

Leptospermum spp.

Tea tree
Myrtaceae

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OVERVIEW

The genus *Leptospermum*, mostly native from Australia but also from S. E. Asia to New Zealand, are valued in horticulture for their shrubby habit, sometimes aromatic foliage, and numerous attractive small flowers (Brickell and Zuk 1997). In Hawai'i, several *Leptospermum* species have been cultivated in the past for use in forestry plantings and in more recent times for use in landscaping. Previously, three species were known from Hawai'i, *L. laevigatum*, *L. flavescens*, and *L. scoparium* (Wagner et al. 1999). After revision of Hawaiian specimens in 1999, several other species were identified and some misidentifications were corrected, resulting in a total of five *Leptospermum* species, *L. laevigatum*, *L. morisonii*, *L. petersonii*, *L. polygalifolium* and *L. scoparium* (Herbarium Pacificum Staff 1999, Wagner et al. 1999). Some invasive attributes of plants in this genus include shrubby thick aggressive growth capable of crowding or shading out desirable species, ability to invade inhospitable areas, and numerous light wind born seeds. Other than Hawai'i, *Leptospermum* is also considered invasive in South Africa where *Leptospermum laevigatum* is known to spread and potentially threatens native vegetation (Scarborough Conservation Group 2002). On Lana'i, *Leptospermum* spp. have spread from original plantings and can form monotypic thickets. On Maui, both *L. morrisonii* and *L. scoparium* were planted during the early 1900's as forestry trees (Skolmen 1960, Herbarium Pacificum Staff 1999, Wagner et al. 1999). *L. morrisonii* has been identified from the wet side of the island near Keanae where it was planted as a forestry tree. It is suspected that other species were planted for forestry and further investigation may turn up more species. *Leptospermums*, possibly *L. scoparium*, *L. laevigatum*, or other species are currently widely cultivated in residential areas of Maui, especially in cooler climates and higher elevations (1,000-4,000 ft) of Kula, Pukalani, Makawao, Olinda, Pi'iholo, and Ha'iku. Very little sign of spread has been noted from these residential plantings with only a few small seedlings seen under one planting in Kula, and it is uncertain whether it will only be a matter of time for these to spread further, or if there is some other reason for lack of evidence of spread in these areas. Further investigation of *Leptospermum* species throughout the state of Hawai'i is needed.

TAXONOMY

Family: Myrtaceae (Myrtle family) (Wagner et al. 1999).

Latin name: Five species known from Hawai'i (Herbarium Pacificum Staff 1999, Wagner et al. 1999): *Leptospermum laevigatum* (Gaertner) F. Muell., *L. morisonii* J. Thompson, *L. petersonii* Bailey, *L. polygalifolium* Salisb., and *L. scoparium* J. R. Forster & G. Forster.

Synonyms: Some synonyms for the species mentioned above include the following: *L. laevigatum* [syn. *Fabricia laevigatum* Sol. ex Gaertn.] (Wagner et al. 1999), *L. petersonii* [syn. *L. flavescens* var. *citratum* J. F. Bailey & C. T. White, *L. citratum* (J. F. Bailey & C. T. White) Chall., Cheel, & Penf.] (Bailey and Bailey 1976), *L. polygalifolium* [syn. *L. flavescens* Sm.] (Herbarium Pacificum Staff 1999, Wagner et al. 1999), *L. scoparium* [syn. *L. s.* var. *incanum* Cockayne] (Wagner et al. 1999), *L. floribundum* Salisb. (Bailey and Bailey 1976)].

Common names: Some common names for the species mentioned above include: *L. laevigatum* – Australian tea tree and *L. scoparium* – New Zealand tea tree, Manuka (Bailey and Bailey 1976).

Taxonomic notes: *Leptospermum* is a genus of 40-80 species of evergreen shrubs to small trees native mostly from Australia but also ranging from S.E. Asia to New Zealand (Bailey and Bailey 1976, Brickell and Zuk 1997, Wagner et al. 1999).

Nomenclature: The name is derived from the Greek *leptos*, meaning slender, and *sperma*, meaning seed, referring to the linear seeds of plants in this genus (Wagner et al. 1999).

Related species in Hawai'i: Species in Hawai'i that are documented as naturalized are mentioned above. However, numerous cultivars, varieties and more species are likely present but have yet to be collected. There has been much confusion in the past over species identification.

DESCRIPTION

Leptospermum: "Shrubs or small tree. Leaves alternate, 1-3 nerved or nerves obscure, margins entire. Flowers 1-3, axillary, sessile or subsessile; sepals 5; petals 5, clawed; stamens numerous, in a single series; ovary partly inferior, 3-10-celled, ovules few to numerous per cell. Fruit a woody loculicidal capsule. Seeds linear, often many abortive" (Wagner et al. 1999).

L. laevigatum: "Large shrub or tree, to 20 ft., trunk often twisted, bark shredding in long flakes; lvs. broadly oblanceolate, to 1 in. long, mucronate, leathery, with very inconspicuous veins; fls. white, to 3/4 in. across, solitary, axillary, sessile or nearly so; caps. 8-10-valved." (Bailey and Bailey 1976).

L. morisonii: Observed as a large tree up to 60 ft (20 m) tall.

L. petersonii: "Shrub or tree, to 20 ft., lvs. linear or linear-lanceolate, to 2 in. long; fls. white, to 3/8 in. across, solitary, axillary or terminal on lateral branchlets, sessile or nearly so; caps. 5-valved, valves slightly domed above rim." (Bailey and Bailey 1976).

L. polygalifolium: "Erect to spreading, freely branching shrub or tree. Crowded, spreading or occasionally reflexed, mid- to deep green leaves, 1/4 – 3/4 in (0.5-2 cm) long, are linear to inversely lance-shaped-elliptic, with conspicuous oil glands, sometimes lightly aromatic. From late spring to summer, bears solitary, cup-shaped, white or cream, sometimes green- or pink-tinted flowers, 1/2 in (1.5 cm) across. Height 6-22 ft (2-7 m)." (Brickell and Zuk 1997).

L. scoparium: "Shrub or small tree to 20 ft (6 m) high and 6 in (15 cm) in trunk diameter, with irregular crown of many nearly erect wiry branches. Bark gray brown, fissured and shreddy, with thick outer layer. Inner bark light pink, fibrous, slightly bitter or astringent. Twigs very slender erect or nearly so, gray and finely hairy when young, becoming fissured and rough. Leaves borne singly (alternate), stalkless, needle-like and very narrow (linear), 5/16 – 5/8 in (8-15 mm) long and about 1/16 in (1.5 mm) wide, sharp-pointed, narrowed to stalkless base, thin, slightly stiff, with whitish pressed hairs when young, dull green above, paler beneath, with tiny gland-dots visible under lens. Flowers single and almost stalkless at end of short side twigs, about 5/8 in (15 mm) across. the green conical base (hypanthium) 1/8 in (3 mm) long bears on rim 5 whitish pointed sepals, 5 rounded petals whitish or tuning pinkish, and many threadlike white stamens, and has pistil with inferior ovary and slender style. Fruits (seeds capsules) nearly stalkless, bell-shaped, 1/4 in (6 mm) long and broad, gray, hard, and becoming very wrinkled, 5-celled, opening at flattened top along 5 spreading starlike lines, remaining attached on older twigs. Seeds many, tiny, reddish brown, 1/16 in (1.5 mm) long." (Little and Skolmen 1989).

BIOLOGY & ECOLOGY

Cultivation: *Leptospermum* species are attractive evergreen shrubs to small trees, often with aromatic foliage and unique bark with a shredded appearance. They have numerous small blossoms of many different colors of red, pink, and white. In Hawai'i, they have been planted as ornamentals, in forestry plantations, and in erosion control projects.

Invasiveness: In Hawai'i, at least 5 species of *Leptospermum* are now documented as naturalized. *L. laevigatum* and *L. scoparium* were both planted on Lana'i during forestry efforts in part to stabilize the eroding soils. According to Robert Hobdy (DLNR-DOFAW) (pers. comm.), both species stayed put for a long time then suddenly began to spread, with *L. scoparium* being the more aggressive of the two. With thick shrubby growth, not much else can grow beneath *Leptospermum* infestations. Seeds are light and numerous, being spread on the wind. In South Africa, *L. laevigatum* was originally cultivated as a hedge plant and is now spreading into natural areas (ARC-PPRI 2002).

Pollination: Unknown.

Propagation: *Leptospermum* spp. can be propagated from seeds in the spring, from cuttings in May, or from hardwood cuttings in the fall (Bailey and Bailey 1976).

Dispersal: Numerous light seeds are born on the wind. This popular plant is spread in horticulture trade. It has also been used in various places to stabilize eroding soils and sands. Seeds are produced in fire resistant seed capsules (ARC-PPRI 2002).

Pests and Diseases: According to Brickell and Zuk (1997), pests and diseases are infrequent.

DISTRIBUTION

Native range: Species in the genus *Leptospermum* are native mostly from Australia, from areas of Queensland, New South Wales, Lord Howe Island, and Tasmania, with a few species also from S. E. Asia to New Zealand, occurring mostly in rainforest and semi-arid areas (Brickell and Zuk 1997). These areas are made up of mixed coniferous and broadleaf forest, mixed woodland, and some alpine and coastal areas with average annual temperatures varying from 50-86 F (10-30 C) in January to 32-68 F (0-20 C) in July and average annual rainfall around 20-80 in (50-200 cm) (Hammond 1986).

Global distribution: *Leptospermums* are cultivated in various parts of the world. They have been used for forestry efforts and plantings aimed to stabilize soils and sands. In the United States, they are cultivated in at least Southern California and Hawai'i (Little and Skolmen 1989). In South Africa, *Leptospermum laevigatum* has long been cultivated as a hedge plant. It is now considered an aggressive invader of natural areas (fynbos). It is cultivated in the town of Scarborough where it is now considered an invasive alien species that threatens the unique natural areas nearby (Scarborough Conservation Group 2002). The town is situated within the Cape Peninsula Protected Natural Environment and is aspiring to be conservation village. Under proposed regulation 15 of the Conservation of Agricultural Resources Act, residents are encouraged to remove invasive plants that threaten natural areas from their yards and replace them with native indigenous plant species. *L. laevigatum* is listed as a Category I invasive plant species which makes it an offence to grow in the proposed legislation. This unique area is biologically rich and consists of a lower coastal terrace, lower mountain slopes, wetlands, and associated dune systems. The climate is typically Mediterranean and consists of cool wet winters and warm dry summers. Average annual rainfall varies from 500-600 mm in low coastal areas to about 1,100 mm on mountain peaks (Scarborough Conservation Group 2002). The geology is comprised largely of ancient granite rock covered by more recent layers of sedimentary rock made up mostly of shale and quartzitic sandstone (Scarborough Conservation Group 2002). Soils are typically shallow, nutrient poor, and sandy with low water holding capabilities (Scarborough Conservation Group 2002).

State of Hawai'i distribution: In Hawai'i, several *Leptospermum* species are documented as planted and naturalized. It is likely that other species will be identified as more specimens are collected. This genus is capable of forming thickets which crowd out other plants. According to Smith (1985), it appears to have allelopathic activity like many other members of the Myrtaceae family, and is found in mesic habitats between 300-700 m (984-2,297 ft) elevation. The following species are documented from Hawai'i with information mainly from Herbarium Pacificum Staff (1999) and Wagner et al. (1999).

L. laevigatum: O'ahu, Honolulu. Lana'i, in bare areas among *Eucalyptus* trees, planted before 1930 by G. Munro.

L. morrisonii: Maui, along ditch trail between Honomanu Valley and Keanae Valley, planted in forest reserve in moderately dry, open region, Ko'olau Forest Reserve.

L. petersonii: Hawai'i, South Kona district, Captain Cook, McCandless Ranch, also cultivated in Hilo Forestry Arboretum.

L. polygalifolium: O'ahu, mostly known from cultivated specimens and one naturalized specimen.

L. scoparium: Kaua'i, at 1,100-3,900 ft (335-1,189 m) elevation (Little and Skolmen 1989). O'ahu, large dense stands in the Poamoho and Kawailoa areas at about 1,800-2,200 ft (549-671 m) elevation, other infestations found along Waimano and Manana trails, also at Mt. Ka'ala Natural Area Reserve, incipient population found in or near disturbed areas (Tanimoto and Char 1992). Lana'i, cultivated and now naturalized, primarily in disturbed mesic to wet forest and areas of forestry plantings, 1,083-4,003 ft (330-1,220 m) elevation. First collected on Lana'i in 1927 (Wagner et al. 1999). It is naturalized and has become a pest on Lana'i Hale.

Island of Maui distribution: One naturalized species is known from Maui, *L. morisonii*. This species was planted in the Ko'olau Forest Reserve and does not look like the typical ornamental species. This species was not originally recorded in forestry records, rather, *L. scoparium* is the species listed as being planted in Ko'olau. Most likely, several species were planted that were not originally recorded and it is likely that other species exist in Hawai'i but have yet to be documented. *L. morisonii* can be observed in the Ko'olau Forest Reserve along irrigation roads and in plantations. Some large mature trees were observed near the ditch trail and in gulches just beyond the trail. Most appeared planted. There seemed to be little evidence of naturalization, except for one instance where it appeared that there was a seedling on a stump. Other *Leptospermum* species, probably *L. laevigatum* and *L. scoparium* are commonly planted in residential areas from 1,000-4,000 ft (305-1,219 m) elevation in the areas of Kula, Pukalani, Makawao, Olinda, Pi'iholo, and Ha'iku of East Maui. One plant was observed in Kahului and one in Kihei (hot lowland areas). No plants were observed on West Maui. These commonly cultivated plants seem to be most popular in the landscaping mix of the cooler climate of "Upcountry" East Maui. Not much sign of spread has been noted in these areas with the exception of an occasional plant germinating beneath the parent plant. It is uncertain whether more spread of this nature is occurring due to difficulties in getting into close proximity with the specimens and the lack of first hand knowledge of the planting. It could also be a matter of time before the *Leptospermum* spp. begin to spread in Kula. Further investigation is necessary to determine what species these are and what extent of naturalization is occurring. If there is spread occurring, it is not very obvious or conspicuous at this time.

CONTROL METHODS

Physical control: It may be possible to hand pull small seedlings. There are mixed results on cutting the tree at the base without herbicide application. Some sources said this was effective while others said it was not effective. These plants seem rather hardy and merely cutting them at the base may not result in full control. Herbicide application may be necessary.

Chemical control: Most likely, cut stump and basal bark application of herbicides are effective. It is uncertain whether foliar applications are effective.

Biological control: Biological control agents have been released in South Africa including a leaf-mining gracillariid moth, *Parectopa thalassias*, from Australia, and an unidentified gall-forming midge, *Dasineura* sp. (ARC-PPRI 2002). The leaf-mining moth was first released in April 1996 and has successfully dispersed to all areas of South Africa where *L. laevigatum* occurs (ARC-PPRI 2002). Damage to the plant is caused by the feeding of the moth larva which cause young leaves to prematurely brown, and become bloated. The female moths lay tiny eggs on upper and lower surfaces of *L. laevigatum* leaves (older leaves are not attacked). After hatching, moth larva penetrate the leaf and feed on the internal leaf tissue, feeding in a serpentine like pattern within the leaf. Each moth completes this cycle in a single leaf, exits the leaf, spins a silk cocoon, and pupates into an adult moth (ARC-PPRI 2002). Moth life cycle varies from two months during summer to three months during autumn and there is a rest period during winters. Several generations occur per year. Feeding damage in the moth's native Australia causes up to 50% leaf drop (ARC-PPRI 2002). It is hoped that repeated defoliation in South Africa by the introduced moth will slow growth and vigor in smaller plants.

Cultural control: The public could be discourage from planting *Leptospermum* species or other potentially invasive non-native plants.

Noxious weed acts: *Leptospermum* spp. are not listed as noxious weeds in the United States. However, some are known to become invasive in Hawai'i and South Africa.

MANAGEMENT RECOMMENDATIONS

Leptospermum species are widely cultivated as ornamentals and for erosion control. Several species have spread from initial plantings, in places such as Hawai'i and South Africa, threatening native vegetation by forming shrubby thickets that crowd out desirable plants. On Maui, *L. morisonii* was planted in the Ko'olau Forest Reserve. This species shows little sign of spread at this time. In addition, the *Leptospermum* species being cultivated in residential areas of East Maui should be determined and further monitoring for signs of spread and potential risks should continue.

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