

Ficus macrophylla

Moreton bay fig

Moraceae

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OVERVIEW

Over sixty species of *Ficus* are cultivated in Hawai'i. Most species that are cultivated do not reproduce and spread from initial plantings because of the absence of their associated pollinator wasp. Without their associated wasp, *Ficus* trees are unable to reproduce. The pollinator wasp for *F. macrophylla*, *Pleistodontes froggatti* Mayr., was purposefully introduced to Hawai'i in 1921 (Wagner et al. 1999). The wasp successfully established and reproduction of *F. macrophylla* has been documented on Maui and Hawai'i (Oppenheimer and Bartlett 2000, Starr et al. 2002). This species has many invasive characteristics including prolific fruit production, small seeds that are bird dispersed, ability to invade both disturbed and native forests, and difficulty in control due to epiphytic growth and steep terrain. The pollinator wasp for *F. macrophylla* recently arrived in New Zealand, allowing this species to spread there as well, making it a potential threat to natural areas. On Maui, *F. macrophylla* is not as widespread as other more popular fig trees and controlling small populations near natural areas may be feasible.

TAXONOMY

Family: Moraceae (Mulberry family)

Latin name: *Ficus macrophylla* Desf. ex Pers. (Bailey and Bailey 1976).

Synonyms: *F. macrocarpa* Hugel ex Kunth & Bouche (Bailey and Bailey 1976), *F. magnolioides* (Riffle 1998).

Common names: Moreton Bay fig, Australian banyan (Bailey and Bailey 1976).

Taxonomic notes: The genus *Ficus* is made up of about 1,000 species from pantropical and subtropical origins (Wagner et al. 1999). Plants in the genus are all woody, ranging from trees and shrubs to climbers (Neal 1965).

Nomenclature: The species name, *macrophylla*, suggests the large size of the leaves.

Related species in Hawai'i: In Hawai'i, about 60 other species of *Ficus* are cultivated (Wagner et al. 1999).

DESCRIPTION

"Wide spreading, evergreen tree with aerial roots (some becoming props). Oblong to elliptic or ovate, leathery leaves, mid-green and hairless above, to 10 in (25 cm) long, are paler beneath, often with rust-red scales. Ovoid fig, to 3/4 in (2 cm) long, ripening from green to purple with yellow-green flecks, are produced only on mature trees in the open, usually in pairs" (Brickell and Zuk 1997). Neal (1965) adds that this species has an extensive surface root system and leaf buds enclosed in rose-colored sheaths, 2 to 4 in

long, which soon fall. "Large tree, to 50 ft in cultivation, to 200 ft in the wild. Leaves ovate to elliptic, 6-12 in long, acute, glossy above, silvery to rusty-dotted beneath. Figs axillary, globose, dark, reddish-brown to purple with paler spots, to 1 in diam." (Bailey and Bailey 1976). Seeds are minute.

BIOLOGY & ECOLOGY

Cultivation: This large banyan is cultivated for its impressive size as a specimen or avenue tree. In the United States, it has long been cultivated in California and more recently in Florida. In cultivation, the tree reaches lesser heights than in its native habitat and is said to be somewhat cold and drought tolerant (Riffle 1998). In the State of Hawai'i, over 36,000 trees were planted for reforestation between 1910 and 1960, mostly on Hawai'i and O'ahu, with fewer on Kaua'i (Skolmen 1910-1960). On Maui, *F. macrophylla* trees are observed in plantings in yards, old estates, parks, botanical gardens, and near buildings.

Invasiveness: In Hawai'i, *F. macrophylla* is spreading from initial plantings to adjacent areas. Numerous fruits are born on mature trees, attracting fruit eating birds that disperse the small seeds. Seeds often germinate in trees and grow as epiphytes, eventually replacing the host tree. *F. macrophylla* has been spreading in both disturbed and native forests. *F. macrophylla* will germinate and grow in a variety of host trees. Seedlings growing as epiphytes have been observed growing in adjacent forestry plantings, such as *Melaleuca quinquinervia*. Trees in residential areas nearby *F. macrophylla* plantings, such as palms, also have *F. macrophylla* seedlings growing in them. Young trees have also been observed growing in abandoned buildings. When *F. macrophylla* plantings are located near native forests, native tree species, such as koa (*Acacia koa*) and ohia (*Metrosideros polymorpha*), are often hosts of *F. macrophylla*. The host trees will eventually be strangled and replaced by the *F. macrophylla*. In New Zealand, Gardner and Early (1996) report that pollinator wasps, *Pleistodontes froggatti*, were first found in 1993 at Westfield, Auckland, then within the next month at several well separated places on the Auckland isthmus. It is uncertain whether the wasp made it to New Zealand on its own or as an accidental introduction. In New Zealand, fruit is readily eaten by blackbirds (*Turdus merula*) and many other animals including possums (*Trichosurus vulpecula*) (Gardner and Early 1996).

Pollination: The fruit (syconium or fig) and reproduction systems of species in the genus *Ficus* are unique. Each species of *Ficus* has an associated species of agaonid wasp (Hymenoptera: Chalcoidea: Agaonidae). *Ficus* species can only be pollinated by their associated agaonid wasps and in turn, the wasps can only lay eggs within their associated *Ficus* fruit. The pollinator wasp for *F. macrophylla* is *Pleistodontes froggatti*.

Propagation: In Hawai'i, seeds are viable. Most figs can be grown from air layers or cuttings.

Dispersal: Plants are initially spread by humans who grow the plant for ornament. Various birds observed by the authors foraging and roosting in other *Ficus* trees on Maui

include mynah birds (*Acridotheres tristis tristis*), blue faced doves (*Geopelia striata*), lace necked doves (*Streptopelia chinensis*), Japanese white-eye (*Zosterops japonicus*), and house sparrows (*Passer domesticus*), though there are probably more. Other animals, such as bats, pigs, rodents, parrots, and monkeys may be capable of spreading fruit.

Pests and Diseases: Brickell and Zuk (1997) report the following pests and diseases of *Ficus* spp.: mealybugs, scale insects, spider mites, root knot nematodes, and thrips occur under most environmental conditions, fungal and bacterial leaf spots, crown gall, twig dieback, and Southern blight.

DISTRIBUTION

Native range: *F. macrophylla* is native to tropical Queensland and northern New South Wales in Australia (Riffle 1998). In this area of Eastern Australia, typical average temperatures range from 68–86 F (20–30 C) in January and from 50–68 F (10–20 C) in July (Hammond 1986). Average annual rainfall in this region ranges from 20-80 in (50-200 cm) (Hammond 1986).

Global distribution: *F. macrophylla* is widely cultivated. It is grown in the United States in at least Hawai'i, California, and Florida. Apparently, Californians historically had a great interest in introducing and growing Australian plants for landscaping and therefore, *F. macrophylla* has been grown in California for much longer than in Florida (Riffle 1998). It is a drought tolerant banyan that is hardier to cold than most banyans and can withstand temperatures 28 F (-7 C) or above, though younger trees are more susceptible to cold (Riffle 1998). Trees grown in the continental United States do not grow as large as trees in their native habitat. It is cultivated and naturalized in New Zealand.

State of Hawaii distribution: *F. macrophylla* is cultivated and naturalized in Hawai'i. It was used in reforestation and mostly planted in the 1920's through 1930's with 4,092 trees planted on Kaua'i, 10,687 on O'ahu, and 21,727 on Hawai'i (Skolmen 1910-1960). Though not noted in Skolmen (1910-1960) trees also occur on Maui and Midway Atoll. Trees are probably grown on all the main islands, though statewide distribution is not confirmed. At Midway Atoll, there are two large mature trees near the West Beach area on either side of the golf cart path. The pollinator wasps were first noted by Nishida (1998). The wasps were still present in 1999 and 2001, but no seedlings or signs of reproduction were noted. These two trees were targeted for eradication to prevent future spread of another *Ficus* species on Midway (*F. microcarpa* is already spreading there causing serious damage to historical structures and strangling desirable trees). It is uncertain whether the control work has been executed or not.

Island of Maui distribution: On Maui, *F. macrophylla* is occasionally planted as a specimen or street tree near buildings and parks from sea level up to about 3,000 ft (914 m). Naturalized plants have been observed from close to sea level up to less than 2,000 ft (610 m). It is uncertain how high in elevation this plant is capable of invading. Plants seem to prefer mesic to moist habitat. A few plantings of single trees occur in Lahaina and naturalized trees were observed near Olowalu, possibly indicating that there are more

trees located in the gulches upslope. A planting in Flemming Arboretum is now the source of seedlings that are invading native mesic to wet forests to over 1,600 ft (488 m). According to Oppenheimer and Bartlett (2000), "Although *F. macrophylla* can be terrestrial, in most of the observations it seems to be epiphytic, at least when young. Eventually roots reach the ground, and the host tree will be smothered or broken by the sheer weight. *F. macrophylla* seems to favor *Acacia koa*, but small trees have also been noted on *Metrosideros polymorpha* var. *glabberima*, *Diospyros sandwicensis*, and *Schinus terebinthifolius*...Control methods are being considered before this taxon becomes more widespread, but it's epiphytic habit and preference for native trees as hosts makes herbicide options limited." Another area where plants are spreading from initial plantings is in the Ha'iku area. Several large trees are located in a landscape at an old estate. From there, seedlings and small trees are observed mostly growing as epiphytes in surrounding vegetation. A relatively isolated location of a naturalized plant was observed in Nahiku. This area is very moist, close to protected watershed forests, and the furthest east location on Maui to date. This may be a good site to assess for control.

CONTROL METHODS

Physical control: Small seedlings can be hand pulled.

Chemical control: "Fig trees are particularly sensitive to triclopyr herbicides as a basal or cut-stump treatment. Trees found growing on concrete or rock structures should be treated with herbicide while young to avoid costly structural damage. Use extreme caution when applying herbicide to figs growing as epiphytes to ensure that the poison does not contact the host tree. When exotic figs germinate high in the branches of large trees in natural forest communities, it may be extraordinarily difficult to get close enough to the fig to treat it." (Hammer 1996).

Biological control: Nadel et al. (1991) report several pests that could be looked at for biological control potential including various ants which were seen carrying off pollinator wasps from *Ficus* fruits, Hymenoptera and mites that may be parasites of the pollinator wasps, and staphylinids which were seen entering *Ficus* fruits and eating the pollinator wasps.

Cultural control: The public could be asked not to grow *F. macrophylla*.

Noxious weed acts: None.

MANAGEMENT RECOMMENDATIONS

With the pollinator wasp present in Hawai'i, *F. macrophylla* currently is spreading and will likely continue to do so. The distribution on Maui is currently not as widespread as other non-native *Ficus* species, such as *F. microcarpa* and *F. platypoda*. Control work should be done in areas with limited distribution of *F. macrophylla* trees and in areas where *F. macrophylla* could cause most severe harm, such as in watersheds and protected areas. Control methods will need to be investigated to figure out how to deal with epiphytic growth on native trees in steep and wet terrain. The two trees on Midway should be eradicated if they have not yet done so. New locations of *F. macrophylla*

should be monitored so that control work can be done before the situation gets beyond management. *Ficus* wasps should be prohibited from entry to Hawai'i to prevent other *Ficus* trees from spreading beyond initial plantings and potentially causing harm to Hawai'i's native ecosystems.

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