Taxon: Melaleuca megacephala F. Muell. **Family:** Myrtaceae

Common Name(s): hillock bush
red-flowered paperbark

Synonym(s): Myrtoleucodendron megacephalum

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 8 May 2020

WRA Score: -1.0 **Designation:** L **Rating:** Low Risk

Keywords: Shrub, Naturalized in Australia, Unarmed, Ornamental, Wind-Dispersed

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)	Intermediate
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	n
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	y
302	Garden/amenity/disturbance weed		
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	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems		
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		
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)		
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed		
603	Hybridizes naturally		
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)		
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		
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		
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**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	[No evidence] "Natural occurrence: Western Australia: the Kalbarri–Geraldton district. Ecology: Recorded as occurring in scrubland, mixed heathland, low open forest, coastal sand plain, on sand, lateritic soil, sand over limestone, sandstone, rocky loam, and clayey sand."

102	Has the species become naturalized where grown?	
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	**Notes**
	WRA Specialist. (2020). 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"	Intermediate
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 8 May 2020]	"Native Australasia AUSTRALIA: Australia [Western Australia (w.)]"
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"Natural occurrence: Western Australia: the Kalbarri–Geraldton district. Ecology: Recorded as occurring in scrubland, mixed heathland, low open forest, coastal sand plain, on sand, lateritic soil, sand over limestone, sandstone, rocky loam, and clayey sand."

202	Quality of climate match data	High
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 8 May 2020]	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Australian Native Plant Society. (2008). Melaleuca megacephala. http://anpsa.org.au/m-meg.html. [Accessed 8 May 2020]	"Although native to a dry summer climate Melaleuca megacephala has been grown successfully in more humid climates, such as along the coastal strip east of the Great Dividing Range. However, it is probably not suited to sub-tropical and tropical climates."
	Dave's Garden. (2020). Honey Myrtle - Melaleuca megacephala. https://davesgarden.com/guides/pf/go/117816/. [Accessed 8 May 2020]	"Hardiness: USDA Zone 8a: to -12.2 °C (10 °F) USDA Zone 8b: to -9.4 °C (15 °F) USDA Zone 9a: to -6.6 °C (20 °F) USDA Zone 9b: to -3.8 °C (25 °F) USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F) USDA Zone 11: above 4.5 °C (40 °F)"

204	Native or naturalized in regions with tropical or subtropical climates	n
	Source(s)	**Notes**
	Australian Native Plant Society. (2008). Melaleuca megacephala. http://anpsa.org.au/m-meg.html. [Accessed 8 May 2020]	"Although native to a dry summer climate Melaleuca megacephala has been grown successfully in more humid climates, such as along the coastal strip east of the Great Dividing Range. However, it is probably not suited to sub-tropical and tropical climates."
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"Natural occurrence: Western Australia: the Kalbarri–Geraldton district. Ecology: Recorded as occurring in scrubland, mixed heathland, low open forest, coastal sand plain, on sand, lateritic soil, sand over limestone, sandstone, rocky loam, and clayey sand."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

205	Does the species have a history of repeated introductions outside its natural range?	n
	Source(s)	**Notes**
	Australian Native Plant Society. (2008). Melaleuca megacephala. http://anpsa.org.au/m-meg.html. [Accessed 8 May 2020]	"Despite the large flower clusters and neat foliage, this species seems to be only rarely cultivated."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Keighery, G. (2013). Weedy native plants in Western Australia: an annotated checklist. Conservation Science Western Australia, 8, 259-273	[Naturalized outside natural range in Western Australia] "Melaleuca megacephala F Muell. NATURAL DISTRIBUTION: Yalgoo, Geraldton Sandplains IBRA Regions. WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region. HABITATS: Banksia attenuata/B. menziesii woodland. FIRST RECORD: Reid Highway Bushland, Malaga, GJ & BJ Keighery 1865. OTHER RECORDS: None known. NOTES: Self-seeding from plantings, now spreading rapidly."

Qsn #	Question	Answer
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No additional evidence of naturalization or invasiveness
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence

302	Garden/amenity/disturbance weed	
	Source(s)	**Notes**
	Keighery, G. (2013). Weedy native plants in Western Australia: an annotated checklist. Conservation Science Western Australia, 8, 259-273	[Included in a list of "weedy" native plants. No description of impacts] "Melaleuca megacephala F Muell. NATURAL DISTRIBUTION: Yalgoo, Geraldton Sandplains IBRA Regions. WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region. HABITATS: Banksia attenuata/B. menziesii woodland. FIRST RECORD: Reid Highway Bushland, Malaga, GJ & BJ Keighery 1865. OTHER RECORDS: None known. NOTES: Self-seeding from plantings, now spreading rapidly."
	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**
	Keighery, G. (2013). Weedy native plants in Western Australia: an annotated checklist. Conservation Science Western Australia, 8, 259-273	[Included in a list of "weedy" native plants. No description of impacts] "Melaleuca megacephala F Muell. NATURAL DISTRIBUTION: Yalgoo, Geraldton Sandplains IBRA Regions. WEEDY DISTRIBUTION: Swan Coastal Plain IBRA Region. HABITATS: Banksia attenuata/B. menziesii woodland. FIRST RECORD: Reid Highway Bushland, Malaga, GJ & BJ Keighery 1865. OTHER RECORDS: None known. NOTES: Self-seeding from plantings, now spreading rapidly."
	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**

Qsn #	Question	Answer
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Melaleuca quinquenervia … In Florida, melaleuca invades pine flatwoods, sawgrass marshes, cypress swamps and disturbed wet sites. It is considered as a transformer species and is especially threatening the sawgrass marshes of the Florida Everglades (Dray et al., 2006). Native plants are crowded out and the tree diminishes habitat for wildlife; the tree provides little food for birds and mammals (Langeland and Craddock Burks, 1998; Julian et al., 2012). Once established, tree islands are built and it transforms sawgrass marshes into forest habitats with a strongly impoverished species diversity of plants and animals (Center et al., 2012). The same mechanisms lead to reduced species richness in wetlands of Puerto Rico and the Bahamas (Pratt et al., 2005, 2007)."
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"Melaleuca species can seed profusely and there are instances in Australia where they have escaped cultivation and naturalised to become invasive and troublesome weeds, especially where periodic fires provide a suitable seedbed. Species that are reported to have naturalised include M. armillaris, M. bracteata, M. decussata, M diosmifolia, M. ericifolia (per root suckers), M. halmaturorum, M. hypericifolia, M. incana, M. lanceolata, M. leucadendra, M. linariifolia, M. microphylla, M. nesophila, M. parvistaminea, M. pentagona, M. quinquenervia, M. styphelioides, M. viminalis and M. viminea (Lazarides et al. 1997; Randall 2002; Richardson et al. 2011; Wiersema and León 2013)."

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	[No evidence] "Shrub 0.4–3.3 m tall; bark rough. Branchlets glabrescent, pubescent. Leaves alternate, 5.5–20.5 mm long, 3.5–10.5 mm wide, 1.2–3.3 times as long as wide, short-petiolate; blade glabrescent, pubescent to sericeous-pubescent and often becoming lanuginosepubescent distally, obovate to broadly obovate or elliptic to broadly elliptic, in transverse section transversely linear, the base attenuate or cuneate, the apex acute, obtusely shortly acuminate, acuminate, broadly acute or obtuse to rounded, the veins longitudinal, 3–5(–7), oil glands moderately dense, obscure to distinct, scattered."

402	Allelopathic	
	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. No evidence found, but allelopathy documented in genus

Qsn #	Question	Answer
403	**Parasitic**	**n**
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"Shrub 0.4–3.3 m tall; bark rough. Branchlets glabrescent, pubescent." [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. Other members of genus 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."

405	Toxic to animals	n
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	No evidence
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	[Susceptibility of Melaleuca megacephala not specified] "A wide range of insects causing damage to leaves, stems and roots of various Melaleuca species- including suckers (e.g. bugs, psyllids, froghoppers, scales, galls and thrips) and chewing pests (e.g. sawflies, caterpillars, beetles and borers) - has been described by Elliot and Jones (1982, 1983), Elliot et al. (1998) and Jones and Elliot (1986), who also give methods of control."
	WRA Specialist. (2020). Personal Communication	Unknown if Melaleuca megacephala 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 megacephala is therefore unlikely to significantly affect the distribution of Austropuccinia psidii.

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	No evidence
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	[Unknown if Melaleuca megacephala increases fire risk, but no direct evidence found] "Many melaleucas are highly fire-tolerant during all but the early seedling stages before a thick protective layer of bark has formed. Fire-ravaged individuals regenerate through stimulation of epicormic buds under the thick bark to sprout vigorously after fire in a process called coppicing (Figure 14). Populations may expand through fire-induced release of seed from Serotinous capsules on the trees and stimulation of germination of seed in soil seedbanks."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	Australian Native Plants. (2020). Melaleuca megacephala. https://www.australianplants.com/plants.aspx?id=1388. [Accessed 8 May 2020]	"Exposure: Full Sun to Partial Shade"
	Australian Native Plant Society. (2008). Melaleuca megacephala. http://anpsa.org.au/m-meg.html. [Accessed 8 May 2020]	"It requires a well drained, sunny position."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Australian Native Plant Society. (2008). Melaleuca megacephala. http://anpsa.org.au/m-meg.html. [Accessed 8 May 2020]	"Heath on sand, sandstone and rocky hills along the central coast of Western Australia."
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"on sand, lateritic soil, sand over limestone, sandstone, rocky loam, and clayey sand."
	Australian Native Plants. (2020). Melaleuca megacephala. https://www.australianplants.com/plants.aspx?id=1388. [Accessed 8 May 2020]	"Soil: Well-drained, alkaline, light to heavy"

411	Climbing or smothering growth habit	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"Shrub 0.4–3.3 m tall; bark rough. Branchlets glabrescent, pubescent."

412	Forms dense thickets	
	Source(s)	**Notes**
	Beard, J.S. & Burns, A.C. (1976). The Vegetation of the Geraldton Area Western Australia. Vegmap Publications, Perth	[A dominant component of thicket vegetation. Unknown if other vegetation is excluded] "Melaleuca-Hakea Thicket Again, at least two communities are included in this unit, the one with M. megacephala and H. pycnoneura dominant and the other with Casuarina campestris and M. uncinata." … "Below the breakaway there is mainly Melaleuca megacephala thicket with Callitris huegelii, Nuytsia, Acacia blakelyi, Casuarina humilis, Dryandra fraseri, Conospermum stoechadis, Calothamnus quadri.fidus." … "Further downstream the lower valley slopes tend to carry scrub of Acacia acuminata, A. rostellifera and Jacksonia cupulifera, with Melaleuca megacephala thicket on the upper rocky slopes."

501	Aquatic	n
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	[Terrestrial] "Recorded as occurring in scrubland, mixed heathland, low open forest, coastal sand plain, on sand, lateritic soil, sand over limestone, sandstone, rocky loam, and clayey sand."

502	Grass	n
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 8 May 2020]	Family: Myrtaceae Subfamily: Myrtoideae Tribe: Melaleuceae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 8 May 2020]	Family: Myrtaceae Subfamily: Myrtoideae Tribe: Melaleuceae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"Shrub 0.4–3.3 m tall; bark rough. Branchlets glabrescent, pubescent."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**
	Australian Native Plant Society. (2008). Melaleuca megacephala. http://anpsa.org.au/m-meg.html. [Accessed 8 May 2020]	"Conservation Status: Not considered to be at risk in the wild."
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	[No evidence] "Natural occurrence: Western Australia: the Kalbarri–Geraldton district. Ecology: Recorded as occurring in scrubland, mixed heathland, low open forest, coastal sand plain, on sand, lateritic soil, sand over limestone, sandstone, rocky loam, and clayey sand. Flowering time: Recorded as flowering in January and from June to November."

602	Produces viable seed	
	Source(s)	**Notes**
	Australian Native Plant Society. (2008). Melaleuca megacephala. http://anpsa.org.au/m-meg.html. [Accessed 8 May 2020]	"Propagation is easy from both seed and cuttings."
	Sweedman, L. & Merritt, D. 2006. Australian seeds: a guide to their collection, identification and biology. Csiro Publishing, Collingwood, Australia	Melaleuca megacephala - M Mean time to germinate = 14 days

603	Hybridizes naturally	
	Source(s)	**Notes**
	Craven, L. A. (2006). New combinations in Melaleuca for Australian species of Callistemon (Myrtaceae). Novon: A Journal for Botanical Nomenclature, 16(4), 468-475	[Unknown. Documented in other species] "Hybridization in nature has been noted in Melaleuca and Callistemon in the following instances: in the M. leucadendra species group (Blake, 1968; Cumming, pers. comm.); between M. bracteate F. Mueller and M. styphelioides Smith (Lepschi, pers. comm.); between diverse species of the M. scabra R. Brown group, i.e., M. leuropoma Craven and M. systena Craven (Craven, pers. obs.); between several species of the M. uncinata R. Brown complex (Broadhurst et al., in prep.); between M. aspalathoides Schauer and M. holosericea Schauer (Lepschi, pers. comm.); between M. barlowii Craven and M. nematophylla F. Mueller ex Craven (Craven, pers. obs.); between diverse species of the M. laxiflora Turczaninow group (Craven, pers. obs.); between C. citrinus (Curtis) Skeels and C. subulatus Cheel (Craven, pers. obs.); and is suggested between M. alternifolia (Maiden & Betche) Cheel and M. linariifolia Smith (Butcher et al., 1994, 1995)."

Qsn #	Question	Answer
604	**Self-compatible or apomictic**	
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	[Unknown. Possibly No] "Barlow and Forrester (1984) also studied self-incompatibility in various Melaleuca species, although not in M. alternifolia, and found that self-pollen tubes do not penetrate past the base of the style."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"Melaleucas are mostly insect-pollinated." … "Inflorescences capitate, pseudoterminal and sometimes also upper axillary, with 4–12 triads, up to 50 mm wide. Hypanthium hairy, 2–3.5 mm long. Calyx lobes abaxially glabrous or hairy to glabrescent, 1–3 mm long, scarious throughout or rarely scarious in a marginal band 0.2–0.5 mm wide. Petals deciduous, (2–)3–5 mm long. Stamens (10–)12–16 per bundle; filaments yellow to white, creamy-yellow or lemon, (7–)14.5–16.5 mm long, the bundle claw (3–)5.5–8 mm long, 0.4–0.5 times as long as the filaments. Style (8.5–)16.5–19 mm long. Ovules c. 10–15 per locule."

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	Australian Native Plant Society. (2008). Melaleuca megacephala. http://anpsa.org.au/m-meg.html. [Accessed 8 May 2020]	"Propagation is easy from both seed and cuttings"
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"Some melaleuca species have the ability to root sucker, and through root extension and interconnectivity form dense clumps of single clones." [Several species mentioned, but no evidence for Melaleuca megacephala]

607	Minimum generative time (years)	
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	[Possibly 2-4+ years] "Flowering starts early in many species. For example, M. alternifolia planted in breeding populations in northern New South Wales set the first flower buds as early as 2 years after planting. However, the first 'reasonable' flowering (defined as 45% of trees) did not occur until almost 4 years from plantings within the species' natural range (Doran et al. 2002). In M. alternifolia, a cold winter (minimum temperatures below 5 °C) appears to stimulate floral bud formation while good spring rains are needed to support a good flowering and retention of the developing fruit (Baskorowati et al. 2010a, c)."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Sweedman, L. & Merritt, D. 2006. Australian seeds: a guide to their collection, identification and biology. Csiro Publishing, Collingwood, Australia	Melaleuca megacephala - Seeds 1 mm long [Melaleuca 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]

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Australian Native Plant Society. (2008). Melaleuca megacephala. http://anpsa.org.au/m-meg.html. [Accessed 8 May 2020]	[Uncommonly cultivated as an ornamental] "Despite the large flower clusters and neat foliage, this species seems to be only rarely cultivated."

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	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**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	[Presumably Wind-Dispersed] "High on the list of undesirable traits, particularly when introducing melaleucas to a new environment, is the potential for their spread from cultivation to become noxious weeds. This occurs through distribution of seed by wind and water from canopies that hold a store of mature fruit, often for many years, awaiting the right conditions to stimulate release (e.g. fire)"
	Sweedman, L. & Merritt, D. 2006. Australian seeds: a guide to their collection, identification and biology. Csiro Publishing, Collingwood, Australia	Small (1 mm) seeds presumably wind-dispersed

705	Propagules water dispersed	
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"Recorded as occurring in scrubland, mixed heathland, low open forest, coastal sand plain, on sand, lateritic soil, sand over limestone, sandstone, rocky loam, and clayey sand." [Not a riparian species, but small, 1 mm seeds, could be secondarily dispersed by water]

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	[No evidence] "Infructescences globose. Fruit 4.5–7 mm long, with weakly developed sepaline teeth; cotyledons obvolute."

Qsn #	Question	Answer
707	**Propagules dispersed by other animals (externally)**	**n**
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	Melaleuca 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

708	**Propagules survive passage through the gut**	**n**
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"Infructescences globose. Fruit 4.5–7 mm long, with weakly developed sepaline teeth; cotyledons obvolute." [Fruiting capsules unlikely to be consumed, or seeds to survive gut passage]

801	**Prolific seed production (>1000/m2)**	
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"Infructescences globose. Fruit 4.5–7 mm long, with weakly developed sepaline teeth; cotyledons obvolute." [Unknown]
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Unknown. Other invasive Melaleuca capable of prolific seed production] "Melaleuca quinquenervia … Annual seed production is prolific with up to 20 million seeds per tree and seeds are dispersed by wind."

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Royal Botanic Gardens Kew. (2020) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/. [Accessed 8 May 2020]	"Storage Behaviour: Orthodox Storage Conditions: 98 % viability following drying to mc's in equilibrium with 15 % RH and freezing for 61 days at -20C at RBG Kew, WP"
	WRA Specialist. (2020). Personal Communication	Longevity of seeds under natural conditions unknown

Qsn #	Question	Answer
803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	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 8 May 2020]	[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."
	WRA Specialist. (2020). 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 megacephala if required

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"Many melaleucas are highly fire-tolerant during all but the early seedling stages before a thick protective layer of bark has formed. Fire-ravaged individuals regenerate through stimulation of epicormic buds under the thick bark to sprout vigorously after fire in a process called coppicing" [Ability of M. megacephala to coppice unknown]
	Australian Native Plant Society. (2008). Melaleuca megacephala. http://anpsa.org.au/m-meg.html. [Accessed 8 May 2020]	"The species responds to pruning to encourage a bushy shape."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	Brophy J.J., Craven L.A. and Doran J.C. (2013). Melaleucas: their botany, essential oils and uses. ACIAR Monograph No. 156. Australian Centre for International Agricultural Research, Canberra	"A threat to the future health and genetic diversity of a substantial number of Melaleuca species in eastern Australia is from Puccinia psidii sensu lato (synonym Uredo rangelii). This exotic pathogen has the common name of myrtle rust in Australia but it is known as guava or eucalyptus rust elsewhere, with origins in Brazil. Myrtle rust targets species of the family Myrtaceae, including Melaleuca. First observed in Australia on the central coast of New South Wales in 2010, it has now spread from Victoria to northern Queensland. In susceptible plants, young spore-covered leaves and shoots become curled and distorted and severe infection can cause shoots to die, causing these plants to become stunted after repeated infections. In the worst cases, death of the whole plant can occur after repeated destruction of new growth. As this book goes to press, this disease is of concern to all with an interest in the conservation and sustainable use of Australian plants of the family Myrtaceae."
	WRA Specialist. (2020). Personal Communication	Unknown. Austropuccinia psidii is present in the Hawaiian Islands, and may affect Melaleuca megacephala, as it does other Melaleuca species

Summary of Risk Traits:

High Risk / Undesirable Traits
• Grows in arid climates
• Naturalized outside natural range in Western Australia
• Other Melaleuca species are invasive
• Tolerates many soil types
• Reported to form thickets in Australia (unknown if able to exclude other vegetation)
• Reproduces by seeds
• Seeds dispersed by wind, possibly water and intentionally by people
• Gaps in biological and ecological information may reduce accuracy of assessment

Low Risk Traits
• Unarmed (no spines, thorns, or burrs)
• Not reported to spread vegetatively
• Herbicides may provide effective control