

**LOCAL NAMES**

English (pacific kauri); Fijian (da'ua,dakua dina,makadri,makadre,takua makadre,dakua,dakua makadre)

**BOTANIC DESCRIPTION**

*Agathis macrophylla* is a tall tree typically to about 30–40 m tall, 3 m in bole diameter, with a broad canopy of up to 36 m diameter. Branches may be erect to horizontal and massive. Mature specimens have wide, spreading root systems whereas seedlings and young specimens have a vigorous taproot with one or more whorls of lateral roots.

Leaves simple, entire, elliptic to lanceolate, leathery, and dark green, and shiny above and often glaucous below; about 7–15 cm long and 2–3.5 cm wide, with many close inconspicuous parallel veins. The leaves taper to a more or less pointed tip, rounded at the base, with the margins curved down at the edge. Petioles short, from almost sessile up to 5 mm long.

Cones egg-shaped at the end of the first year, about 5 cm long, and 3 cm in diameter, more or less round at the end of the second year, 8–10 cm in diameter. Female cones much larger than males, globular, on thick woody stalks, green, slightly glaucous, turning brownish during ripening.

Seeds brown, small, ovoid to globose, flattened, winged, and attached to a triangular cone scale about 2.5 cm across.

**BIOLOGY**

Pacific kauri is monoecious and produces cones instead of flowers. The first female cones begin to be produced at about 10 years old and take up to 2 years to mature (more often in 12-15 months). The seeds, released during disintegration of the cone are mostly wind dispersed. Long dispersal distances of up to hundreds of kilometers is likely during cyclones.

Pacific kauri has an estimated life span of 300–1000 years and a 40-55 years projected rotation length for timber production.

**ECOLOGY**

Pacific kauri naturally grows in humid, lowland subtropical, tropical and lower montane rainforests. It occurs more frequently on ridge crests, often exposed slopes, but also on flat to undulating terrain. It can also occur as scattered individuals or in small groups as an emergent or upper canopy tree, in various closed forest associations.

It occurs in association with many different angiosperm and gymnosperm trees including *Camposperma brevipetiolata*, *Fagraea* spp., *Hernandia* spp., *Cryptocarya turbinata*, *Calophyllum neo-ebudicum*, *Garcinia vitiensis*, *Hernandia cordigera*, *Ilex vitiensis*, *Palaquium* spp., *Podocarpus* spp. *Calophyllum vitiense*, *Dacrydium nidulum*, *D. nausoriense*, *Endospermum macrophyllum*, *Fagraea berteriana*, *Garcinia* spp., *Gymnostoma vitiense*, *Myristica* spp., *Palaquium hornei*, *Podocarpus* spp., *Retrophyllum vitiense*, and *Syzygium* spp.

Pacific kauri occurs in near coastal situations and is tolerant of light salt spray. Trees are well adapted to growing in windy locations and cyclones and are likely to tolerate short dry periods.

**BIOPHYSICAL LIMITS**

Altitude: 5 - 1150 m

Temperature: 25 - 28°C

- Mean maximum temperature of hottest month 29 - 31°C

- Mean minimum temperature of coldest month 17 - 23°C

- Minimum temperature tolerated 7°C

Rainfall: 1900 - 6000 mm

Soil type: Pacific kauri generally prefers well drained, friable (oxisols), basalt-derived clay loams and clays with a well developed upper humus layer. It grows in acid to neutral soils (pH 4.0 - 7.4).

**DOCUMENTED SPECIES DISTRIBUTION**

Native: Fiji, Solomon Islands, Vanuatu

Exotic: Malaysia, New Zealand



The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to

your planting site.

**PRODUCTS**

**Timber:** Its finely grained, pale, easily worked, and uniform timber is of major commercial importance with various high value end-uses, including furniture, handicrafts, veneer, boat building, light construction, and paneling.

**Gum or resin:** Manila copal produced from the living inner bark was used in varnishes and is still used mixed with synthetics. The resin is traditionally used as canoe caulk, for lighting and torches, for glazing pots; and the resin soot was used for tattoos.

**Tannin or dyestuff:** Smoke residues of the burnt resin were traditionally used as a dye for hair.

**SERVICES**

**Boundary or barrier:** Tropical cyclones occur at periodic intervals in all parts of its range. Pacific kauri has an ability to withstand strong winds thereby acting as a wind break or barrier. In certain situations it is suited as boundary marker, due to size and longevity.

**Erosion control:** The species is suitable soil protection and binding in areas where long term stabilization of less stable soil profiles is needed. It has spreading root systems that help stabilize soils on ridges and slopes.

**Shade or shelter:** The tree is mainly suitable as a long term over storey tree for more shade tolerant understory crops; however, wide-spaced plantings of less dense forms of Pacific kauri may provide light shade for a wider variety of crops. It is well suited to inclusion as a tree component in silvopastoral systems, to provide high shade for cattle.

**Ornamental:** it can be planted in large public spaces, including along roads. Due to its traditional importance, its long life span and increasing rarity, the plant is ideal for planting in village and schoolyards as a "landmark" tree.

**Wildlife habitat:** It is a very useful wildlife habitat tree, especially for birds, and provides a unique structural element in SW Pacific forest ecosystems.

**Other services:** In some areas the tree has spiritual and ceremonial significance. In Fiji it is the totem tree of several family clans, villages, and districts. In mature trees the canopy is emergent and constitutes a unique structural element in the forests in which it occurs; i.e., the form/structure of Pacific kauri cannot be replaced by any other species. Hence it has major significance in conservation of the plant communities in which it is a component.

**TREE MANAGEMENT**

Spacing should be at an initial density of 400 - 500 stems/ha, reducing to a final density of about 150 stems/ha through mortality and one selective, non-commercial thinning at about 20 - 25 years. In secondary or logged forest, enrichment planting should be at a spacing of 2 - 3 m in lines 9 - 10 m apart; in cleared areas a spacing of 4 - 5 x 4 - 5 m in association with agricultural intercrops is recommended.

Mature plantations self-prune well but regular weeding and vine cutting should be done during the first 4 - 5 years, especially in open grown plantations so as to produce a stock of well formed stems. In native forests it is recommended that natural regeneration be periodically tended, mainly released from vines and climbers, following opening up of the canopy through logging, since the species is a gap opportunist.

Pacific kauri is very tolerant of shading, but growth rates are greatly reduced at higher levels of shading. It is reasonably tolerant of root competition, but seedlings/saplings should be kept free of competition from grasses.

**GERMPLASM MANAGEMENT**

To achieve greater seed viability and longevity, recently matured cones should be collected. Cones should be open air dried, and seeds extracted immediately to minimize fungal damage and/or germination in the cone. On average about half the seeds are viable. Freshly collected seed has about 5000 - 6000 viable seeds/kg.

Pacific kauri seed storage behavior is intermediate. For long term storage, seed should be dried to around 9 - 13% moisture content and kept at -13°C. Drying below 7% moisture content reduces viability.

It is recommended that de-winged seeds be sown immediately following collection and processing. No pretreatment is required, and fresh, undamaged seeds germinate rapidly, commencing within 2 - 7 days (at 26°C) and completed by 14 days.

For introduction into areas outside of its natural range, it is important to inoculate seedlings with appropriate mycorrhizal fungi. Seedlings reach a plantable size after about 6 - 12 months in the nursery, and are suitable for field planting when they have reached 25 - 30 cm.

**PESTS AND DISEASES**

Pacific kauri has low susceptibility to termite attack and beetle larvae. Pink disease, caused by *Corticium salmonicolor*, and root fungi may be lethal to the plant but are usually restricted to waterlogged sites. Other pests and diseases include foliage blight (*Cylindrocladium macrosporum*), necrotic bark, leaf gall, canker, hollow butt, coreid bug (*Amblypelta cocophaga*), and *Phellinus noxius*. The most serious pests are larvae of the primitive moth *Agathipaga vitiense* whose attack may greatly reduce the amount of viable seed produced, by up to 95%. Plants may suffer from dieback especially when grown on soils of poor structure.

**FURTHER READING**

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**SUGGESTED CITATION**

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