i>
<i>Quercus merrillii</i>
<i>Quercus quangtriensis</i>
<i>Quercus treubiana</i>

Quercus nivea King

IUCN Red List Category and Criteria: Endangered B2ab(i,ii,iii)

Classification: subgenus *Cerris*, section *Cyclobalanopsis*

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DISTRIBUTION AND BIOLOGY

Quercus nivea is a rare, evergreen oak that occurs in Malaysia (Peninsular Malaysia, Sabah, Sarawak; Figure 1). It inhabits subtropical wet forest at an elevation of 305–1000 m (Carrero & Strijk, 2020; Figure 2). *Quercus nivea* is a tree that

grows up to 20 m tall and 40 cm in diameter (Soepadmo, 1968). Leaves are elliptic to oblong, leathery and thick, 8–17 x 2.5–7 cm (Hélandot, 2018). Leaf margins are entire and revolute. Acorns are obovoid to subglobose, 2 cm in diameter, and enclosed 1/2 by the cup (Hélandot, 2018).

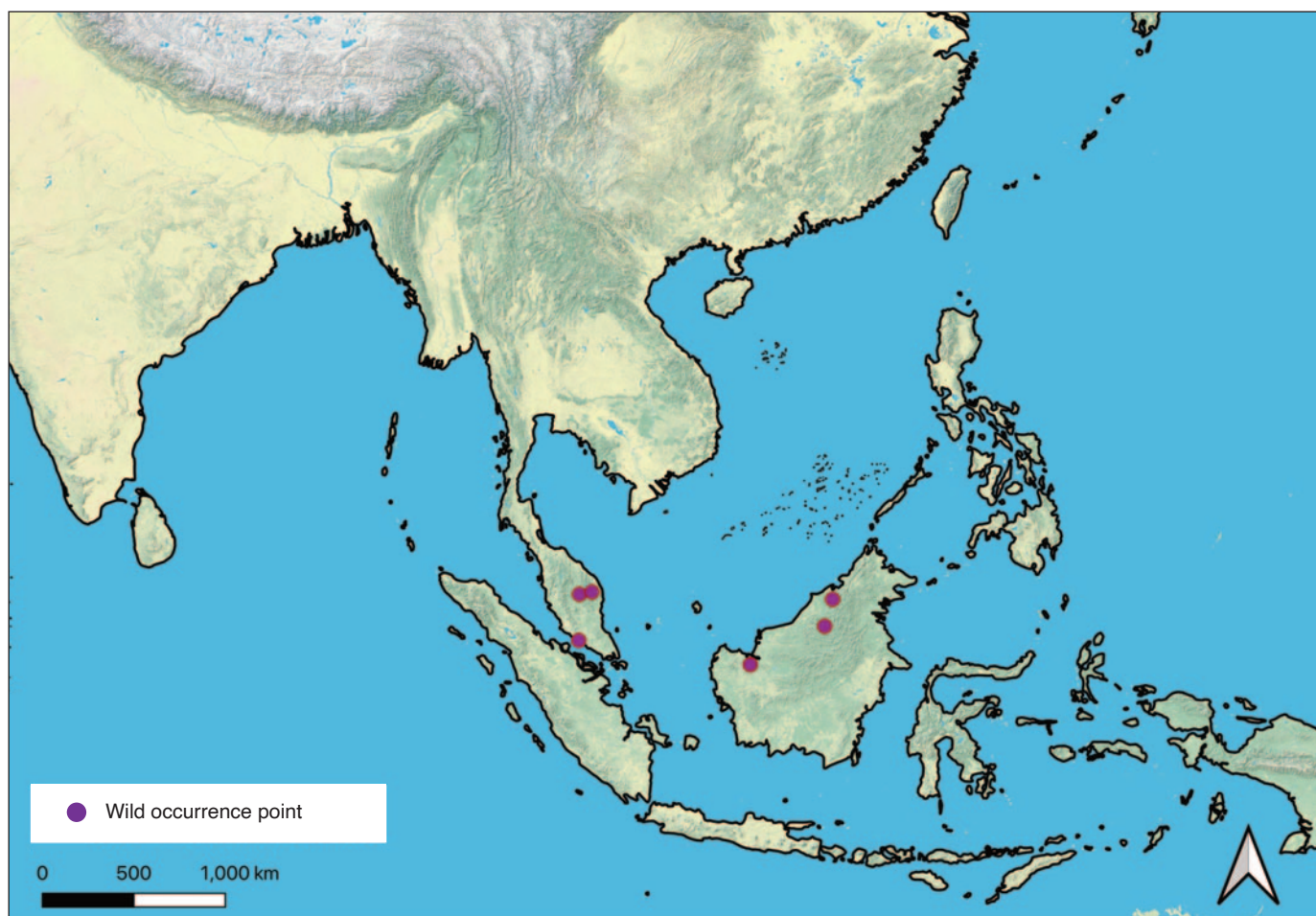


Figure 1. Wild (i.e., in situ) occurrence points for *Quercus nivea*

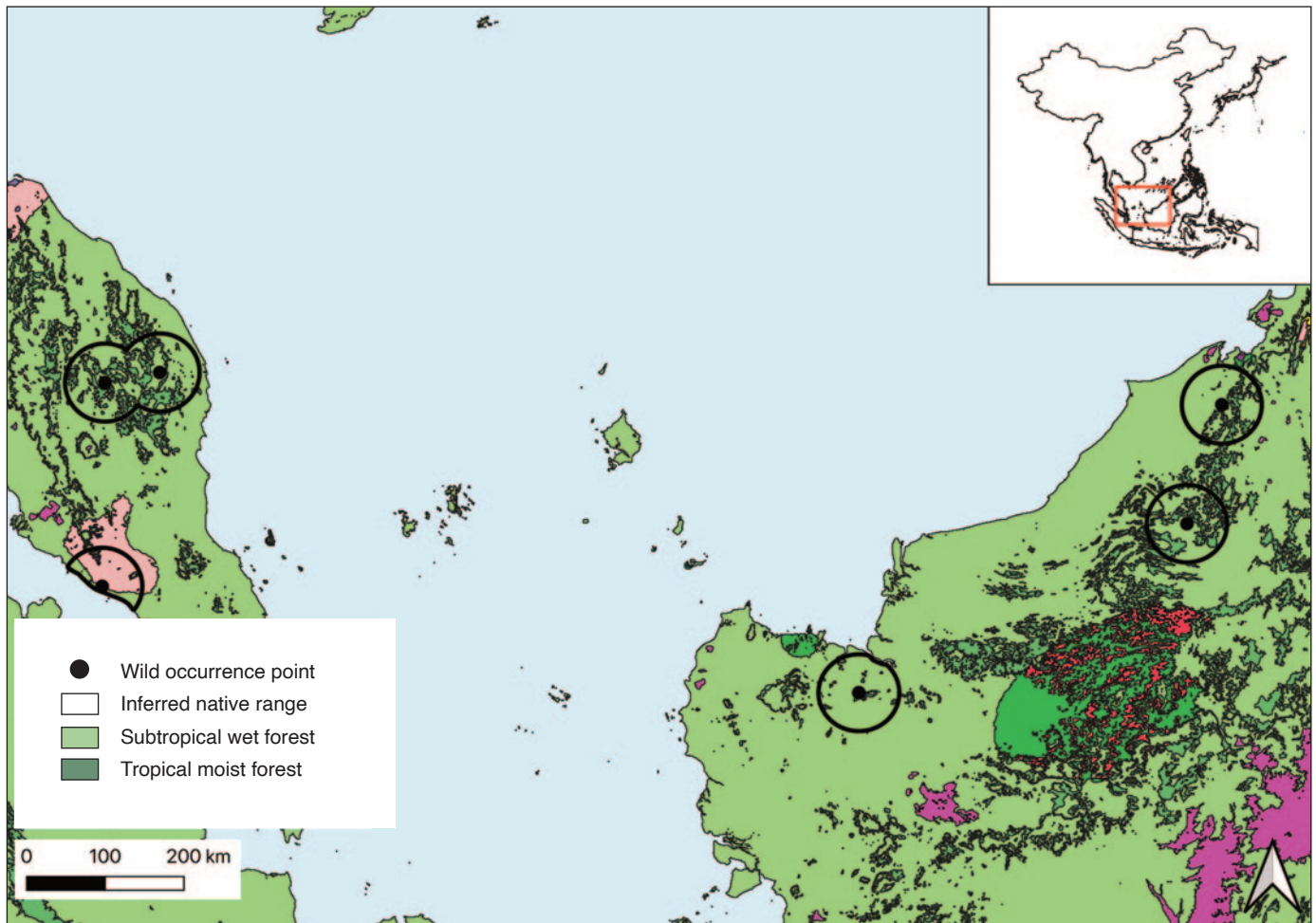


Figure 2. Holdridge Life zones within the inferred native range of *Quercus nivea*. Map legend includes the HLZs with at least one occurrence point of *Q. nivea*. For a full map of HLZs within the study region, see Appendix B in Good et al. (2026).

THREATS TO WILD POPULATIONS

Biodiversity loss in Southeast and East Asia is primarily driven by habitat loss from rapid urbanization, industrialization, and agricultural expansion, resulting in some of the highest deforestation rates globally (Austin et al., 2017; Botterill-James et al., 2024; World Resources Institute, 2025). For oaks in Southeast and East Asia, agricultural expansion (including wood and pulp plantations) is the leading threat, followed by logging and wood harvesting (Good et al., 2026). While species-specific data remain limited, a literature review and consultation with species experts indicates that these broader pressures are applicable to *Q. nivea* and other terrestrial plant species.

Logging and wood harvesting: Logging in Pahang (Peninsular Malaysia) where suspected individuals survive, is now regulated and targets specific species within a strict diameter set. The focal species are primarily Dipterocarpaceae,

and during the selective harvesting procedures, care is generally taken to prevent or reduce damage to surrounding trees and other species. *Quercus nivea* is not listed as a target species. Nursery activities undertaken by Forestry are focused on rearing specific Dipterocarpaceae, with replanting aiming for a recurring harvesting regime every 30 years, depending on growth speed and overall forest regeneration. There is a growing interest of increasing the number of families included in nursery activities used for reforestation, and a recent Fagaceae training workshop held by the Tropical Rainforest Conservation and Research Centre (TRCRC) included discussions on what species would be a priority, what propagation protocols would be needed and the nursery conditions required to facilitate this process (J.S.Strijk (ACTG), Banun Living Collection Training Workshop, May 2026). *Quercus nivea* is Peninsular Malaysia's most threatened Oak, which makes it a priority species in these ongoing developments.

Agriculture, wood and pulp plantations: None specifically known for *Q. nivea*.

Residential/commercial development, mining, roads: *Q. nivea* only occurs in small populations, making it especially sensitive to development and conversion activities.

Tourism and recreation: None specifically known for *Q. nivea*.

Fire and fire suppression: None specifically known for *Q. nivea*.

Invasive species competition/disturbance: None specifically known for *Q. nivea*.

Climate change and severe weather: *Q. nivea* only occurs in small populations and is therefore extraordinarily sensitive to habitat changes resulting from increased weather extremes and climate change. With a wide altitudinal cline (300–1000m), and with the lowlands (outside protected areas) having been mostly cleared in Peninsular Malaysia, it stands to reason that the only remaining populations are at higher elevations. Ecological conditions at higher altitudes can be more extreme, with storms and landslides potentially affecting small populations more strongly.

Genetic material loss: *Q. nivea* only occurs in small, isolated populations which can have strong negative effects on the maintenance of genetic diversity and genetic health of these populations.

Pests/pathogens: None specifically known for *Q. nivea*.

Extremely small populations: *Q. nivea* only occurs in small populations and is therefore extraordinarily sensitive to habitat fragmentation and disturbance. There is currently no information on population sizes.

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

Number of ex situ collections reporting this species	0
Number of plants in ex situ collections	0
Average number of plants per institution	0
Percent of ex situ plants of wild origin	NA
Percent of wild origin plants with known locality	NA

CONSERVATION ACTIVITIES

Once per year between 2021 and 2025, *Quercus* accessions data were requested from ex situ collections globally. A total of 45 institutions from 12 countries submitted data for Southeast and East Asian (SE-E Asian) oak species, including *Q. nivea*. We also included ex situ collections data in our analysis from the 267 institutions that responded to surveys conducted in 2017–2022 for previous gap analysis of oaks led by The Morton Arboretum, as these often included all *Quercus* level accession data at an institution and could have included one or more of our target species. Past, present, and planned conservation activities for SE-E Asian oak species of concern were also examined through literature review and expert consultation.

There were no institutions that reported ex situ collections of *Q. nivea* (Table 1). As a result, geographic and ecological coverage of ex situ collections for *Q. nivea* could not be calculated.

Using methods adapted from Khoury et al. (2020), we estimated the degree of representation of *Q. nivea* 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 3; UNEP-WCMC and IUCN, 2025). A fifty-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.

The final conservation score *in situ* for *Q. nivea* is 49/100 (Table 2). As a reference, the threatened or Data Deficient SE-E Asian oaks with the highest *in situ* conservation scores are *Q. blaoensis* with a score of 77/100, and *Q. xuanlienensis* with a score of 79/100.

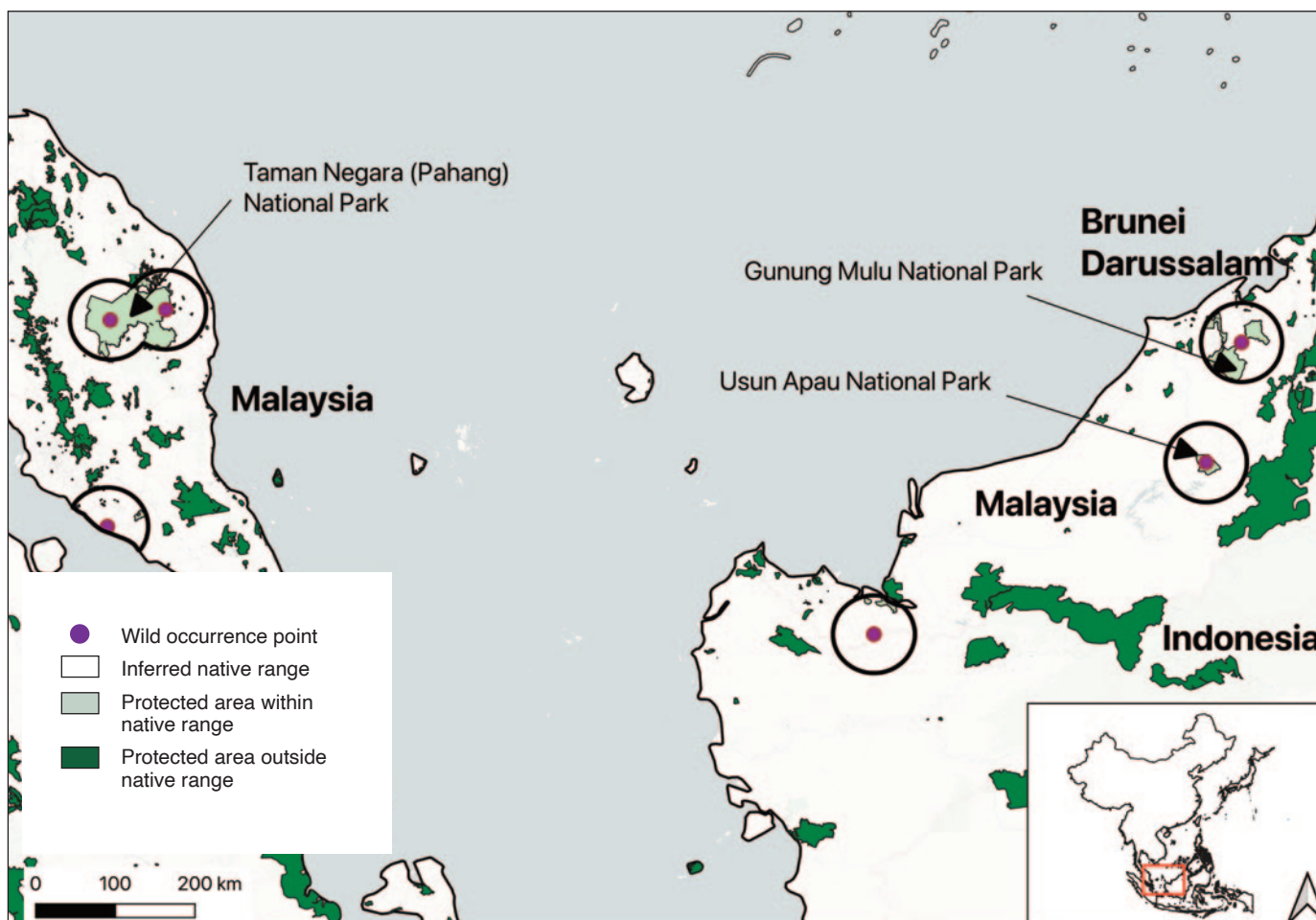


Figure 3. Wild occurrence points and inferred native range of *Quercus nivea* in relation to protected areas. Protected areas are from the World Database on Protected Areas (UNEP-WCMC and IUCN, 2025).

Table 2. *In situ* conservation scores for *Quercus nivea* 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 <i>in situ</i>	22
Ecological coverage <i>in situ</i>	100
Species representation in <i>in situ</i> collections	25
Final <i>in situ</i> conservation score	49

Land protection: Twenty-two percent of the species' inferred native range is within protected areas (Table 2). Protected areas include Taman Negara (Pahang) National Park in Peninsular Malaysia, and Usun Apau National Park in Sarawak, Malaysia.

Sustainable management of land: None specifically known for *Q. nivea*.

Population monitoring and/or occurrence surveys: The majority of datapoints in Peninsular Malaysia have not been surveyed for many decades, and no recent herbarium collections are known. Efforts are underway to relocate and re-assess the populations in Malacca, Taman Negara and the wider Central Forest Spine (see “Education, outreach, and/or training” below).

Wild collecting and/or ex situ curation: At current, no living individuals have been located inside Peninsular Malaysia. As part of ongoing work, ex situ work is in preparation for *Q. nivea* and ongoing for eight other species of *Quercus* within the region.

Propagation and/or breeding programs: At the time of publication, no living individuals have been located inside Peninsular Malaysia. As part of ongoing work, nursery propagation is in preparation for *Q. nivea* and ongoing for eight other species of *Quercus* within the region.

Reintroduction, reinforcement, and/or translocation: Currently, no living individuals have been located inside Peninsular Malaysia. As part of ongoing work, reintroduction, reinforcement, and/or translocation is in preparation for *Q. nivea* and eight other species of *Quercus* within the region.

Research: As part of the ongoing Oak of Peninsular Malaysia conservation project (see “Education, outreach, and/or training” below), species distribution model (SDM) analyses are being prepared to establish viability of existing oak habitat, to identify potential shifts and to identify new habitat under current and future climate change scenarios.

Education, outreach, and/or training: A 2-year project, funded by the International Oak Society (IOS) and led by the Alliance for Conservation Tree Genomics (ACTG - www.actg.science), and Universiti Kebangsaan Malaysia (UKM) is being conducted between 2025-2027. The project includes training of staff, students and local specialists in oak identification, propagation and conservation for the nine species of *Quercus* in Peninsular Malaysia. (International Oak Society, n.d.)

Species protection policies: None specifically known for *Q. nivea*.

PRIORITY CONSERVATION ACTIONS

Recommended conservation actions include protecting logged forests from fire and conversion to plantations. Surveying is recommended to confirm the status and population dynamics of *Quercus nivea* populations and to determine the presence and severity of additional threats.

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