

<b>Taxon:</b> <i>Syzygium grande</i> (Wight) Walp.	<b>Family:</b> Myrtaceae
<b>Common Name(s):</b> sea apple	<b>Synonym(s):</b> <i>Eugenia grandis</i> Wight

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Assessor Approved	<b>End Date:</b> 30 Nov 2018
<b>WRA Score:</b> 8.0	<b>Designation:</b> H(HPWRA)	<b>Rating:</b> High Risk

**Keywords:** Coastal Tree, Naturalized, Thicket-Forming, Animal-Dispersed, Water-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)	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	y
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	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	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y

Qsn #	Question	Answer Option	Answer
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		
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	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed		
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m <sup>2</sup> )		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides		
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
	Henderson, M. R. (1949). The genus <i>Eugenia</i> (Myrtaceae) in Malaya. The Garden's Bulletin Singapore, Vol. XII, Part 1. 293 pp.	[Much planted, but no evidence of domestication] "Wild only on sandy and rocky seacoasts. Much planted inland as a roadside tree."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2018. 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
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium</i> Gaertn.(Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	"Distribution. — Widespread, from Seychelles to Borneo. In Indochina found in Cambodia, Laos and Vietnam"

202	Quality of climate match data	High
	Source(s)	Notes
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium</i> Gaertn.(Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Henderson, M. R. (1949). The genus <i>Eugenia</i> (Myrtaceae) in Malaya. The Garden's Bulletin Singapore, Vol. XII, Part 1. 293 pp.	"Wild only on sandy and rocky seacoasts. Much planted inland as a roadside tree." [Restricted to low elevation tropical climates]

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium</i> Gaertn.(Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	"Distribution. — Widespread, from Seychelles to Borneo. In Indochina found in Cambodia, Laos and Vietnam"

Qsn #	Question	Answer
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, Ōahu. Bishop Museum Occasional Papers 87: 3-18	"Hundreds of seedlings and saplings were seen, mostly within 100 m of the original plantings in both Haukulu and 'Aihualama. Although only four trees were recorded as planted in 'Aihualama, over a dozen mature trees >10 m tall and thickets of saplings 1–5 m tall were observed in unmanaged secondary forest. The spread of this species may have been slowed by dispersal limitation. Material examined: O'AHU: Naturalized plants in <i>Ardisia eliptica</i> forest, Aihualama, Lyon Arboretum, 18 May 2005, Daehler 1108, (BISH); Lyon Arboretum (cultivated), 12 Oct 1967, D. Herbst 648 (HLA); Wahiawa Botanic Garden (cultivated), 23 Apr 1986, J. Lau 2294 (BISH)."

205	Does the species have a history of repeated introductions outside its natural range?	n
	Source(s)	Notes
	CABI. 2018. Invasive Species Compendium. Wallingford , UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	"In Hawaii, where the species can be found growing on coastal edge forests, it was apparently first grown in the Lyon Arboretum in 1932, with a report of its naturalized state around the Arboretum first reported in 2006 (Daehler and Baker, 2006); there were observed "hundreds of seedlings and saplings... mostly within 100 m of the original plantings in both Haukulu and 'Aihualama" and "thickets of saplings in unmanaged forests". Date of introduction to the West Indies is uncertain but, similarly to the case of Hawaii, it may have occurred within the last century. The species was not listed in floras from the late nineteenth and early twentieth centuries, but specimens were collected in Cuba in 1930 and 1932 (Smithsonian Museum of Natural History, 2015). Liogier and Martorell (2000) described it as "scarcely cultivated" in Puerto Rico."
	Liogier, A.H. & Martorell, L.F. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Second Edition Revised. La Editorial, UPR, San Juan, Puerto Rico	"scarcely cultivated in the tropics"
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, Ōahu. Bishop Museum Occasional Papers 87: 3-18	"This tree, native to tropical Asia, was first planted in the Arboretum in 1932 under the synonym <i>Eugenia grandis</i> Wight."

301	Naturalized beyond native range	y
	Source(s)	Notes

Qsn #	Question	Answer
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers 87: 3-18	" <i>Syzygium grande</i> (Wight) Wall. New naturalized record. This tree, native to tropical Asia, was first planted in the Arboretum in 1932 under the synonym <i>Eugenia grandis</i> Wight. It is characterized by its broadly elliptical leaves (10–25 cm x 6–12 cm) with up to 20 well-spaced secondary veins in a pinnate arrangement (Lemmens et al. 1995: 456), the veins appearing to disappear before reaching the leaf margin. The fruits are urn-shaped to ellipsoid berries, apparently green when ripe, 1–2 cm in length, containing a single seed ca. 5–7 mm in size. Hundreds of seedlings and saplings were seen, mostly within 100 m of the original plantings in both Haukulu and 'Aihualama. Although only four trees were recorded as planted in 'Aihualama, over a dozen mature trees >10 m tall and thickets of saplings 1–5 m tall were observed in unmanaged secondary forest. The spread of this species may have been slowed by dispersal limitation. Material examined: O'AHU: Naturalized plants in <i>Ardisia elliptica</i> forest, Aihualama, Lyon Arboretum, 18 May 2005, Daehler 1108, (BISH); Lyon Arboretum (cultivated), 12 Oct 1967, D. Herbst 648 (HLA); Wahiawa Botanic Garden (cultivated), 23 Apr 1986, J. Lau 2294 (BISH)."

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	CABI. 2018. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	[No evidence] "Based on current literature <i>S. grande</i> is not a high-risk species, but considering that several other <i>Syzygium</i> species are known to be weedy or invasive and even threats to native biodiversity, monitoring of this species may be required in the future."
	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
	CABI. 2018. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"currently, there has been no report of its invasion or negative economic or environmental impact, but this is an area for future research."
	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
	CABI. 2018. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"currently, there has been no report of its invasion or negative economic or environmental impact, but this is an area for future research."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

305	Congeneric weed	y
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Eugenia uniflora: forms dense thickets that displace native plants and prevents their regeneration" ... "Syzygium jambos: It is invasive because it forms dense impenetrable thickets that expand rapidly. The dense canopies shade out almost all native species and lead to monospecific stands. The tree resprouts vigorously after damage."

401	Produces spines, thorns or burrs	n
	<b>Source(s)</b>	<b>Notes</b>
	Henderson, M. R. (1949). The genus Eugenia (Myrtaceae) in Malaya. The Garden's Bulletin Singapore, Vol. XII, Part 1. 293 pp.	[No evidence] "A big tree, up to c. 30 metres tall; bark greyish buff or pinkish, rough, shallowly fissured, somewhat flaky in big trees ; inner bark pale pink to dark reddish, pale yellow near surface."

402	Allelopathic	
	<b>Source(s)</b>	<b>Notes</b>
	Fujii, Y., Parvez, S. S., Parvez, M., Ohmae, Y., & Iida, O. 2003. Screening of 239 medicinal plant species for allelopathic activity using the sandwich method. Weed Biology and Management, 3(4): 233-241	[Possibly Yes. Bioassay demonstrates allelopathic potential] "Leaf litter of 239 medicinal plant species were collected from the Izu Experimental Station for Medicinal Plants, National Institute of Health Sciences, Shizuoka, Japan, and these were subjected to analysis of their allelopathic effects using the sandwich method," ... "Table 1. Screening of leaf litter of 239 medicinal plant species under different families using the sandwich method" [Eugenia grandis - ** Indicates stronger inhibitory activity greater than the mean + 1 SD]

403	Parasitic	n
	<b>Source(s)</b>	<b>Notes</b>
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium Gaertn.</i> (Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	"Tree to 20 m tall, c. 20 cm dbh." [Myrtaceae. No evidence]

404	Unpalatable to grazing animals	
	<b>Source(s)</b>	<b>Notes</b>
	O'Dempsey, T. (2012). Nature Society (Singapore)'s Position Paper on Wild Pigs in Singapore. Nature Society (Singapore). <a href="https://nss.org.sg">https://nss.org.sg</a> . [Accessed ]	"Food sources for wild pigs in the nature reserves include: ... <i>Syzygium grande</i> (Sea Apple) is one example of a prolific food source exploited by wild pigs due to the frequency and amount of fruits produced;"
	Tan, K. H., Zubaid, A., & Kunz, T. H. (1998). Food habits of <i>Cynopterus brachyotis</i> (Muller)(Chiroptera: Pteropodidae) in Peninsular Malaysia. <i>Journal of Tropical Ecology</i> , 14(3), 299-307	[Leaves consumed by fruit bats] "Information on the feeding habits of the lesser dog-faced fruit bat, <i>Cynopterus brachyotis</i> , was obtained by the collection of food remains directly beneath daytime and feeding roosts." ... " <i>Cynopterus brachyotis</i> appeared to feed extensively on the leaves of <i>Erythrina orientalis</i> , <i>E. subumbrans</i> , <i>Eugenia grandis</i> , <i>Cassia spectabilis</i> , <i>Pellacalyx saccardianus</i> and <i>Artocarpus fulvicortex</i> . In the case of the <i>Eugenia</i> spp., <i>Artocarpus fulvicortex</i> and <i>Ficus religiosa</i> , only the young leaves were eaten."
	WRA Specialist. 2018. Personal Communication	Palatability of foliage to browsing and grazing animals unknown

Qsn #	Question	Answer
405	<b>Toxic to animals</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Tropical Plants Database, Ken Fern. (2018). <i>Syzygium grande</i> . <a href="http://tropical.theferns.info/viewtropical.php?id=Syzygium+grande">http://tropical.theferns.info/viewtropical.php?id=Syzygium+grande</a> . [Accessed 29 Nov 2018]	"Known Hazards None known"
	Tan, K. H., Zubaid, A., & Kunz, T. H. (1998). Food habits of <i>Cynopterus brachyotis</i> (Muller)(Chiroptera: Pteropodidae) in Peninsular Malaysia. <i>Journal of Tropical Ecology</i> , 14(3), 299-307	[Leaves consumed by fruit bats] "Information on the feeding habits of the lesser dog-faced fruit bat, <i>Cynopterus brachyotis</i> , was obtained by the collection of food remains directly beneath daytime and feeding roosts." ... " <i>Cynopterus brachyotis</i> appeared to feed extensively on the leaves of <i>Erythrina orientalis</i> , <i>E. subumbrans</i> , <i>Eugenia grandis</i> , <i>Cassia spectabilis</i> , <i>Pellacalyx saccardianus</i> and <i>Artocarpus fulvicortex</i> . In the case of the <i>Eugenia</i> spp., <i>Artocarpus fulvicortex</i> and <i>Ficus religiosa</i> , only the young leaves were eaten."
	Quattrocchi, U. 2012. <i>CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	<b>Source(s)</b>	<b>Notes</b>
	CAB International, 2005. <i>Forestry Compendium</i> . CAB International, Wallingford, UK	"Pests recorded Fungus diseases: Fusarium oxysporum Pestalotia Pests recorded at the generic level ( <i>Syzygium</i> ): Insects: Anastrepha fraterculus (South American fruit fly) Anastrepha suspensa (caribbean fruit fly) Ceroplastes destructor (white wax scale) Ceroplastes rubens (red wax scale) Coccus hesperidum (brown soft scale) Icerya seychellarum (Seychelles scale) Parasaissetia nigra (pomegranate scale) Pulvinaria psidii (green shield scale) Trichoferus campestris Fungus diseases: Armillaria tabescens (armillaria root rot)"
	WRA Specialist. 2018. Personal Communication	Unknown. A potential host of <i>Austropuccinia psidii</i> , as are other <i>Syzygium</i> species, but not documented to date

Qsn #	Question	Answer
407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Tropical Plants Database, Ken Fern. (2018). <i>Syzygium grande</i> . <a href="http://tropical.theferns.info/viewtropical.php?id=Syzygium+grande">http://tropical.theferns.info/viewtropical.php?id=Syzygium+grande</a> . [Accessed 29 Nov 2018]	"Known Hazards - None known"
	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	n
	Source(s)	Notes
	Wild Singapore. Wild Fact Sheets - Jambu air laut or Sea apple - <i>Syzygium grande</i> . <a href="http://www.wildsingapore.com">http://www.wildsingapore.com</a> . [Accessed 28 Nov 2018]	"According to Burkill, it was planted extensively in Singapore in the 1800's as fire breaks as it is resistant to lalang fires."
	NParks Flora&FaunaWeb. (2018). <i>Syzygium grande</i> . <a href="https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3160">https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3160</a> . [Accessed 28 Nov 2018]	"Tree used to be planted closely, as a firebreak, at the edge of lalang-infested wasteland because 'live' wood of this tree does not burn easily."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers 87: 3-18	"Although only four trees were recorded as planted in 'Aihualama, over a dozen mature trees >10 m tall and thickets of saplings 1-5 m tall were observed in unmanaged secondary forest." [Suggests seedlings and saplings will establish in and tolerate shade of other trees]
	NParks Flora&FaunaWeb. (2018). <i>Syzygium grande</i> . <a href="https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3160">https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3160</a> . [Accessed 29 Nov 2018]	"Light Preference : Full Sun"
	Comer, E. J. H. (1978). The Freshwater Swamp-forest of South Johore and Singapore. Botanic Gardens Parks & Recreation Department, Singapore	[Saplings described as shade-tolerant] "In these hot places young <i>Casuarina</i> grew fast and built a forest-belt, 10-50 m wide, of small trees which developed into an apparently pure stand of tall trees but, in fact, there were growing up beneath them the more shade-tolerant saplings which, with slower growth, would form the <i>Eugenia grandis</i> forest."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Soil descriptors - Soil texture: light; medium; heavy - Soil drainage: free; impeded - Soil reaction: acid; neutral - Special soil tolerances: shallow; infertile"

411	Climbing or smothering growth habit	n
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium</i> Gaertn.(Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	"Tree to 20 m tall, c. 20 cm dbh."

412	Forms dense thickets	y
	<b>Source(s)</b>	<b>Notes</b>
	Shono, K., Davies, S. J., & Kheng, C. Y. (2006). Regeneration of native plant species in restored forests on degraded lands in Singapore. <i>Forest Ecology and Management</i> , 237 (1-3), 574-582	"Woody regeneration (≥10 cm) in the three 4-year old sites" [ <i>Syzygium grande</i> - No. (ha <sup>-1</sup> ) = 27,467 = 2.7 per m <sup>2</sup> ]
	Senterre, B., Chew, M. Y., & Chung, R. C. (2015). Flora and vegetation of Pulau Babi Tengah, Johor, Peninsular Malaysia. <i>Check List</i> , 11(4), 1714	[Forms a dominant zone in coastal Malaysia] "The littoral zone is characterized by the reduction or absence of the typical coastal elements, e.g., <i>Barringtonia asiatica</i> , by the higher species diversity (107 species) compared to the coastal forests, and by the dominance of some species such as <i>Syzygium grande</i> . This zone corresponds to what was named the "Eugenia grandis-zone" by Corner (1985). It can extend several km inland, depending on topography and climate. On islands with a steep topography, this zone can be restricted to a few hundred meters, or absent due to human impact."
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. <i>Bishop Museum Occasional Papers</i> 87: 3-18	[Thickets of saplings formed] "Hundreds of seedlings and saplings were seen, mostly within 100 m of the original plantings in both Haukulu and 'Aihualama. Although only four trees were recorded as planted in 'Aihualama, over a dozen mature trees >10 m tall and thickets of saplings 1–5 m tall were observed in unmanaged secondary forest."

501	Aquatic	n
	<b>Source(s)</b>	<b>Notes</b>
	Henderson, M. R. (1949). The genus <i>Eugenia</i> (Myrtaceae) in Malaya. <i>The Garden's Bulletin Singapore</i> , Vol. XII, Part 1. 293 pp.	[Terrestrial tree] "Wild only on sandy and rocky seacoasts. Much planted inland as a roadside tree."

502	Grass	n
	<b>Source(s)</b>	<b>Notes</b>
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 28 Nov 2018]	Family: Myrtaceae Subfamily: Myrtoideae Tribe: Syzygieae

Qsn #	Question	Answer
503	<b>Nitrogen fixing woody plant</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 28 Nov 2018]	Family: Myrtaceae Subfamily: Myrtoideae Tribe: Syzygieae
504	<b>Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium Gaertn.</i> (Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	"Tree to 20 m tall, c. 20 cm dbh."
601	<b>Evidence of substantial reproductive failure in native habitat</b>	n
	<b>Source(s)</b>	<b>Notes</b>
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium Gaertn.</i> (Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	"Conservation status. — IUCN Global Status: Least Concern (LC); IUCN Regional (Indochina) Status: Least Concern (LC)."
602	<b>Produces viable seed</b>	y
	<b>Source(s)</b>	<b>Notes</b>
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, Oʻahu. <i>Bishop Museum Occasional Papers</i> 87: 3-18	"Although only four trees were recorded as planted in 'Aihualama, over a dozen mature trees >10 m tall and thickets of saplings 1–5 m tall were observed in unmanaged secondary forest." [Producing viable seeds]
	NParks Flora&FaunaWeb. (2018). <i>Syzygium grande</i> . <a href="https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3160">https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3160</a> . [Accessed 28 Nov 2018]	"Propagation Method : Seed, Stem Cutting"
	CABI. 2018. <i>Invasive Species Compendium</i> . Wallingford , UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	"There are about 70 fruits per kilogram, each containing a single seed. Seed viability is short (15-25 days). About 60-70% of seeds germinate after direct sowing. In nurseries, seed germination can increase to 75-80% when raised in polybags."
603	<b>Hybridizes naturally</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Brink, M., 2008. <i>Syzygium cordatum</i> Hochst. ex C.Krauss. In: Louppe, D., Oteng-Amoako, A.A. & Brink, M. (Editors). <i>Prota 7(1): Timbers/Bois d'œuvre 1</i> . [CD-Rom]. PROTA, Wageningen, Netherlands	[Unknown. Hybridization documented in genus] " <i>Syzygium cordatum</i> hybridizes with <i>Syzygium guineense</i> (Willd.) DC., and the 2 species are connected by a complete range of intermediates."
604	<b>Self-compatible or apomictic</b>	

Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Nair, K. N. (ed.). (2017). The Genus <i>Syzygium</i> : <i>Syzygium cumini</i> and other underutilized species. CRC Press, Boca Raton, FL	[Unknown for <i>S. grande</i> ] "The breeding biology of <i>Syzygium</i> has been understudied. Several studies showed that <i>Syzygium</i> are pollinated by birds, bats, and insects (bees, wasps, moths, ants, and spiders) and have low to high self-compatibility (Nic Lughadha and Proenca 1996; Parnell et al. 2007). Chantaranonthai and Parnell (1994) showed that in <i>S. jambos</i> (L.) Alston, <i>S. megacarpum</i> (Craib) Rathakr. et N. C. Nair, and <i>S. samarangense</i> (Blume) Merr. et L. M. Perry, three breeding systems occur: apomictic, inbreeding (excluding apomixis), and outbreeding. Some species display inconsistent incidents of polyembryony, for example, <i>S. cumini</i> (L.) Skeels (Nic Lughadha and Proenca 1996). In short, there is no conclusive evidence indicating a general breeding trend in <i>Syzygium</i> , especially in regards to inbreeding or outbreeding."

605	Requires specialist pollinators	n
	<b>Source(s)</b>	<b>Notes</b>
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers 87: 3-18	"Although only four trees were recorded as planted in 'Aihualama, over a dozen mature trees >10 m tall and thickets of saplings 1–5 m tall were observed in unmanaged secondary forest." [Producing viable seeds, indicating that whatever pollinators that are present are effectively pollinating this species in the Hawaiian Islands]
	NParks Flora&FaunaWeb. (2018). <i>Syzygium grande</i> . <a href="https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3160">https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3160</a> . [Accessed 28 Nov 2018]	"Its flowers produced nectars, and are probably pollinated by bats. The nectar can also attract insects like butterflies and birds."
	Wild Singapore. Wild Fact Sheets - Jambu air laut or Sea apple - <i>Syzygium grande</i> . <a href="http://www.wildsingapore.com">http://www.wildsingapore.com</a> . [Accessed 28 Nov 2018]	"Role in the habitat: The flowers are pollinated by insects and the fruits are 'eagerly sought after' by monkeys, bats and birds who disperse the seeds."
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium</i> Gaertn.(Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	"White, sessile, hypanthium not glaucous, not fibrous, 7-8 × 6-7, obconic, pseudostalk distinct, 2.5-3 mm long; sepals 4, free, semiobovate, unequal, outer sepals 2.5 × 2.6-3 mm, inner sepals 3 × 4.2-4.5 mm; petals 4, free, 5-6 × 5-6 mm, orbicular; outer stamens 2-2.2 cm long, anther sacs parallel, connective gland inconspicuous; style c. 10 mm long, ovules 12-15 per locule, irregularly radiating."

606	Reproduction by vegetative fragmentation	n
	<b>Source(s)</b>	<b>Notes</b>
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"It coppices well when young, but coppicing ability declines with age. It can also be propagated vegetatively through grafting and air-layering." ... "Silvicultural practice descriptors - Seed storage orthodox - Vegetative propagation by air layering; grafting - Stand establishment using natural regeneration; direct sowing; planting stock"

607	Minimum generative time (years)	

Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	NParks Flora&FaunaWeb. (2018). <i>Syzygium grande</i> . <a href="https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3160">https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3160</a> . [Accessed 29 Nov 2018]	"Plant Growth Rate : Fast" [Time to maturity unspecified]

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	<b>Source(s)</b>	<b>Notes</b>
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium Gaertn.</i> (Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	[Large fruit & seeds lack means of external attachment] "Subglobose, 7 × 7 cm, surface smooth, calyx ring with smooth rim; seed 1, subglobose, 4.4 × 4 cm"

702	Propagules dispersed intentionally by people	y
	<b>Source(s)</b>	<b>Notes</b>
	Liogier, A.H. & Martorell, L.F. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Second Edition Revised. La Editorial, UPR, San Juan, Puerto Rico	"a native to southeastern Asia, scarcely cultivated in the tropics."
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium Gaertn.</i> (Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	"In forest or planted along roadside."
	Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, Oahu. <i>Bishop Museum Occasional Papers</i> 87: 3-18	"This tree, native to tropical Asia, was first planted in the Arboretum in 1932 under the synonym <i>Eugenia grandis</i> Wight."

703	Propagules likely to disperse as a produce contaminant	n
	<b>Source(s)</b>	<b>Notes</b>
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium Gaertn.</i> (Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	"Tree to 20 m tall, c. 20 cm dbh." ... "Subglobose, 7 × 7 cm, surface smooth, calyx ring with smooth rim; seed 1, subglobose, 4.4 × 4 cm" [No evidence. Unlikely. A tree with large seeds that are unlikely to become an inadvertent contaminant, if grown with other commercial crops or produce]

704	Propagules adapted to wind dispersal	n
	<b>Source(s)</b>	<b>Notes</b>
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium Gaertn.</i> (Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	"Subglobose, 7 × 7 cm, surface smooth, calyx ring with smooth rim; seed 1, subglobose, 4.4 × 4 cm"

705	Propagules water dispersed	y
	<b>Source(s)</b>	<b>Notes</b>
	NParks Flora&FaunaWeb. (2018). <i>Syzygium grande</i> . <a href="https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3160">https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3160</a> . [Accessed 28 Nov 2018]	"Seed / Spore Dispersal : Abiotic (Water; Gravity)"

Qsn #	Question	Answer
	CABI. 2018. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"Seed dispersal by water is possible: the species thrives in coastal edge forests of its native Malay range as well as in Hawaii and Singapore."
	Henderson, M. R. (1949). The genus Eugenia (Myrtaceae) in Malaya. The Garden's Bulletin Singapore, Vol. XII, Part 1. 293 pp.	"Wild only on sandy and rocky seacoasts." [Distribution along seacoasts suggests water dispersal may occur]

706	Propagules bird dispersed	
	Source(s)	Notes
	Shono, K., Davies, S. J., & Kheng, C. Y. (2006). Regeneration of native plant species in restored forests on degraded lands in Singapore. Forest Ecology and Management, 237 (1-3), 574-582	"Appendix A ... <i>Syzygium grande</i> ... Dispersal agent = birds and/or bats (B), mammals (M)"
	Wild Singapore. Wild Fact Sheets - Jambu air laut or Sea apple - <i>Syzygium grande</i> . http://www.wildsingapore.com. [Accessed 28 Nov 2018]	"Role in the habitat: The flowers are pollinated by insects and the fruits are 'eagerly sought after' by monkeys, bats and birds who disperse the seeds."
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium Gaertn.</i> (Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). Adansonia, 37(2), 179-275	"Subglobose, 7 × 7 cm, surface smooth, calyx ring with smooth rim; seed 1, subglobose, 4.4 × 4 cm, seed" [Large fruits & seed may limit bird species in the Hawaiian Islands capable of dispersing seeds]
	Hails, C. J., Kavanagh, M., Kumari, K., & Ariffin, I. (2013). Bring back the birds. The Raffles Bulletin of Zoology, Supplement No. 29: 245-260	"Table 1. Plants that attract insects to their flowers, bear fruits that are attractive to birds, and bear flowers that attract nectarivorous birds." [Includes <i>Syzygium grande</i> ]

707	Propagules dispersed by other animals (externally)	
	Source(s)	Notes
	Guy, G., & Baker, N. (2017). Short-nosed Fruit Bat feeding on fruits of <i>Terminalia catappa</i> and <i>Syzygium grande</i> at Pulau Pinang, Peninsular Malaysia. SEAVR 2017: 034-035	[Fruit dispersed and seeds discarded by fruit bats without ingestion] "A <i>Cynopterus</i> fruit bat was observed in a private garden hanging from a slender branch of an exotic fir tree, whilst cradling and consuming the pulp of a fruit of the Sea Almond <i>Terminalia catappa</i> (Fig. 1). A total of 12 seeds of <i>Terminalia catappa</i> and 12 of <i>Syzygium grande</i> were found beneath the same tree"
	WRA Specialist. 2018. Personal Communication	Due to the fruit and seed size, seeds might not be ingested or internally dispersed by birds or other animals in the Hawaiian Islands, but could potentially be carried away from the tree and dispersed after fruit pulp is consumed. Rodents, mongoose, and/or game birds could potentially disperse seeds in the manner.

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	O'Dempsey, T. (2012). Nature Society (Singapore)'s Position Paper on Wild Pigs in Singapore. Nature Society (Singapore). https://nss.org.sg. [Accessed 29 Nov 2018]	"Food sources for wild pigs in the nature reserves include: ... <i>Syzygium grande</i> (Sea Apple) is one example of a prolific food source exploited by wild pigs due to the frequency and amount of fruits produced;"
	Wild Singapore. Wild Fact Sheets - Jambu air laut or Sea apple - <i>Syzygium grande</i> . http://www.wildsingapore.com. [Accessed 28 Nov 2018]	"Role in the habitat: The flowers are pollinated by insects and the fruits are 'eagerly sought after' by monkeys, bats and birds who disperse the seeds."

Qsn #	Question	Answer
	Soh, W. K., & Parnell, J. (2015). A revision of <i>Syzygium Gaertn.</i> (Myrtaceae) in Indochina (Cambodia, Laos and Vietnam). <i>Adansonia</i> , 37(2), 179-275	"Subglobose, 7 × 7 cm, surface smooth, calyx ring with smooth rim; seed 1, subglobose, 4.4 × 4 cm"

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	CABI. 2018. <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	"There are about 70 fruits per kilogram, each containing a single seed. Seed viability is short (15-25 days). About 60-70% of seeds germinate after direct sowing. In nurseries, seed germination can increase to 75-80% when raised in polybags." [Densities unknown]

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	Notes
	CAB International, 2005. <i>Forestry Compendium</i> . CAB International, Wallingford, UK	"Seed viability is short (15-25 days). About 60-70% of seeds germinate after direct sowing."

803	Well controlled by herbicides	
	Source(s)	Notes
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching, L. 2003. <i>Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide</i> . CTAHR, UH Manoa, Honolulu, HI	"Sensitive to picloram applied cut surface and to glyphosate applied to drilled holes. Good control with triclopyr applied basal bark and cut-surface(30)." [Herbicides effective on related invasive species <i>S. jambos</i> , so may also be effective on <i>Syzygium grande</i> ]

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	CAB International, 2005. <i>Forestry Compendium</i> . CAB International, Wallingford, UK	"It coppices well when young, but coppicing ability declines with age. It can also be propagated vegetatively through grafting and air-layering."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Carnegie, A. J., &amp; Lidbetter, J. R. (2012). Rapidly expanding host range for <i>Puccinia psidii</i> sensu lato in Australia. <i>Australasian Plant Pathology</i>, 41(1), 13-29</p>	<p>[Pathogen present in Hawaiian Islands. Impacts <i>Syzygium</i> and <i>Eugenia</i> species. Effects on <i>Syzygium grande</i> unknown] "A rust affecting Myrtaceae was recently detected in New South Wales, Australia." ... "In Australia, <i>P. psidii</i> s.l. has currently been found on 107 host species in 30 genera during surveys, including species in <i>Angophora</i>, <i>Asteromyrtus</i>, <i>Austromyrtus</i>, <i>Backhousia</i>, <i>Callistemon</i>, <i>Chamelaucium</i>, <i>Choricarpia</i>, <i>Decaspermum</i>, <i>Eucalyptus</i>, <i>Eugenia</i>, <i>Gossia</i>, <i>Lenwebbia</i>, <i>Leptospermum</i>, <i>Lophomyrtus</i>, <i>Melaleuca</i>, <i>Metrosideros</i>, <i>Myrtus</i>, <i>Pilidiostigma</i>, <i>Rhodamnia</i>, <i>Rhodomyrtus</i>, <i>Ristantia</i>, <i>Stockwellia</i>, <i>Syncarpia</i>, <i>Syzygium</i>, <i>Tristania</i>, <i>Tristaniopsis</i>, <i>Ugni</i>, <i>Uromyrtus</i> and <i>Xanthostemon</i>. Species under cultivation (in nurseries and gardens) that are severely affected include <i>Gossia inophloia</i>, <i>Agonis flexuosa</i>, <i>Syzygium jambos</i> and <i>S. anisatum</i> while species that are severely damaged in native bushland include <i>Rhodamnia rubescens</i>, <i>Rhodomyrtus psidioides</i>, <i>Choricarpia leptopetala</i> and <i>Melaleuca quinquenervia</i>."</p>

**Summary of Risk Traits:**

High Risk / Undesirable Traits

- Thrives in tropical climates
- Naturalized on Oahu, Hawaiian Islands
- Other *Syzygium* and *Eugenia* species are invasive
- Shade-tolerant
- Tolerates many soil types
- Forming thickets where naturalized in Hawaiian Islands, and forms dominant cover in coastal forests within native range
- Reproduces by seeds
- Seeds dispersed by birds, other frugivorous animals, by water & intentionally by people
- Coppices when young; coppicing ability declines with age
- Gaps in biological and ecological information reduce accuracy of risk prediction

Low Risk Traits

- No reports of negative impacts in native or introduced range
- Unarmed (no spines, thorns, or burrs)
- Non-toxic
- Fire-resistant; planted as a fire break
- Not reported to spread vegetatively
- Seeds recalcitrant, lose viability rapidly and will not form a persistent seed bank