

Taxon: *Eucalyptus camaldulensis* Dehnh.

Family: Myrtaceae

Common Name(s): blue gum
Murray red gum
red gum
red river gum
river gum
river red gum

Synonym(s): *Eucalyptus acuminata* Hook.
Eucalyptus camaldulensis Dehnh. var.
Eucalyptus camaldulensis var.
Eucalyptus longirostris F. Muell. ex
Eucalyptus rostrata Schltldl.

Assessor: Chuck Chimera

Status: Assessor Approved

End Date: 21 Oct 2021

WRA Score: 14.0

Designation: H(HPWRA)

Rating: High Risk

Keywords: Forestry Tree, Naturalized, Environmental Weed (South Africa), Riparian, 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	y
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	y
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)	y
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	y=1, n=0	y
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		

Qsn #	Question	Answer Option	Answer
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	y
409	Is a shade tolerant plant at some stage of its life cycle		
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	y=1, n=-1	y
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	3
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	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/m ²)		
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
	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	[Not domesticated] "River red gum is the most widely distributed of all eucalypts. With the exception of the southern parts of Western Australia, the Nullarbor Plain and the coastal fringe of most of Victoria, New South Wales and eastern Queensland, it is found throughout mainland Australia."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2021). 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
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 18 Oct 2021]	"Native Australasia AUSTRALIA: Australia [New South Wales, Queensland, South Australia, Victoria, Western Australia, Northern Territory]"
	Louppe, D., Oteng-Amoako, A.A. & Brink, M. (2008). Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Netherlands	"The natural distribution of <i>Eucalyptus camaldulensis</i> covers most of the Australian mainland, ranging from the tropical Northern Territory to cool, temperate Victoria. It is planted in many tropical and subtropical countries, probably being the world's most widely planted tree in arid and semi-arid lands, and it has become naturalized in many areas."

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 18 Oct 2021]	

203	Broad climate suitability (environmental versatility)	y
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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	"Climate: Altitudinal range: 20–700 m ; Hottest/coldest months: 26–32°C/1–7°C (Murray–Darling form), 31–32°C/15– 18°C (simulata), 33–38°C/3–8°C (arid zone populations), 34–39°C/8–16°C (tropical populations); Frost incidence: low but up to 20 frosts a year may be experienced in southern and inland areas; Rainfall: 325–750 mm (Murray–Darling form), 900–1000 mm (simulata), 150–500 mm (arid zone populations), 500–1100 mm (tropical populations), winter through to summer max. (Murray–Darling form), uniform to summer max. (arid zone populations), summer max. (tropical populations, simulata)."
	Louppe, D., Oteng-Amoako, A.A. & Brink, M. (2008). Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Netherlands	"Under natural conditions, river red gum occurs typically along watercourses and on floodplains, usually in open forest and woodland, up to 700 m altitude. Planted trees grow under a wide range of climatic conditions, from temperate to hot and from humid to arid. Annual rainfall in natural stands varies from 250–2500 mm, but planted trees can survive in areas with as little as 150 mm annually. Survival in arid regions depends on the presence of a high water table or seasonal flooding. In Africa best growth is observed in areas with an average annual rainfall of 700–1200 mm. The length of the dry season may vary from 0–8 months. Mean annual temperatures range from 13–28°C. Mean minimum temperature of the coldest month ranges from 3–22°C, mean maximum temperature of the hottest month from 21–40°C. In general, river red gum tolerates up to 20 frosts per year, but does not tolerate temperatures below –10°C. In tropical Africa it is grown from sea-level up to 2800 m altitude. "

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i extensively planted on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i, and regenerating from seed at least within or near the plantations. Over 428,000 trees planted between 1911 and 1941, but earliest collection seen made on O'ahu in 1909 (Rock 6056, BISH)."
	Louppe, D., Oteng-Amoako, A.A. & Brink, M. (2008). Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Netherlands	"The natural distribution of <i>Eucalyptus camaldulensis</i> covers most of the Australian mainland, ranging from the tropical Northern Territory to cool, temperate Victoria. It is planted in many tropical and subtropical countries, probably being the world's most widely planted tree in arid and semi-arid lands, and it has become naturalized in many areas. It has been planted in Africa since 1900 and it is now very widely grown in tropical Africa, where it is probably the most common tree in woodlots, shelterbelts and fuelwood plots, but less important in large-scale plantations."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i extensively planted on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i, and regenerating from seed at least within or near the plantations. Over 428,000 trees planted between 1911 and 1941, but earliest collection seen made on O'ahu in 1909 (Rock 6056, BISH)."
	Little Jr., E.L. & Skolmen, R.G. (1989). Common forest trees of Hawaii: (native and introduced). USDA Agriculture Handbook No. 679. USDA Forest Service, Washington, D.C.	"Of all eucalypts, the most widely distributed as a wild tree. Extensively planted in arid areas throughout the world. Very popular in Israel for forestation."
	Loupe, D., Oteng-Amoako, A.A. & Brink, M. (2008). Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Netherlands	"The natural distribution of <i>Eucalyptus camaldulensis</i> covers most of the Australian mainland, ranging from the tropical Northern Territory to cool, temperate Victoria. It is planted in many tropical and subtropical countries, probably being the world's most widely planted tree in arid and semi-arid lands, and it has become naturalized in many areas. It has been planted in Africa since 1900 and it is now very widely grown in tropical Africa, where it is probably the most common tree in woodlots, shelterbelts and fuelwood plots, but less important in large-scale plantations. "

301	Naturalized beyond native range	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i extensively planted on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i, and regenerating from seed at least within or near the plantations. Over 428,000 trees planted between 1911 and 1941, but earliest collection seen made on O'ahu in 1909 (Rock 6056, BISH)."
	Loupe, D., Oteng-Amoako, A.A. & Brink, M. (2008). Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Netherlands	"The natural distribution of <i>Eucalyptus camaldulensis</i> covers most of the Australian mainland, ranging from the tropical Northern Territory to cool, temperate Victoria. It is planted in many tropical and subtropical countries, probably being the world's most widely planted tree in arid and semi-arid lands, and it has become naturalized in many areas."

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Primarily an environmental weed] " <i>E. camaldulensis</i> has a negative impact on biodiversity. Henderson (2001) describes it as a habitat transformer. The species has been blamed in some countries (e.g. India and Thailand) for reducing soil water reserves, depleting soil nutrients, and other ecologically negative effects. In South Africa, <i>E. camaldulensis</i> competes with and replaces indigenous riverine species. Extensive stands along watercourses are likely to cause a significant reduction in stream flow."

303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes

Qsn #	Question	Answer
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Primarily an environmental weed] "E. camaldulensis has a negative impact on biodiversity. Henderson (2001) describes it as a habitat transformer. The species has been blamed in some countries (e.g. India and Thailand) for reducing soil water reserves, depleting soil nutrients, and other ecologically negative effects. In South Africa, E. camaldulensis competes with and replaces indigenous riverine species. Extensive stands along watercourses are likely to cause a significant reduction in stream flow."

304	Environmental weed	y
	Source(s)	Notes
	Forsyth, G. G., Richardson, D. M., Brown, P. J., & Van Wilgen, B. W. (2004). A rapid assessment of the invasive status of Eucalyptus species in two South African provinces: working for water. South African Journal of Science, 100(1-2), 75-77	"Red River gum has transformed long stretches of rivers and its importance as a major weed has been underestimated in previous reviews of alien plant invasions in South Africa." ... "Red River gum was found to be highly invasive along river courses in both the Western Cape (46% of observations classified as invasive) and in Mpumalanga (28% of observations classified as invasive). In the middle reaches of the Berg River and the lower reaches of the Sonderend River, this species now dominates the riverine vegetation and is clearly in the 'transformer' category." ... "Red River gum is the greatest threat as it is found throughout much of South Africa and has already transformed long stretches of rivers and dam shores. Red River gum is a major environmental weed."
	Keet, J. H., & Richardson, D. M. (2022). A rapid survey of naturalized and invasive eucalypt species in southwestern Limpopo, South Africa. South African Journal of Botany, 144, 339-346	"The two most problematic species we recorded in our survey are E. camaldulensis and E. grandis. Both species are known invasives (Randall, 2017), with the former best known as an aggressive invader of riparian ecosystems in South Africa (Hirsch et al., 2020; Le Maitre et al., 2019). Both are high-risk species and are invasive elsewhere in the world (Gordon et al., 2012, 2011; Randall, 2017; Ziller et al., 2019), and both have the potential to be serious invaders in South Africa (Hirsch et al., 2020; Musengi and Archibald, 2017), having significant impacts on the biotic (e.g. reducing native plant species richness) and abiotic components (e.g. increasing soil water repellency) of the environment (Hirsch et al., 2020; Kerr and Ruwanza, 2016)."
	Henderson, L. (2001). Alien Weeds and Invasive Plants. Alien weeds and invasive plants: A Complete Guide to Declared Weeds and Invaders in South Africa. Agricultural Research Council, Pretoria	[Eucalyptus camaldulensis] "Invades: Perennial, seasonal and intermittent watercourses. Origin: Australia (all states except Tasmania). Invasive status: Transformer. Declared invader (category 2)."

305	Congeneric weed	y
	Source(s)	Notes

Qsn #	Question	Answer
	Henderson, L. (2001). Alien Weeds and Invasive Plants. Alien weeds and invasive plants: A Complete Guide to Declared Weeds and Invaders in South Africa. Agricultural Research Council, Pretoria	"Because of the many negative impacts that Eucalyptus species have on the environment, some taxa have been declared invaders in South Africa. According to the regulations of the National Environment Management: Biodiversity Act (NEM:BA, Act 10 of 2004, Department of Environmental Affairs, South African Government), six Eucalyptus species are currently listed as invasive (<i>E. camaldulensis</i> , <i>E. cladocalyx</i> , <i>E. conferruminata</i> S.G.M., <i>E. diversicolor</i> , <i>E. grandis</i> , and <i>E. tereticornis</i> Sm.); these species require regulation and management."
	Forsyth, G. G., Richardson, D. M., Brown, P. J., & Van Wilgen, B. W. (2004). A rapid assessment of the invasive status of Eucalyptus species in two South African provinces: working for water. South African Journal of Science, 100(1-2), 75-77	"Gum trees, or eucalypts (<i>Eucalyptus</i> species), have been targeted for invasive alien plant clearing programmes in many parts of South Africa. This has caused some dissatisfaction where the species concerned also have useful characteristics, and stakeholders contend that some of these useful species are not invasive. A rapid assessment of the invasive status of Eucalyptus species at 82 sites in South Africa (54 in the Western Cape and 28 in Mpumalanga) indicated that only Red River gum (<i>E. camaldulensis</i>) and flooded gum (<i>E. grandis</i>) are clearly invasive."
	Simberloff, D. & Rejmánek, M. (2011). Encyclopedia of Biological Invasions. University of California Press, Berkeley & Los Angeles	"Over 800 species of eucalypts (<i>Angophora</i> , <i>Corymbia</i> , and <i>Eucalyptus</i>) are native to Australia and a few Pacific islands. These genera include some of the most important solid timber and paper pulp forestry trees in the world. Besides pines, eucalypts are the most commonly and widely cultivated exotic trees. Almost 20 million ha (200,000 km ²) of eucalyptus plantations exist in tropical, subtropical, and temperate countries. In many countries, eucalypts are the most common and conspicuous nonnative trees. Over 70 species are naturalized (reproduce and maintain their populations) outside their native ranges. However, given the extent of cultivation, eucalypts are markedly less invasive than many other widely cultivated trees and shrubs. Reasons for this relatively low invasiveness are still not completely understood. Conclusions about positive or negative environmental and economic impacts of eucalypts are often anecdotal, highly controversial, and context dependent."
	Weber, E. (2017). Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[<i>Eucalyptus globulus</i>] "The tree invades neighbouring plant communities from initial plantings. By building dense bushes and forests, it displaces native plant species and their associated wildlife with extremely species-poor stands of blue gum. The trees produce a thick litter layer consisting of leaves, bark strips and branch lees, preventing germination and establishment of understorey plants. This is aided by allelochemicals released from leaves (Bossard et al., 2000). Litter of blue gum is highly flammable and the trees accumulate large amounts of litter, increasing fire hazards. Drifting burning material is common in eucalyptus stands, thus the potential to ignite spot fires is very high"
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	A large number of species are cited as naturalized and/or weeds

401	Produces spines, thorns or burrs	n
	Source(s)	Notes

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence] "Trees 20 -45 m tall, bark white, gray, brown, or red in patches, smooth throughout. Adult leaves alternate, blades concolorous, lanceolate to narrowly lanceolate, 8-30 cm long, 0.7-2 cm wide, apex acuminate, petioles 12-15 mm long. Flowers 7-11 in axillary, simple umbels, peduncles 6-15 mm long, pedicels 5-12 mm long; buds globose-rostrate or ovoid-conical, 6-9 mm long, 3-6 mm wide; operculum hemispherical, rostrate, or conical, apex obtuse. Fruit hemispherical or ovoid, 5-8 mm long and wide, valves 3-5, exserted"

Qsn #	Question	Answer
402	Allelopathic	y
	Source(s)	Notes
	Ruwanza, S., Gaertner, M., Esler, K. J., & Richardson, D. M. (2015). Allelopathic effects of invasive <i>Eucalyptus camaldulensis</i> on germination and early growth of four native species in the Western Cape, South Africa. <i>Southern Forests: A Journal of Forest Science</i> , 77(2), 91-105	" <i>Eucalyptus camaldulensis</i> Dehnh. (red river gum; Myrtaceae) is an invasive tree in riparian habitats of the Western Cape, South Africa, where it replaces indigenous vegetation and affects ecosystem functioning. These invasions lead to changes in river geomorphology and reduction in stream flow. The mechanisms that drive these effects are poorly understood. The potential for allelopathic effects of aqueous extracts of <i>E. camaldulensis</i> tissues and of soil and litter collected beneath <i>E. camaldulensis</i> trees on the germination and seedling growth of four selected native plant species was investigated in a greenhouse experiment. Soils collected beneath <i>E. camaldulensis</i> trees were used in three treatments: untreated soils, sterilised soils and sterilised soils overlaid with a eucalypt litter layer. In addition, soils collected from underneath native species were used in two treatments: untreated soils and soils overlaid with a eucalypt litter layer. All soil treatments were watered with three <i>E. camaldulensis</i> leaf, bark and root aqueous treatments. Compounds present in the aqueous extracts and fresh samples were identified using gas chromatography. Soil and aqueous treatments showed varying effects on germination and seedling growth of the four native species. Germination and seedling growth of <i>Olea europaea</i> subsp. <i>africana</i> and <i>Dimorphotheca pluvialis</i> were significantly reduced by <i>E. camaldulensis</i> root and bark aqueous extracts as well as by the soils treatments. The addition of eucalypt litter to native and sterilised soils reduced shoot and root growth of all four native species. Compounds such as α -phellandrene, eucalyptol, p-menth-1-en-8-ol and α -pinene, which have the potential to inhibit germination and plant growth, were identified in <i>E. camaldulensis</i> aqueous extracts and fresh samples. Although the methods applied in this study had limitations (e.g. lack of control treatment to litter addition), the results provide an additional motivation to prioritise removal of invasive <i>E. camaldulensis</i> stands from riparian ecosystems. Restoration initiatives should target native species that are not negatively affected by allelopathy."
	del Moral, R., & Muller, C. H. (1970). The Allelopathic Effects of <i>Eucalyptus camaldulensis</i> . <i>The American Midland Naturalist</i> , 83(1), 254–282	" <i>Eucalyptus camaldulensis</i> is representative of a wide variety of plants capable of establishing gradients of toxicity in an otherwise relatively uniform environment. Such gradients drastically alter the species composition and thus are highly important to the study of vegetation composition. Allelopathic factors interact dramatically with other environmental factors and must be considered a part of the environmental complex."

403	Parasitic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Trees 20 -45 m tall, bark white, gray, brown, or red in patches, smooth throughout." [Myrtaceae. No evidence]

Qsn #	Question	Answer
404	Unpalatable to grazing animals	
	Source(s)	Notes
	National Research Council (U.S.). Advisory Committee on Technology Innovation. (1980). Firewood Crops: Shrub and Tree Species for Energy Production. Volume 1. National Academy of Sciences, Washington, D.C.	"The leaves are not favored by livestock or wildlife-an advantage."
	CSIRO. (2004). Water for a Health Country. Taxon Attribute Profiles. <i>Eucalyptus camaldulensis</i> Dehnh. https://www.anbg.gov.au . [Accessed 20 Oct 2021]	[Seedlings and saplings grazed by some animals during drought or if other food is lacking] "Rabbits and kangaroos heavily graze seedlings during prolonged dry periods when feed is scarce (Dexter, 1978). Until 1950s grazing of river red gum forests was at a fairly high level, modifying the original understorey (Dalton, 1990). Where narrow bands of trees occur along a watercourse, too high grazing pressure will disadvantage maintenance of a self-replacing stand. In these cases only a small amount of regeneration results, and this is easily grazed out by stock. However, sapling growth is not, or rarely, grazed by stock unless animals are starved of other forage (Cunningham et al., 1981). Cattle grazing on weeds may help control weeds, reducing competition for moisture (Dexter, 1978)."

405	Toxic to animals	n
	Source(s)	Notes
	CSIRO. (2004). Water for a Health Country. Taxon Attribute Profiles. <i>Eucalyptus camaldulensis</i> Dehnh. https://www.anbg.gov.au . [Accessed 21 Oct 2021]	[No evidence] "Rabbits and kangaroos heavily graze seedlings during prolonged dry periods when feed is scarce (Dexter, 1978). Until 1950s grazing of river red gum forests was at a fairly high level, modifying the original understorey (Dalton, 1990). Where narrow bands of trees occur along a watercourse, too high grazing pressure will disadvantage maintenance of a self-replacing stand. In these cases only a small amount of regeneration results, and this is easily grazed out by stock. However, sapling growth is not, or rarely, grazed by stock unless animals are starved of other forage (Cunningham et al., 1981). Cattle grazing on weeds may help control weeds, reducing competition for moisture (Dexter, 1978)."
	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. Multiple medicinal uses

406	Host for recognized pests and pathogens	
	Source(s)	Notes

Qsn #	Question	Answer
	<p>CAB International. (2005). Forestry Compendium. CAB International, Wallingford, UK</p>	<p>"In the nursery, <i>E. camaldulensis</i> is susceptible to a diverse range of fungi causing damping-off, collar rot, and leaf diseases (<i>Pythium</i> spp., <i>Phytophthora</i> spp., <i>Rhizoctonia</i> spp., and <i>Cylindrocladium</i> spp.). Insects (e.g. termites and aphids) and rodents may be troublesome, and both physical and chemical control measures may be needed. In Australia, natural stands and plantations of <i>E. camaldulensis</i> are affected by many insects and fungi. Leaves are often attacked by leaf chewing insects, particularly of the Chrysomelidae and Curculionidae families (such as <i>Paropsis</i> spp., <i>Chrysophtharta</i> spp., <i>Gonipterus</i> spp., and <i>Oxyops</i> spp.) (Stone and Bacon, 1995). Where the tree is well adapted outside Australia, it is relatively free from problems. In parts of Africa and Asia termites affect young trees and must be chemically controlled (Day et al., 1994). In Africa the <i>Eucalyptus</i> snout beetle, <i>Gonipterus scutellatus</i>, of Australian origin, feeds on young shoots but can be controlled biologically (a substantial measure of success was achieved with the introduction from Australia during 1926 of the Mymarid egg parasite, <i>Anaphes nitens</i>), and moribund or newly felled trees may become infested with the Australian stem borer or longicorn beetle, <i>Phoracantha semipunctata</i> (Poynton, 1979). The longicorn beetle has caused major damage to plantations of <i>E. camaldulensis</i> in parts of North Africa and the Middle East (e.g. it is the most important pest of eucalypts in Israel; Mendel, 1987). <i>E. camaldulensis</i> was found to be relatively resistant to this pest in southern California, USA, and this was associated with the species drought resistance (Hanks et al., 1995). Disease is most common where the species is planted off-site, or where inappropriate provenances are used, resulting in stressed, unthrifty trees which are more susceptible to disease than healthy ones. Stem cankers and leaf diseases proliferate where rainfall and humidity are much higher than normally encountered in the natural habitat (e.g. in parts of India; Sharma and Mohanan, 1991). In humid regions of Vietnam and Thailand many <i>E. camaldulensis</i> plants are defoliated by fungi causing severe reductions in growth rate and deformed crowns and stems. Several pathogens are associated with this disease in these countries, with <i>Cylindrocladium quinqueseptatum</i> an important causal agent (ACIAR, 1996). The most susceptible provenances suffer mortality and general decline, but some provenances (e.g. Katherine) are little affected, allowing selection and breeding for resistance to the disease. In Indonesia, prominent leaf spot symptoms on <i>E. camaldulensis</i> have been attributed to an unidentified <i>Mycosphaerella</i> species (Crous and Alfenas, 1995). <i>Colletotrichum gloeosporioides</i> has been found responsible for leaf spot and twig blight diseases of young <i>E. camaldulensis</i> plantations in Bangladesh, but was controllable by chemical sprays (Shayesta, 1996)."</p>

Qsn #	Question	Answer
	Loupe, D., Oteng-Amoako, A.A. & Brink, M. (2008). Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Netherlands	"In the nursery, river red gum is susceptible to various fungi causing damping-off and leaf diseases. Proper hygiene and watering sparingly minimize damage. Insects (e.g. termites, locusts and aphids) and rodents may be troublesome. However, on suitable sites outside Australia, river red gum is relatively free of diseases and pests. Stem canker and leaf diseases proliferate where rainfall and humidity are much higher than in the natural habitat. In Ethiopia <i>Eucalyptus camaldulensis</i> suffers from a stem canker disease caused by <i>Coniothyrium zuluense</i> , characterized by the presence of necrotic lesions, cracking of stems, gum pockets in the wood, and malformation of stems. In the humid tropics, river red gum may be defoliated by fungi including <i>Cylindrocladium</i> spp. during the rainy season. The most susceptible provenances suffer mortality and general decline, but well-adapted provenances (e.g. 'Katherine') are little affected. In parts of Africa and Asia, termites attack seedlings and young trees and must be chemically controlled. In Africa the eucalyptus snout beetle (<i>Gonipterus scutellatus</i>), of Australian origin, feeds on young shoots but is controlled biologically; moribund or newly-felled trees may become infested with an Australian stem borer or the longicorn beetle (<i>Phoracantha semipunctata</i>)."
	National Research Council (U.S.). Advisory Committee on Technology Innovation. (1980). Firewood Crops: Shrub and Tree Species for Energy Production. Volume 1. National Academy of Sciences, Washington, D.C.	"Young trees and those weakened by drought can be badly infected by moth larvae, eucalyptus snout beetle, termites, and eucalypt borer."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Medicinal uses] "Leaves insecticidal, antifeedant, molluscicidal, spasmolytic, anti-ulcer, antinociceptive, an infusion for the relief of colds, congestion, diabetes, a leaf decoction to treat stomachache and dysmenorrhea; leaves with ripe fruits of <i>Piliostigma</i> boiled and taken orally for menstrual disorders; fresh leaves applied against rheumatism; leaf paste or juice applied to forehead to relieve headaches and cold. Leafy twigs decoction of <i>Azadirachta indica</i> , <i>Eucalyptus camaldulensis</i> and <i>Citrus aurantifolia</i> used for cough. Leaves essential oil antibacterial, mosquito repellent, molluscicidal, insecticidal, antiseptic, expectorant, febrifuge, antifungal, antioxidant, tonic, astringent, hemostatic, vermifugal, a cough sedative. Astringent gum used for diarrhea. Veterinary medicine, oil applied for the treatment of inflammation on foot."
	CAB International. (2005). Forestry Compendium. CAB International, Wallingford, UK	[No evidence] " <i>E. camaldulensis</i> wood is used mainly for poles, posts, firewood, charcoal, and paper pulp. Logs may be sawn for construction timber, furniture, and packing cases, although the quality is sometimes poor. It is widely planted for shade, shelter, and amenity purposes, and as a source of nectar in honey production. Some tropical provenances produce medicinal-grade <i>Eucalyptus</i> oil."

408	Creates a fire hazard in natural ecosystems	y
	Source(s)	Notes

Qsn #	Question	Answer
	CSIRO. (2004). Water for a Health Country. Taxon Attribute Profiles. <i>Eucalyptus camaldulensis</i> Dehnh. https://www.anbg.gov.au . [Accessed 21 Oct 2021]	" <i>Eucalyptus camaldulensis</i> is very fire sensitive and even low intensity fires may cause cambial injury (Dexter, 1978). Fire kills regeneration and even mature trees are susceptible if the fire is intense enough since <i>E. camaldulensis</i> lacks a lignotuber. Fire will cause damage to the butt, lowering the value of the timber and predisposing tree to fungal and insect attack (Dalton, 1990)."
	Dimitrakopoulos, A. P., & Papaioannou, K. K. (2001). Flammability assessment of Mediterranean forest fuels. <i>Fire Technology</i> , 37(2), 143-152	"Flammability classification, regression models of time-to-ignition vs moisture content, and moisture of extinction of dominant Mediterranean natural fuels" [<i>Eucalyptus camaldulensis</i> classified as extremely flammable]
	Mandle, L., Bufford, J. L., Schmidt, I. B., & Daehler, C. C. (2011). Woody exotic plant invasions and fire: reciprocal impacts and consequences for native ecosystems. <i>Biological Invasions</i> , 13(8), 1815-1827	"Red river gum (<i>Eucalyptus camaldulensis</i>), a native of Australia and invasive in Mediterranean regions, including in California, has highly flammable volatile oils (Dimitrakopoulos and Papaioannou 2001)."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	Notes
	Plants for a Future. (2021). <i>Eucalyptus camaldulensis</i> . https://pfaf.org/USER/Plant.aspx?LatinName=Eucalyptus+camaldulensis . [Accessed 21 Oct 2021]	"It cannot grow in the shade."
	Louppe, D., Oteng-Amoako, A.A. & Brink, M. (2008). <i>Plant Resources of Tropical Africa 7(1). Timbers 1</i> . PROTA Foundation, Wageningen, Netherlands	[Brief period of shade "tolerance"] "Shading is needed for the first week after transplanting, thereafter plants should be fully exposed."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	CAB International. (2005). <i>Forestry Compendium</i> . CAB International, Wallingford, UK	" <i>E. camaldulensis</i> occurs on a variety of soil types. It is common on heavy clays in southern Australia, but more generally occurs on sandy alluvial soils in the north. It infrequently occurs on the margins of salt lakes. It has been recorded growing on calcareous soils in South Australia (e.g. near Port Lincoln) and Western Australia (e.g. DeGrey and Greenough Rivers, and Wiluna) (Jacobs, 1981; Eldridge et al., 1993)."
	Louppe, D., Oteng-Amoako, A.A. & Brink, M. (2008). <i>Plant Resources of Tropical Africa 7(1). Timbers 1</i> . PROTA Foundation, Wageningen, Netherlands	"River red gum occurs on a variety of soils, commonly on sandy and silty alluvial soils, but in southern Australia occasionally on heavy clays. It is found along the borders of salt lakes and adapted cultivars are grown on saline waterlogged soils in degraded irrigation schemes. River red gum is not adapted to calcareous soils, except for a few populations in southern and western Australia growing on shallow soils over limestone"
	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). <i>Forest Trees of Australia</i> . CSIRO Publishing, Collingwood, Australia	"Soils are alluvials, often sands and sandy loams overlying clay. On larger river systems sandy levees on river bends are common habitats but clayey riverbanks are also favoured. It grows on calcareous clay loams derived from limestone on the lower Eyre Peninsula and on York Peninsula in South Australia."

411	Climbing or smothering growth habit	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Trees 20 -45 m tall, bark white, gray, brown, or red in patches, smooth throughout."

412	Forms dense thickets	Y
	Source(s)	Notes
	Little Jr., E.L. & Skolmen, R.G. (1989). Common forest trees of Hawaii: (native and introduced). USDA Agriculture Handbook No. 679. USDA Forest Service, Washington, D.C.	"Range-Widespread in Australia, mainly along streams and in flood plains, it often forms pure forests."

501	Aquatic	n
	Source(s)	Notes
	Louppe, D., Oteng-Amoako, A.A. & Brink, M. (2008). Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Netherlands	[Terrestrial, riparian] "Under natural conditions, river red gum occurs typically along watercourses and on floodplains, usually in open forest and woodland, up to 700 m altitude."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Terrestrial] "Native to much of mainland Australia, particularly in drier areas, often near watercourses; in Hawai'i extensively planted on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i, and regenerating from seed at least within or near the plantations."

502	Grass	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 18 Oct 2021]	Genus: Eucalyptus Subgenus: Symphyomyrtus Section: Exsertaria Family: Myrtaceae Subfamily: Myrtoideae Tribe: Eucalypteae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 18 Oct 2021]	Genus: Eucalyptus Subgenus: Symphyomyrtus Section: Exsertaria Family: Myrtaceae Subfamily: Myrtoideae Tribe: Eucalypteae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Trees 20 -45 m tall, bark white, gray, brown, or red in patches, smooth throughout."

601	Evidence of substantial reproductive failure in native habitat	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	"River red gum is the most widely distributed of all eucalypts. With the exception of the southern parts of Western Australia, the Nullarbor Plain and the coastal fringe of most of Victoria, New South Wales and eastern Queensland, it is found throughout mainland Australia."

602	Produces viable seed	y
	Source(s)	Notes
	CAB International. (2005). Forestry Compendium. CAB International, Wallingford, UK	"E. camaldulensis is usually propagated from seed. There are about 700,000 viable seed/kg of seed and chaff mixture. As a rule-of-thumb, 1 kg of E. camaldulensis seed is sufficient to provide plants for 100 ha of plantation at routine spacings (3 x 2 m) and typical seedling survival rates (25%). Viability of seed stored dry (5-8% moisture content) in air-tight containers in the refrigerator (3-5°C) will be maintained for several years (Doran et al., 1987). No pre-sowing treatment is required."
	Loupe, D., Oteng-Amoako, A.A. & Brink, M. (2008). Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Netherlands	"Seed germination rate of river red gum is generally high and can reach almost 100%."

603	Hybridizes naturally	y
	Source(s)	Notes
	Loupe, D., Oteng-Amoako, A.A. & Brink, M. (2008). Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Netherlands	"Eucalyptus camaldulensis is closely related to Eucalyptus tereticornis Sm. The latter can be distinguished by its taller and more steeply branched habit, its acutely conical operculum and black, rough-coated seeds. Where both species grow naturally, as in eastern Victoria and Queensland, hybridization and subsequent introgression occurs. Several populations in far northern Queensland, previously identified as Eucalyptus tereticornis, show several characteristics of Eucalyptus camaldulensis and are now considered a separate subspecies of the latter (subsp. simulata Brooker & Kleinig). Among them are the fast-growing provenances 'Laura River', 'Palmer River' and 'Walsh River' that are widely planted in tropical regions. Natural hybrids between Eucalyptus camaldulensis and Eucalyptus alba Reinw. ex Blume are also reported, while hybridization with Eucalyptus grandis occurs in plantations."

604	Self-compatible or apomictic	y

Qsn #	Question	Answer
	Source(s)	Notes
	CAB International. (2005). Forestry Compendium. CAB International, Wallingford, UK	[Mostly outcrossing, although limited seed set may occur from selfed plants] "Eucalypts have hermaphrodite, protandrous flowers which are pollinated by insects or birds (Griffin, 1989). They reproduce by a mixed mating system, with both outcrossing and selfing (Moran and Bell, 1983; Moran, 1992). Analyses of the breeding system of <i>E. camaldulensis</i> using allozymes indicate a predominantly outcrossing mating system. Outcrossing rates of 86 and 96% were recorded in populations at Lake Albacutya (McDonald et al., 1995) and Petford (P. Butcher, personal communication, 1995), respectively."
	Rambuda, T. D., & Johnson, S. D. (2004). Breeding systems of invasive alien plants in South Africa: does Baker's rule apply?. <i>Diversity and Distributions</i> , 10(5-6), 409-416	[Seed set of bagged flowers was 60.3 ± 22 (13), suggest an autogamous breeding system] "Table 2 Results of experiments to determine the breeding systems of invasive alien plant species in South Africa. Species are arranged according to treatment and then family names alphabetically. AU = bagged treatment to test for autogamy, SE = selfed, OU = outcrossed, AP = emasculated to test for apomixis, OP = open-pollinated. Values represent mean ± standard deviation with the sample size in parentheses." [<i>Eucalyptus camaldulensis</i> - Inferred breeding system = autogamy]

605	Requires specialist pollinators	n
	Source(s)	Notes
	CAB International. (2005). Forestry Compendium. CAB International, Wallingford, UK	"Pollination is mainly carried out by insects, but is also undertaken by birds and small mammals."
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Unspecialized flowers] "Flowers 7-11 in axillary, simple umbels, peduncles 6-15 mm long, pedicels 5-12 mm long; buds globose-rostrate or ovoid-conical, 6-9 mm long, 3-6 mm wide; operculum hemispherical, rostrate, or conical, apex obtuse. Fruit hemispherical or ovoid, 5-8 mm long and wide, valves 3-5, exerted."
	Roubik, D.W. (1995). Pollination of cultivated plants in the tropics. <i>FAO Services Bulletin</i> 118. FAO, Rome, Italy	Pollinators = bees

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	USDA Natural Resources Conservation Service. (2021). <i>Eucalyptus camaldulensis</i> . https://plants.usda.gov/home/plantProfile?symbol=EUCA2 . [Accessed 21 Oct 2021]	"Vegetative Spread Rate: None"
	CAB International. (2005). Forestry Compendium. CAB International, Wallingford, UK	[Artificial vegetative propagation possible. No evidence of natural vegetative spread] " <i>E. camaldulensis</i> is usually propagated from seed." ... " <i>E. camaldulensis</i> is one of several eucalypt species suited to mass vegetative propagation through stem cuttings (Eldridge et al., 1993). Cuttings from juvenile shoots (i.e. below the 100th node) root readily in 30% of genotypes (Doran and Williams, 1994)."

607	Minimum generative time (years)	3
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Qsn #	Question	Answer
	Source(s)	Notes
	CAB International. (2005). Forestry Compendium. CAB International, Wallingford, UK	"Production of the first seed crop may occur within three years of planting."
	Loupe, D., Oteng-Amoako, A.A. & Brink, M. (2008). Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Netherlands	"River red gum may start flowering when 1.5–2 years old. On favourable sites in the tropics, the period from planting to production of the first seed crop may be as short as 3 years."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"No specific information was available for <i>E. camaldulensis</i> , but the small seed size would be consistent with the wind dispersal of several other invasive Eucalypt species e.g. <i>E. cladocalyx</i> , <i>E. grandis</i> and <i>E. lehmanii</i> (Dean et al., 1986). Long distance dispersal is common as this species is among the most widely introduced forestry species with a vast global distribution."
	WRA Specialist. (2021). Personal Communication	Small size could facilitate attachment on vehicles, other equipment or footwear, but no direct evidence of this occurring has been found

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i extensively planted on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i, and regenerating from seed at least within or near the plantations. Over 428,000 trees planted between 1911 and 1941, but earliest collection seen made on O'ahu in 1909 (Rock 6056, BISH)."
	Little Jr., E.L. & Skolmen, R.G. (1989). Common forest trees of Hawaii: (native and introduced). USDA Agriculture Handbook No. 679. USDA Forest Service, Washington, D.C.	"Introduced to Hawaii in the 1880's and first planted at Ulupalakua on Maui and Eucalyptus Ridge on Tantalus Mountain, Oahu; one of the most commonly planted eucalypts in Hawaii. Primarily used as a windbreak tree. The Division of Forestry had planted 429,000 trees by 1960, and many more were planted by private landowners. Although it will grow well in wet forest conditions, this species has been used most extensively in semiarid sites where it achieves relatively good growth. Recorded from Niihau."
	Loupe, D., Oteng-Amoako, A.A. & Brink, M. (2008). Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Netherlands	"The natural distribution of <i>Eucalyptus camaldulensis</i> covers most of the Australian mainland, ranging from the tropical Northern Territory to cool, temperate Victoria. It is planted in many tropical and subtropical countries, probably being the world's most widely planted tree in arid and semi-arid lands, and it has become naturalized in many areas. It has been planted in Africa since 1900 and it is now very widely grown in tropical Africa, where it is probably the most common tree in woodlots, shelterbelts and fuelwood plots, but less important in large-scale plantations."

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

Qsn #	Question	Answer
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"No specific information was available for <i>E. camaldulensis</i> , but the small seed size would be consistent with the wind dispersal of several other invasive Eucalypt species e.g. <i>E. cladocalyx</i> , <i>E. grandis</i> and <i>E. lehmanii</i> (Dean et al., 1986). Long distance dispersal is common as this species is among the most widely introduced forestry species with a vast global distribution."
	WRA Specialist. (2021). Personal Communication	No evidence of seed contamination in produce or other silvicultural or horticultural crops or products

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	CSIRO. (2004). Water for a Health Country. Taxon Attribute Profiles. <i>Eucalyptus camaldulensis</i> Dehnh. https://www.anbg.gov.au . [Accessed 21 Oct 2021]	"In <i>Eucalyptus</i> species, passive release of seed is aided by wind (House, 1997). Free seed fall is least during winter and greatest in spring and summer. High seed fall in spring may have adaptive significance as floods usually recede during this period (Dexter, 1978)."
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"No specific information was available for <i>E. camaldulensis</i> , but the small seed size would be consistent with the wind dispersal of several other invasive Eucalypt species e.g. <i>E. cladocalyx</i> , <i>E. grandis</i> and <i>E. lehmanii</i> (Dean et al., 1986). Long distance dispersal is common as this species is among the most widely introduced forestry species with a vast global distribution."
	Dean, S. J., Holmes, P. M., & Weiss, P. W. (1986). Seed biology of invasive alien plants in South Africa and South West Africa/Namibia. In Ecology and management of biological invasions in southern Africa. Edited by IAW Macdonald, FJ Kruger, AA Ferrar. Oxford University Press, Cape Town	"Seeds are wind dispersed, and remain viable for more than 10 years"

705	Propagules water dispersed	y
	Source(s)	Notes
	Williams, J.E. & Woinarski, J. (1997). <i>Eucalypt Ecology: Individuals to Ecosystems</i> . Cambridge University Press, Cambridge, UK	"dispersal is enhanced by water (e.g. <i>E. camaldulensis</i>)"
	Raath, G. (2015). The impact of high rainfall and flood events on <i>Eucalyptus camaldulensis</i> distribution along the central Breede river. MSc. Thesis, Stellenbosch University, Stellenbosch	" <i>E. camaldulensis</i> displays a complementary recruitment strategy, where germination is initiated by rainfall, and seed dispersal is facilitated through flooding (Jensen, Walker & Paton 2008). Propagules are spread and germination promoted via such events. 'Maintenance' recruitment, or recruitment at a rate sufficient to replenish existing population numbers, is often observed with the event of rainfall, but is usually localised (Jensen, Walker & Paton 2008). Peak recruitment, where larger amounts of seedlings become established than is required for maintenance, can be initiated by flooding events which spread seed over longer distances (Jensen, Walker & Paton 2008)."

Qsn #	Question	Answer
	CSIRO. (2004). Water for a Health Country. Taxon Attribute Profiles. <i>Eucalyptus camaldulensis</i> Dehnh. https://www.anbg.gov.au . [Accessed 21 Oct 2021]	"In <i>Eucalyptus</i> species, passive release of seed is aided by wind (House, 1997). Free seed fall is least during winter and greatest in spring and summer. High seed fall in spring may have adaptive significance as floods usually recede during this period (Dexter, 1978). <i>Eucalyptus camaldulensis</i> seeds sank within 36 hours of being dropped into still water in laboratory tests and it was suggested that under field conditions they would sink more rapidly (Dexter, 1978). However, McEvoy (1992) found that seeds remained buoyant for at least 17 days after sowing. He suggested that there might be a potential for floodwaters to act as a dispersal agent."

706	Propagules bird dispersed	n
	Source(s)	Notes
	Stefano, J. D. (2002). River red gum (<i>Eucalyptus camaldulensis</i>): a review of ecosystem processes, seedling regeneration and silvicultural practice. <i>Australian Forestry</i> , 65(1), 14-22	"In red gum ecosystems, seed dispersal is aided by the movement of floodwaters."
	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). <i>Forest Trees of Australia</i> . CSIRO Publishing, Collingwood, Australia	[Not fleshy fruited] "Fruits: Pedicellate, ovoid or globose (including the disc), 0.3–0.6 (hypanthia only) × 0.4–1 cm; disc broad, ascending; valves (3)4(5), robust, strongly exerted. Seeds cuboid, yellow, yellow-brown, except var. <i>acuminata</i> which are mixed with black seeds, hilum terminal."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Stefano, J. D. (2002). River red gum (<i>Eucalyptus camaldulensis</i>): a review of ecosystem processes, seedling regeneration and silvicultural practice. <i>Australian Forestry</i> , 65(1), 14-22	"In red gum ecosystems, seed dispersal is aided by the movement of floodwaters."

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	Stefano, J. D. (2002). River red gum (<i>Eucalyptus camaldulensis</i>): a review of ecosystem processes, seedling regeneration and silvicultural practice. <i>Australian Forestry</i> , 65(1), 14-22	[No evidence of consumption or internal dispersal] "In red gum ecosystems, seed dispersal is aided by the movement of floodwaters."

801	Prolific seed production (>1000/m2)	n
	Source(s)	Notes
	USDA Natural Resources Conservation Service. (2021). <i>Eucalyptus camaldulensis</i> . https://plants.usda.gov/home/plantProfile?symbol=EUCA2 . [Accessed 21 Oct 2021]	"Fruit/Seed Abundance: Medium"
	CSIRO. (2004). Water for a Health Country. Taxon Attribute Profiles. <i>Eucalyptus camaldulensis</i> Dehnh. https://www.anbg.gov.au . [Accessed 21 Oct 2021]	"Number of viable seeds per unit weight of a seedlot : mean 698,000/kg" [Seed densities under natural conditions unknown]

Qsn #	Question	Answer
	Bonner, F.T. & Karrfalt, R.P. (eds.). (2008). The Woody Plant Seed Manual. USDA FS Agriculture Handbook 727. Government Printing Office, Washington, D.C.	"Table 5—Eucalyptus, eucalyptus: seed yield data" [E. camaldulensis - Viable seeds/(weight of seeds + chaff) = 65–2,100/g and 1,800–59,500/oz]

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	Notes
	Tererai, F., Gaertner, M., Jacobs, S. M., & Richardson, D. M. (2015). Resilience of invaded riparian landscapes: the potential role of soil-stored seed banks. <i>Environmental Management</i> , 55(1), 86-99	"Although E. camaldulensis is dominant in the above-ground vegetation especially in moderately and heavily invaded sites, it appeared to have a small seed bank. This may be ascribed to a short-lived seed bank typical of the genus Eucalyptus and poor seedling survival under shaded conditions leading to seed bank depletion (Rejmanek and Richardson 2011; Booth 2012; Tererai et al. 2013)." ... "Several crucial aspects emerge from this study. Firstly, E. camaldulensis forms a small short-lived seed bank which makes local eradication achievable. Regular follow-up operations will be crucial since eucalypts resprout (Nicolle 2006; Rejmanek and Richardson 2011)."
	CSIRO. (2004). Water for a Health Country. Taxon Attribute Profiles. <i>Eucalyptus camaldulensis</i> Dehnh. https://www.anbg.gov.au . [Accessed 21 Oct 2021]	"Eucalyptus species store little or none of their seed in the soil (see McEvoy, 1992)."

803	Well controlled by herbicides	y
	Source(s)	Notes
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"There is little information available on control of E. camaldulensis specifically, however, for some other invasive eucalypts (e.g. E. cladocalyx, E. globulus), the practice of digging out seedlings and young trees have been applied (Weber, 2003). Similarly mature trees of these species have been felled and the stumps treated with herbicide, and drilling stems and filling with herbicide is a further approach (Weber, 2003)."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Louppe, D., Oteng-Amoako, A.A. & Brink, M. (2008). Plant Resources of Tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Netherlands	"Elite trees are selected in young plantations (5 years old) and felled or girdled to promote coppicing."
	CSIRO. (2004). Water for a Health Country. Taxon Attribute Profiles. <i>Eucalyptus camaldulensis</i> Dehnh. https://www.anbg.gov.au . [Accessed 21 Oct 2021]	"Eucalyptus camaldulensis is very fire sensitive and even low intensity fires may cause cambial injury (Dexter, 1978). Fire kills regeneration and even mature trees are susceptible if the fire is intense enough since E. camaldulensis lacks a lignotuber. Fire will cause damage to the butt, lowering the value of the timber and predisposing tree to fungal and insect attack (Dalton, 1990)."
	CAB International. (2005). Forestry Compendium. CAB International, Wallingford, UK	"The species coppices well for five or more rotations."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y

Qsn #	Question	Answer
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Unlikely. No limiting factors identified in planting and establishment] "in Hawai'i extensively planted on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i, and regenerating from seed at least within or near the plantations. Over 428,000 trees planted between 1911 and 1941, but earliest collection seen made on O'ahu in 1909 (Rock 6056, BISH)."

Summary of Risk Traits:

High Risk / Undesirable Traits

- Broad climate suitability
- Grows, and spreads, in regions with tropical climates
- Naturalized on Kauai, Oahu, Molokai, Maui, and Hawaii (Hawaiian Islands), and elsewhere
- An environmental weed in South Africa, invading and modifying riparian habitats
- Other *Eucalyptus* species are invasive
- Allelopathic
- Highly flammable (may increase fire risk)
- Tolerates many soil types
- Reproduces by seeds
- Hybridizes with other *Eucalyptus* species
- Capable of selfing (with reduced seed set)
- Reaches maturity in 3 years
- Seeds dispersed by water, wind and intentionally by people
- Coppices after cutting, but reported to be killed by fire

Low Risk Traits

- Despite widespread planting and naturalization, not reported as an environmental weed in the Hawaiian Islands
- Unarmed (no spines, thorns, or burrs)
- May be browsed by animals if other foods are unavailable
- Thrives in full sun (dense shade may limit ability to establish and spread)
- Not reported to spread vegetatively
- Forms a small short-lived seed bank