Taxon: Melaleuca alternifolia (Maiden & Betche) Cheel **Family:** Myrtaceae

Common Name(s): narrow leaf paperbark
narrow leaf teatree
teatree

Synonym(s): Melaleuca linariifolia var. alternifolia

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 4 Apr 2019

WRA Score: 7.0 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Subtropical Tree, Essential Oil, Dense Stands, Wind-Dispersed, Coppices

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	n
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	n
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals		
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	y
408	Creates a fire hazard in natural ecosystems	y=1, n=0	y
409	Is a shade tolerant plant at some stage of its life cycle		

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	y
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	2
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Boland, D.J. , Brooker, M.I.H., Chippendale, G.M., Hall, N., Hyland, B.P.M., Johnston, R.D., Kleinig, D.A., McDonald, M.W. & Turner, J.D. 2006. Forest Trees of Australia. CSIRO Publishing, Collingwood, Australia	[No history or evidence of domestication] "Natural stands of this species have been harvested for the production tea tree oil since the 1930s."

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	NA

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**High**
	Source(s)	**Notes**
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"M. alternifolia occurs in the warm, wet east coast of Australia, often in swampy circumstances in dense impenetrable thickets, on a range of soils (pH 4.5-7), up to 300 m altitude."
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 3 Apr 2019]	"Native Australasia AUSTRALIA: Australia [New South Wales, Queensland]"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed]	

203	**Broad climate suitability (environmental versatility)**	**n**
	Source(s)	**Notes**
	Boland, D.J. , Brooker, M.I.H., Chippendale, G.M., Hall, N., Hyland, B.P.M., Johnston, R.D., Kleinig, D.A., McDonald, M.W. & Turner, J.D. 2006. Forest Trees of Australia. CSIRO Publishing, Collingwood, Australia	"Climate: Alt. range: near sea level to 950 m; Hottest/coldest months: 25–30°C/1–9°C; Frost incidence: low to moderate (up to 50 at high elevation sites); Rainfall: 750–1600 mm per year, summer max."

Qsn #	Question	Answer
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"M. alternifolia occurs in the warm, wet east coast of Australia, often in swampy circumstances in dense impenetrable thickets, on a range of soils (pH 4.5-7), up to 300 m altitude. Mean summer maximum temperature is 27-31 °C, mean minimum 17-l9° C, mean winter maximum 18-2l°C, mean minimum 6-7° C, and the species is frost sensitive. Average annual rainfall is 1000-1600 mm."
	Plants for a Future. (2019). Melaleuca alternifolia. https://pfaf.org. [Accessed 2 Apr 2019]	"USDA hardiness 8-11"

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"M. alternifolia occurs in the warm, wet east coast of Australia, often in swampy circumstances in dense impenetrable thickets, on a range of soils (pH 4.5-7), up to 300 m altitude."

205	Does the species have a history of repeated introductions outside its natural range?	n
	Source(s)	**Notes**
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"It is only occasionally cultivated outside this region, mainly in botanical gardens."
	Jacobs, L. E., Richardson, D. M., Lepschi, B. J., & Wilson, J. R. (2017). Quantifying errors and omissions in alien species lists: The introduction status of Melaleuca species in South Africa as a case study. NeoBiota 32: 89–105	"Table 2. List of 36 Melaleuca species in South Africa for which there is a confirmed herbarium record in either the Compton Herbarium, Kirstenbosch (NBG) or in the cultivated collection in the National Herbarium (PRE)." [Melaleuca alternifolia (Maiden & Betche) Cheel - Earliest record = 1974]
	Verdcourt, B. (2001). Flora of Tropical East Africa - Myrtaceae. A.A. Balkema, Rotterdam, Netherlands	"Two specimens named M. lateritia A. Dietr. appear to be this species (Tanzania. Lushoto District: Amani, 4 Aug. 1970, Furuya 1:37 &: Luhoto, State Lodge, 7 Oct. 1974, Ruffo 1031 &: idem, 11 Mar. 1964, Mgaza 584)."
	Imada, C.T., Staples, G.W. & Herbst, D.R. 2005. Annotated Checklist of Cultivated Plants of Hawai'i. http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/. [Accessed 1 Apr 2019]	No records
	Skolmen, R.G. 1980. Plantings on the forest reserves of Hawaii: 1910–1960. Institute of Pacific Islands Forestry, Pacific Southwest Forest & Range Experiment Station, US Forest Service, Honolulu, HI	Not recorded in forestry plantings

Qsn #	Question	Answer
301	**Naturalized beyond native range**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
	Wagner, W.L., Herbst, D.R.& Lorence, D.H. (2019). Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/. [Accessed 3 Apr 2019]	No evidence to date

302	Garden/amenity/disturbance weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

303	Agricultural/forestry/horticultural weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

304	Environmental weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

305	Congeneric weed	y
	Source(s)	**Notes**
	Kaufman, S.R. & Kaufman, W. (2007). Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Stackpole Books, Mechanicsburg, PA	"Melaleuca quinquenervia … Trees can form extremely dense stands that block light to species in the understory and prevent establishment of other vegetation. It often convert mar he into tree--dominated S\vamp , changing habitat for wildlife. Melaleuca took over hundreds of thousands of acre in the Everglades before a massive control program began in the 1990s. Trees are also fire adapted and can cause very hot crown fire . Honey bees use melaleuca flowers as a source of nectar. The pollen causes allergies in some people."

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Harden, G. J. (ed.). Flora of New South Wales, Volume 2. Revised Edition. UNSW Press, Sydney	[No evidence] "Tall shrub to 7 m high with papery bark. Leaves irregularly arranged, scattered to whorled, linear, 10-35 mm long, c. 1 mm wide, apex acute, glabrous; petiole c. 1 mm long."

402	Allelopathic	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Ojha, S., & Bhattacharjee, A. (2013). Evaluation of allelopathic potential of an aromatic exotic tree, Melaleuca leucadendron L. African Journal of Plant Science, 7(11), 558-560	[Unknown. Allelopathy documented in genus] "An attempt was made to evaluate the allelopathic potential of an exotic tree species, Melaleuca leucadendron L. using mung bean (Vigna radiata L.) seeds as responsive bioassay material. This was recorded in terms of the plant extract and plant leachate-induced changes of seed germination behaviour, the levels of DNA and RNA as well as amylase activity in the seed kernels. The results of the present investigation clearly revealed that pretreatment of mung bean seeds with various concentrations [1:1 and 1:2 (w/v)] of M. leucadendron bark extract, leaf extract and leaf leachates for 24 h duration, significantly reduced percentage seed germination and increased the T50 hours. Levels of DNA and RNA were also significantly reduced with concomitant increase of amylase activity in mung bean seed samples pretreated with the bark extract, leaf extract and leaf leachates of M. leucadendron. Tender bark extract and leaf extract showed more inhibitory action on mung bean seed than leaf leachates. Putative allelochemical induced inhibitory effect, that is, reduction of seed germinability along with stimulation of amylase activity in seeds, being the important allelopathic indices, it can be concluded that M. leucadendron can potentially render allelopathic action on the experimental bioassay material."

403	Parasitic	n
	Source(s)	**Notes**
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"Shrub, up to 7 m tall, with layered, papery bark. Leaves variously arranged, scattered to whorled often on one branchlet; petiole 1 mm long; blade linear-acute, 10-35 mm x 1 mm, 3-veined (often only mid-vein visible), puberulous, glabrescent, dotted with oil glands visible with a lens." [Myrtaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	**Notes**
	Knight, A. 2007. A Guide to Poisonous House and Garden Plants. CRC Press, Boca Raton, FL	[Generic description. Probably unpalatable] "Animals are unlikely to eat the leaves of the plant because of the strong pungent odor of the leaves. Most animal poisoning from Melaleuca arises from the application of the oil to the skin and hair coat as a means of cleaning the hair or as a treatment for various dermatologic diseases including ectoparasites."
	Safford, R. J., Maltby, E., Van Ni, D., & Branch, N. P. (2009). Melaleuca Wetlands and Sustainable Development in the Mekong Delta, Vietnam. Pp. 829-849 in E. Maltby & T. Barker (eds.). The Wetlands Handbook. Wiley-Blackwell, Oxford, UK	[Unknown for M. alternifolia. Other Melaleuca species are palatable] "Table 37.1 Direct uses of Melaleuca ecosystems in the Mekong Delta" … "Melaleuca shoots suitable for goats"

405	Toxic to animals	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Knight, A. 2007. A Guide to Poisonous House and Garden Plants. CRC Press, Boca Raton, FL	[Possibly if applied topically, but animals may avoid consumption due to volatile chemicals in leaves] "Melaleuca alternifolia contains an essential, pungent smelling, colorless or light yellow oil similar to Eucalyptus oil. Toxicity is due to the presence of cyclic hydrocarbon terpenes, sesquiterpenes, and various oils that are readily absorbed through the skin and mucous membranes [1]. The mechanism of toxicity has not been determined. Melaleuca oil has antibacterial and antifungal properties and has been used topically on dogs and cats to treat skin infections and repel fleas. The oil is also toxic to people as it is readily absorbed through the skin or if ingested [2-4]. Skin absorption is increased if the melaleuca oil is applied with organic solvents such as alcohol or dimethylsulfoxide (DMSO). Melaleuca have not been associated with cyanide poisoning that has been encountered in sheep, cattle, and goats eating the leaves from recently felled trees of Eucalyptus cladocalyx (sugar gum) and E. viminalis (manna gum) [5,6]. Eucalyptus oil if ingested is toxic. Risk Assessment Animals are unlikely to eat the leaves of the plant because of the strong pungent odor of the leaves. Most animal poisoning from Melaleuca arises from the application of the oil to the skin and hair coat as a means of cleaning the hair or as a treatment for various dermatologic diseases including ectoparasites."

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	Carnegie, A. J., & Lidbetter, J. R. (2012). Rapidly expanding host range for Puccinia psidii sensu lato in Australia. Australasian Plant Pathology, 41(1), 13-29	"Table 2 Current known hosts of Puccinia psidii sensu lato in Australia based on surveys in NSWa and Queenslandb and host testing reported here. Plant names according to Govaerts et al. (2011)"[Includes Melaleuca alternifolia]

Qsn #	Question	Answer
	Uchida, J., Zhong, S., & Killgore, E. (2006). First report of a rust disease on Ohia caused by Puccinia psidii in Hawaii. Plant Disease, 90(4), 524	[It has a very wide host range within the family Myrtaceae, including M. alternifolia] "Several species of Metrosideros (Myrtaceae), referred to as ohia in Hawaii, are endemic trees that comprise as much as 80% of the native Hawaiian forests. For centuries, these trees have provided niches for many indigenous and endangered plants and animals and are treasured by Hawaiians for their beauty and role in folklore and legends. During April 2005, a cultivated ohia plant was diagnosed by the Agricultural Diagnostic Service Center at the University of Hawaii at Manoa as infected by a rust fungus. Rust pustules containing abundant urediniospores were observed on leaves, stems, and sepals, causing discolored spots and severe deformity of young leaves and growing tips. By July 2005, a similar rust disease was observed on other plants in the family Myrtaceae; namely Syzygium jambos (L.) Alston, Eugenia koolauensis Degener, E. reinwardtiana (Blume) DC, and Psidium guajava L. Microscopic examination of the uredinia and urediniospores showed that the rust was morphologically similar to Puccinia psidii, which is reported as the guava or eucalyptus rust in Florida and Central and South America (1,2). To confirm the identity of this fungus, DNA was extracted from urediniospores of two isolates collected from ohia plants, and their nuclear ribosomal internal transcribed spacer (ITS) was amplified with two universal primers, ITS4 and ITS5 (3). Sequences of the ITS region of these isolates from ohia were identical to the P. psidii isolates provided by A. Alfenas in Brazil and M. Rayachhetry in Florida. Koch's postulate of the isolates, obtained from ohia, was performed using 1 × 108 spores/ml of urediniospores suspension in distilled water. The suspension was sprayed onto 6-month-old ohia seedlings. These inoculated seedlings were placed in clear plastic chambers maintained at 100% relative humidity and 22°C with a combination of 10-h fluorescent light period and a 14-h dark period. After 48 h of incubation, the seedlings were removed from the chambers and transferred to a greenhouse where the ambient temperature ranged from 20 to 24°C. Rust pustules appeared after 1 to 2 weeks of incubation. Symptoms first appeared as tiny, bright yellow, powdery eruptions that developed into circular uredinial pustules on the stem and foliage. These pustules later expanded, coalesced, and became necrotic, spreading over the entire leaf and stem surfaces, and then leaves and stems were deformed and tip dieback ensued. These symptoms were the same as those observed on the naturally infected cultivated ohia plant mentioned above. P. psidii is reported to be native to South and Central America that later spread to some Myrtaceous plants in the Caribbean countries (1). It has a very wide host range within the family Myrtaceae (2). To our knowledge, this is the first report of P. psidii in Hawaii. This rust disease may pose a formidable threat to Myrtaceous species that make up the native Hawaiian forests and are grown as ornamental plants or for the production of wood chips."
	WRA Specialist. (2019). Personal Communication	Melaleuca alternifolia could serve as a host to the fungus Austropuccinia psidii, but this pathogen is already present in the Hawaiian Islands and has been documented on a fairly wide host range of native and non-native plants. The cultivation of Melaleuca alternifolia is therefore unlikely to significantly affect the distribution of Austropuccinia psidii.

Qsn #	Question	Answer
407	Causes allergies or is otherwise toxic to humans	y
	Source(s)	Notes
	Knight, A. 2007. A Guide to Poisonous House and Garden Plants. CRC Press, Boca Raton, FL	"Melaleuca alternifolia contains an essential, pungent smelling, colorless or light yellow oil similar to Eucalyptus oil. Toxicity is due to the presence of cyclic hydrocarbon terpenes, sesquiterpenes, and various oils that are readily absorbed through the skin and mucous membranes [1]. The mechanism of toxicity has not been determined."
	Boland, D.J. , Brooker, M.I.H., Chippendale, G.M., Hall, N., Hyland, B.P.M., Johnston, R.D., Kleinig, D.A., McDonald, M.W. & Turner, J.D. 2006. Forest Trees of Australia. CSIRO Publishing, Collingwood, Australia	"Several of the Australian species produce useful oils. The most important is M. alternifolia. This oil is non-toxic and non-irritant and has the unique power to penetrate wounds and slough off pus, leaving a healthy surface. It has been used for throat and mouth conditions, including catarrh, thrush, tonsillitis, ulcers, pyorrhoea and gingivitis, as well as such other infections as tinea."
	Hammer, K. A., Carson, C. F., Riley, T. V., & Nielsen, J. B. (2006). A review of the toxicity of Melaleuca alternifolia (tea tree) oil. Food and Chemical Toxicology, 44(5), 616-625	[Oil extracts may be toxic or allergenic] "The essential oil of Melaleuca alternifolia, also known as tea tree or melaleuca oil, is widely available and has been investigated as an alternative antimicrobial, anti-inflammatory and anti-cancer agent. While these properties are increasingly well characterised, relatively limited data are available on the safety and toxicity of the oil. Anecdotal evidence from almost 80 years of use suggests that the topical use of the oil is relatively safe, and that adverse events are minor, self-limiting and occasional. Published data indicate that TTO is toxic if ingested in higher doses and can also cause skin irritation at higher concentrations. Allergic reactions to TTO occur in predisposed individuals and may be due to the various oxidation products that are formed by exposure of the oil to light and/or air. Adverse reactions may be minimised by avoiding ingestion, applying only diluted oil topically and using oil that has been stored correctly. Data from individual components suggest that TTO has the potential to be developmentally toxic if ingested at higher doses, however, TTO and its components are not genotoxic. The limited ecotoxicity data available indicate that TTO is toxic to some insect species but more studies are required."

408	Creates a fire hazard in natural ecosystems	y
	Source(s)	Notes
	Tasmanian Fire Research Fund. (2006). Fire retardant garden plants for the urban fringe and rural areas. https://www.fire.tas.gov.au. [Accessed 4 Apr 2019]	"High Flammability - These plants have been shown to be highly flammable and should not be planted or allowed to remain inside your house's Building Protection Zone. They should also be avoided in the Fuel Modified Zone. Move these plants away from your house and replace them with less flammable plants" [Includes Melaleuca alternifolia]

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	Notes

Qsn #	Question	Answer
	Australian Native Plants. (2019). Melaleuca alternifolia. https://www.australianplants.com/plants.aspx?id=1373. [Accessed 4 Apr 2019]	"Exposure: Full Sun to Partial Shade"
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"M. alternifolia occurs in the warm, wet east coast of Australia, often in swampy circumstances in dense impenetrable thickets, on a range of soils (pH 4.5-7), up to 300 m altitude."
	Dave's Garden. (2019). Melaleuca Species, Manuka, Narrow-Leaved Paperbark, Tea Tree - Melaleuca alternifolia. https://davesgarden.com/guides/pf/go/74525/. [Accessed 4 Apr 2019]	"Sun Exposure: Full Sun"
	Plants for a Future. (2019). Melaleuca alternifolia. https://pfaf.org. [Accessed 4 Apr 2019]	[Contradictory information. May prefer full sun, but may establish in shade] "It cannot grow in the shade. It prefers moist soil." … "Plants are shade tolerant and succeed in most soils and aspects except dry conditions when they are grown in Australian gardens[157]. "

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Boland, D.J. , Brooker, M.I.H., Chippendale, G.M., Hall, N., Hyland, B.P.M., Johnston, R.D., Kleinig, D.A., McDonald, M.W. & Turner, J.D. 2006. Forest Trees of Australia. CSIRO Publishing, Collingwood, Australia	"In the main part of its range soils are mainly alluvial silty loams, while in the Stanthorpe- Ballandean area they are sandy loams derived from granite."
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"on a range of soils (pH 4.5-7), up to 300 m altitude."
	Colton, R. T., & Murtagh, G. J. (1999). Cultivation of tea tree. Pp. 63-78 in I. Southwell and R. Lowe (eds.). Tea Tree: The Genus Melaleuca. OPA (Overseas Publishers Association), Amsterdam	"Tea trees are hardy perennial plants, adapted to a wide range of soil types. They are drought tolerant and can survive flooding and fire (Murtagh 1996a). However, while the trees are very adaptable, the production of consistent high yields of oil requires fairly specific climate and soil conditions."

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Harden, G. J. (ed.). Flora of New South Wales, Volume 2. Revised Edition. UNSW Press, Sydney	"Tall shrub to 7 m high with papery bark."

412	Forms dense thickets	y
	Source(s)	**Notes**
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"M. alternifolia occurs in the warm, wet east coast of Australia, often in swampy circumstances in dense impenetrable thickets, on a range of soils (pH 4.5-7), up to 300 m altitude."

Qsn #	Question	Answer
	Davis, R. L. (2003). The Australian tea tree oil industry. Pp. 29-40 In Proceedings of International Federation of Essential Oils and Aroma Trades international conference. Sydney, 2-6 Nov. 2003	"Melaleuca alternifolia is a medium sized tree that occurs naturally in a very limited area of Australia, on the north coast of New South Wales (NSW) where it is restricted to the narrow plain between the coast and the dividing range. The tree occurs mainly in wetter areas and swamps, generally in fairly dense stands that often contain relatively few other species."
	Boland, D.J. , Brooker, M.I.H., Chippendale, G.M., Hall, N., Hyland, B.P.M., Johnston, R.D., Kleinig, D.A., McDonald, M.W. & Turner, J.D. 2006. Forest Trees of Australia. CSIRO Publishing, Collingwood, Australia	"Tea tree usually occurs in pure stands or sometimes in proximity to open forests and woodlands dominated by eucalypts. Across its range it occurs with numerous other species including shrubs from the genera Acacia, Melaleuca, Leptospermum and tree species such as Eucalyptus pilularis, Angophora subvelutina and A. robur."

501	Aquatic	n
	Source(s)	**Notes**
	Harden, G. J. (ed.). Flora of New South Wales, Volume 2. Revised Edition. UNSW Press, Sydney	[Terrestrial] "Tall shrub to 7 m high with papery bark."… "Grows along streams and on swampy flats, on the coast and adjacent ranges; north from Grafton district."

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 1 Apr 2019]	Family: Myrtaceae Subfamily: Myrtoideae Tribe: Melaleuceae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 1 Apr 2019]	Family: Myrtaceae Subfamily: Myrtoideae Tribe: Melaleuceae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	Boland, D.J. , Brooker, M.I.H., Chippendale, G.M., Hall, N., Hyland, B.P.M., Johnston, R.D., Kleinig, D.A., McDonald, M.W. & Turner, J.D. 2006. Forest Trees of Australia. CSIRO Publishing, Collingwood, Australia	"Tea tree may either be a shrub 2–3 m tall or a small tree up to 14 m tall. The bole may be up to one quarter the tree height and rarely greater than 30 cm dbh. Branching tends to be ascending but on older specimens the fine branches become contorted. The crown, which can be nearly as wide as the tree is high, has dense soft foliage and is comprised of innumerable fine leaves. The characteristic papery white bark extends to the finest branches."

601	Evidence of substantial reproductive failure in native habitat	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Boland, D.J. , Brooker, M.I.H., Chippendale, G.M., Hall, N., Hyland, B.P.M., Johnston, R.D., Kleinig, D.A., McDonald, M.W. & Turner, J.D. 2006. Forest Trees of Australia. CSIRO Publishing, Collingwood, Australia	[No evidence] "Tea tree is most common in the Grafton-Lismore-Casino region on the north coast of New South Wales. It extends inland to around Tabulam near the Richmond Range. Outliers occur to the north-west in the Stanthorpe-Ballandean area in Queensland. These populations have a shrubby habit. There is a highly disjunct occurrence nearly 200 km to the south of its main distribution near Port Macquarie, New South Wales."

602	Produces viable seed	y
	Source(s)	**Notes**
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"For cultivation, seed is sown in nursery beds, seedlings potted when 4-6 weeks old and transplanted at a density of at least 35 000 trees/ha."
	Baskorowati, L., Moncur, M. W., Doran, J. C., & Kanowski, P. J. (2010). Reproductive biology of Melaleuca alternifolia (Myrtaceae) 1. Floral biology. Australian Journal of Botany, 58(5), 373-383	"In M. alternifolia, the morphological development of buds, flowers and fruit leading to the development of mature seed takes place over a period 16–18 months from flowering. M. alternifolia differed significantly in the number of viable seeds per capsule from individual trees, from 26□3.8 to 57□3.8 germinants."

603	Hybridizes naturally	y
	Source(s)	**Notes**
	Boland, D.J. , Brooker, M.I.H., Chippendale, G.M., Hall, N., Hyland, B.P.M., Johnston, R.D., Kleinig, D.A., McDonald, M.W. & Turner, J.D. 2006. Forest Trees of Australia. CSIRO Publishing, Collingwood, Australia	"Hybrids between the two have been confirmed based on DNA evidence in the highly disjunct Port Macquarie population (Butcher et al. 1995)."

604	Self-compatible or apomictic	
	Source(s)	**Notes**
	Baskorowati, L., Moncur, M. W., Doran, J. C., & Kanowski, P. J. (2010). Reproductive biology of Melaleuca alternifolia (Myrtaceae) 1. Floral biology. Australian Journal of Botany, 58(5), 373-383	"Butcher et al. (1992) reported that M. alternifolia was predominately outcrossing in natural populations, although selfing also occurred. The straightening and then extension of the style following flower opening is considered a mechanism favouring outcrossing (Lloyd and Webb 1986; Moncur and Boland 1989). Stylar extension in the Myrtaceae has been reported for some species although it is not universal (Beardsell et al. 1993)." … "Geitonogamy in M. alternifolia is probable as the duration of flowering within single inflorescences lasts 12 days (12.4□0.89); this demonstrates a high degree of synchrony of flowering within inflorescences, which could lead to self-pollination between flowers within the inflorescence."

Qsn #	Question	Answer
	Butcher, P. A., Bell, J. C., & Moran, G. F. (1992). Patterns of genetic diversity and nature of the breeding system in Melaleuca alternifolia (Myrtaceae). Australian Journal of Botany, 40(3), 365-375	[Capable of selfing at low rates] "The high effective outcrossing rate in M. alternifolia suggests that mechanisms are operating to prevent self-pollination or there is selection against inbreds. Within flowers, self-pollination may be avoided by mechanisms such as protandry or protogyny but selfing between flowers within a tree (geitonogamy) should still be common especially since they appear to be mainly insect pollinated." … "The low selfing rate (<10%) indicates programs based on production of improved seed by open pollination among selected families will not be hampered by significant inbreeding."
	Baskorowati, L., Moncur, M. W., Cunningham, S. A., Doran, J. C., & Kanowski, P. J. (2010). Reproductive biology of Melaleuca alternifolia (Myrtaceae) 2. Incompatibility and pollen transfer in relation to the breeding system. Australian Journal of Botany, 58(5), 384-391	[Capable of selfing, but seed set is low] "Melaleuca alternifolia demonstrated a high degree of self-incompatibility, typical to that found in other Myrtaceous species. This is maintained by a gametophytic self-incompatibility system, the expression of which varies among families. The rejection of self-pollen at the style and ovarian levels, and the consequent low levels or intolerance of selfing, maintain a high level of outcrossing in M. alternifolia populations."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Baskorowati, L., Moncur, M. W., Cunningham, S. A., Doran, J. C., & Kanowski, P. J. (2010). Reproductive biology of Melaleuca alternifolia (Myrtaceae) 2. Incompatibility and pollen transfer in relation to the breeding system. Australian Journal of Botany, 58(5), 384-391	"A wide variety of insects was observed visiting the flowers of M. alternifolia, and capsule set was high even in bags that excluded flower visitors greater than 2 mm. Thrips species seem likely to be important pollinators of this species because they are small and were abundant inside and outside of exclusion bags, although several other insect species such as bees, flies and wasps were also identified as frequent floral visitors."
	Boland, D.J. , Brooker, M.I.H., Chippendale, G.M., Hall, N., Hyland, B.P.M., Johnston, R.D., Kleinig, D.A., McDonald, M.W. & Turner, J.D. 2006. Forest Trees of Australia. CSIRO Publishing, Collingwood, Australia	"Inflorescences: Spikes, terminal or in terminal axils, 3–5 cm long, up to 30 flowers per spike, rachis shortly pubescent; flowers white, one per bract, petals 2–3 mm long, 30-60 stamens per bundle, style 3–4 mm long. Flowers Aug.-Oct."
	Baskorowati, L., Moncur, M. W., Doran, J. C., & Kanowski, P. J. (2010). Reproductive biology of Melaleuca alternifolia (Myrtaceae) 1. Floral biology. Australian Journal of Botany, 58(5), 373-383	"The flowers are borne near the tips of branches and shoots for optimum display and have many features common to flowers pollinated by insects (Faegri and van der Pijl 1971), for instance scent, coloured staminal column and sticky pollen."
	Butcher, P. A., Bell, J. C., & Moran, G. F. (1992). Patterns of genetic diversity and nature of the breeding system in Melaleuca alternifolia (Myrtaceae). Australian Journal of Botany, 40(3), 365-375	"The normal floral system of melaleucas is hermaphroditism (Briggs and Johnson 1979; Byrnes 1984) and insects appear to be the main pollinators." … "Within flowers, self-pollination may be avoided by mechanisms such as protandry or protogyny but selfing between flowers within a tree (geitonogamy) should still be common especially since they appear to be mainly insect-pollinated."

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Tran, D. B., Dargusch, P., Moss, P., & Hoang, T. V. (2013). An assessment of potential responses of Melaleuca genus to global climate change. Mitigation and Adaptation Strategies for Global Change, 18(6), 851-867	"Many species of Melaleuca genus have a suckering habit (e.g. Melaleuca bracteata, Melaleuca cajuputi, Melaleuca leucadendra, and Melaleuca quinquenervia) (AgroForestry Tree Database n.d.; Australian Tropical Rainforest Plants 2010; Blake 1968; Doran and Turnbull 1997; Turnbull 1986; Victorian Resources Online 2011), which gives them the ability to resist waterlogging in their communities." [No evidence for Melaleuca alternifolia, which is able to coppice]
	Baskorowati, L., Moncur, M. W., Doran, J. C., & Kanowski, P. J. (2010). Reproductive biology of Melaleuca alternifolia (Myrtaceae) 1. Floral biology. Australian Journal of Botany, 58(5), 373-383	[No evidence or mention of vegetative reproduction] "Flowering in seedling seed orchards in the natural range of the species rarely starts before the third year from planting and flowering intensity is variable among years. Observations at West Wyalong, outside the natural range of the species, have indicated that flowering occurs in a little over 1 year from planting and flowering intensity is consistently heavy, provided sufficient water is available during spring."

607	Minimum generative time (years)	2
	Source(s)	**Notes**
	Baskorowati, L., Moncur, M. W., Doran, J. C., & Kanowski, P. J. (2010). Reproductive biology of Melaleuca alternifolia (Myrtaceae) 1. Floral biology. Australian Journal of Botany, 58(5), 373-383	[Flowers in >1 to 3 years] "Flowering in seedling seed orchards in the natural range of the species rarely starts before the third year from planting and flowering intensity is variable among years. Observations at West Wyalong, outside the natural range of the species, have indicated that flowering occurs in a little over 1 year from planting and flowering intensity is consistently heavy, provided sufficient water is available during spring."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	**Notes**
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"Fruit a many-seeded, globose, woody capsule, 2-3 mm in diameter." [Seeds are small but lack means of external attachment. They could hypothetically be transported in soil attached to vehicles, footwear or equipment, but evidence is lacking at this time]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Herbal, Ornamental Dispersed by: Humans"

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Herbal, Ornamental Dispersed by: Humans"

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"It is only occasionally cultivated outside this region, mainly in botanical gardens." [No evidence found, but not widely cultivated outside native range. Wind-dispersed seeds could potentially become a contaminant if grown in proximity to other plants or crops]

704	Propagules adapted to wind dispersal	y
	Source(s)	**Notes**
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"Fruit a many-seeded, globose, woody capsule, 2-3 mm in diameter."
	Baskorowati, L., Moncur, M. W., Doran, J. C., & Kanowski, P. J. (2010). Reproductive biology of Melaleuca alternifolia (Myrtaceae) 1. Floral biology. Australian Journal of Botany, 58(5), 373-383	"Melaleuca alternifolia seed is shed from the dry, mature capsule in a mixture of viable seed and undeveloped ovules (chaff). It is difficult to separate the seed from the chaff, because the size, shape and colour of the seed and chaff in this species are so similar."
	Woodall, S. L. (1982). Seed dispersal in Melaleuca quinquenervia. Florida Scientist, 45(2), 81-93	[Morphologically similar species dispersed by wind] "Wind dispersal characteristics of Melaleuca quinquenervia seeds were explored in laboratory and field investigations. Terminal velocities of free-falling seeds (Vt) ranged 0.45-1.75 m/s, but Vt for most seeds was approximately 1.2 m/s. Few seeds with Vt < 0.9 were viable, while the fastest classes had up to 92 % germination. Seed density decreased logarithmically with distance from seed source. The distance of effective dispersal was within 15 times the height of the seed tree. Melaleuca seeds are held for years in closed capsules, but seedfall occurred in an undamaged stand throughout the 6 mo monitored. Herbicidal injections induced sudden massive seedfalls but the seed release rate remained above normal for 3 mo."

705	Propagules water dispersed	y
	Source(s)	**Notes**
	Harden, G. J. (ed.). Flora of New South Wales, Volume 2. Revised Edition. UNSW Press, Sydney	"Grows along streams and on swampy flats, on the coast and adjacent ranges; north from Grafton district. NC NT; Qld." [Distribution suggests seeds would be secondarily dispersed by water]
	Boland, D.J. , Brooker, M.I.H., Chippendale, G.M., Hall, N., Hyland, B.P.M., Johnston, R.D., Kleinig, D.A., McDonald, M.W. & Turner, J.D. 2006. Forest Trees of Australia. CSIRO Publishing, Collingwood, Australia	"This species occurs on coastal plains and adjacent ranges where it grows on seasonally inundated swamps or along watercourses." [Seeds likely dispersed by water in addition to wind]

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"Fruit a many-seeded, globose, woody capsule, 2-3 mm in diameter." [No evidence]

707	Propagules dispersed by other animals (externally)	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"Fruit a many-seeded, globose, woody capsule, 2-3 mm in diameter." [Seeds are small but lack means of external attachment. They could hypothetically be transported in soil attached to animals, but evidence is lacking at this time]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Herbal, Ornamental Dispersed by: Humans"

708	Propagules survive passage through the gut	n
	Source(s)	**Notes**
	Oyen, L.P.A & Dung, N. X. (eds.). (1999). Plant Resource. s of South-East Asia 19, Essential-oil Plants. Prosea Foundation, Bogor, Indonesia	"Fruit a many-seeded, globose, woody capsule, 2-3 mm in diameter." [Unlikely to be consumed]

801	Prolific seed production (>1000/m2)	
	Source(s)	**Notes**
	Baskorowati, L., Moncur, M. W., Doran, J. C., & Kanowski, P. J. (2010). Reproductive biology of Melaleuca alternifolia (Myrtaceae) 1. Floral biology. Australian Journal of Botany, 58(5), 373-383	[Densities per tree unknown] "The ovarium of a M. alternifolia capsule consists of three carpels, containing an average of 175 ovules (mean 174.9 5.38; Table 1). The number of viable seeds per capsule averages 40 (mean 40.1 0.02) with a range from 26 to 57 (Fig. 7). This means that the seed set of M. alternifolia occurs in 23% of available ovules, which places the capsule set of M. alternifolia higher than in other species of Melaleuca. Barlow and Forrester (1984) noted that the seed set in genus Melaleuca is often very low, with 1–2% of ovules present."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	**Notes**
	Royal Botanic Gardens Kew. (2019) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/. [Accessed 3 Apr 2019]	"Storage Behaviour: No data available for species. Of 132 known taxa of genus Melaleuca, 100.00% Orthodox(p/?)"
	Baskorowati, L., Moncur, M. W., Doran, J. C., & Kanowski, P. J. (2010). Reproductive biology of Melaleuca alternifolia (Myrtaceae) 1. Floral biology. Australian Journal of Botany, 58(5), 373-383	[Canopy seed banks form, but longevity in soil unknown] "Capsules of M. alternifolia may remain on a tree for 2 or 3 years and possibly much longer. A single branch may bear two mature crops and one immature crop simultaneously."

803	Well controlled by herbicides	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Munger, G. T. (2005). Melaleuca quinquenervia. In: Fire Effects Information System, [Online]. USDA, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/maggra/all.html. [Accessed 3 Apr 2019]	[Melaleuca quinquenervia effectively controlled by herbicides] "Chemical: Herbicides are among the most effective and widely used tools for controlling melaleuca in peninsular Florida [40]. Herbicides are most effective when integrated within a suite of control measures and strategies. Cost and logistics can make chemical control difficult to implement over large areas of infestation. As Myers and Belles [54] explained, "for small administrative units, like Corkscrew Swamp Sanctuary, portions of Sanibel Island, and some state parks, existing control technologies focusing on herbicides have worked well. For larger units, like Loxahatchee National Wildlife Refuge, the Conservation Area, and Big Cypress Preserve, the sheer scale of the problem has limited control success" [54]."
	WRA Specialist. (2019). Personal Communication	No information on herbicide efficacy and chemical control of this species. However, methods to control the invasive Melaleuca quinquenervia would presumably be effective for controlling Melaleuca alternifolia if required

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**
	Shepherd, M., Wood, R., Raymond, C., Ablett, G., & Rose, T. (2015). Ecotype variation in early growth, coppicing, and shoot architecture of tea tree (Melaleuca alternifolia). Industrial Crops and Products, 76, 844-856	"Tea tree (Melaleuca alternifolia) is native to south eastern Australia where it is also grown as a coppice crop in plantations to produce an essential oil used in medicinal, agricultural and cleaning products."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	Pegg, G. S., Lee, D. J., & Carnegie, A. J. (2018). Predicting impact of Austropuccinia psidii on populations of broad leaved Melaleuca species in Australia. Australasian Plant Pathology, 47(4), 421-430	[Impacts of A. puccinii may depend on provenance of M. alternifolia and environment] "Sandhu and Park (2013) also reported a broad range of susceptibility to A. psidii under artificial inoculation for M. alternifolia, M. ericifolia, M. gibbosa, M. pallida, M. quinquenervia, M. squarrosa and M. virens." … "Shepherd et al. (2015) found that in general Upland (higher altitude, lower rainfall) tea tree (M. alternifolia) provenances exhibited higher levels of resistance to A. psidii when compared to Coastal provenances." … "Melaleuca alternifolia is also considered highly susceptible under glasshouse screening (Morin et al. 2012; Sandhu and Park 2013), but under field conditions impact is considered very low (P. Entwistle Pers. Comm)."

Qsn #	Question	Answer
	Zauza, E. A., Alfenas, A. C., Old, K., Couto, M. M., Graça, R. N., & Maffia, L. A. (2010). Myrtaceae species resistance to rust caused by Puccinia psidii. Australasian Plant Pathology, 39(5), 406-411	[M. alternifolia demonstrates resistance] "Seeds from different species and provenances of Myrtaceae, collected from wild populations in Australia, were screened for resistance to rust caused by Puccini psidii. Seedlings were inoculated with a suspension of rust inoculum and incubated in a mist chamber in the dark for 24 h. Subsequently, the plants were transferred to a growth chamber and rust reaction was evaluated 12 days later. Inter- and intra-specific variability was observed among and within the myrtaceae species. Independent of the provenance, the most resistant species were: Corymbia calophylla 'rosea', C. tesselaris, Melaleuca ericifolia, Eucalyptus tereticornis, E. resinifera, E. scias subsp. scias, E. paniculata, E. pellita and C. intermediata. In contrast, M. nesophila, M. alternifolia, M. cajuputi subsp. cajuputi, M. leucadendra, M. quinquenervia, E. cloeziana, E. diversicolor, E. regnans and E. grandis displayed the highest number of susceptible plants. Among those additional myrtaceaceous genera which were tested for their reaction to rust the most resistant were Asteromyrtus dulcia, A. tenuifolia, Gossia fragrantissima, Lophostemon confertus, Syzygium australe, S. wilsonii subsp. cryptophlebium, Archirhodomytus beckleri, Acmena smithii and Syzygium alatoramulum. Pericalymma ellipticum, Kunzea baxteri, Astartea heteranthera, Regelia ciliata, Rhodomyrtus psidioides and Syncarpia glomulifera were the most susceptible species."
	WRA Specialist. (2019). Personal Communication	Unknown. Austropuccinia psidii is present in the Hawaiian Islands, and may affect certain provenances of Melaleuca alternifolia

Summary of Risk Traits:

High Risk / Undesirable Traits
• Can grow in regions with tropical and subtropical climates
• Other Melaleuca species are invasive
• May be unpalatable to animals
• Oils may be toxic or allergenic to people and animals
• Highly flammable; may increase fire risk in natural ecosystems and threaten structures
• Tolerates many soil types
• Forms dense thickets in native range
• Reproduces by seeds
• Hybridizes with other Melaleuca species
• Seeds dispersed by wind, probably water and intentionally by people
• Seeds capsules may remain on trees for two or three years, forming a persistent canopy seed bank
• Able to coppice & resprout after cutting; tolerates fire

Low Risk Traits
• No reports of invasiveness or naturalization, but no evidence of widespread introduction outside native range
• Unarmed (no spines, thorns, or burrs)
• Valued source of essential oil
• May prefer high light environments (could limit spread into intact forests)
• Mostly self-incompatible (self-pollinated plants have low seed set)
• Not reported to spread vegetatively
• Herbicides may provide effective control