

<b>Taxon:</b> <i>Stenocarpus sinuatus</i> Endl.	<b>Family:</b> Proteaceae
<b>Common Name(s):</b> fire wheel tree firetree Queensland fire wheel tree tulip flower tuliptree wheel of fire wheel of fire tree wheeltree white beefwood white oak white silky oak	<b>Synonym(s):</b> <i>Agnostus sinuatus</i> A.Cunn.

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Assessor Approved	<b>End Date:</b> 29 Jun 2019
<b>WRA Score:</b> 0.0	<b>Designation:</b> L	<b>Rating:</b> Low Risk

**Keywords:** Tropical Tree, Naturalizing, Bird-Pollinated, Slow-Growing, Wind-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	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)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	n
401	Produces spines, thorns or burrs	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens	y=1, n=0	n
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		
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	n
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	y=1, n=-1	n
605	Requires specialist pollinators		
606	Reproduction by vegetative fragmentation		
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	n
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 <sup>2</sup> )		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y

Qsn #	Question	Answer Option	Answer
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
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	[No evidence of domestication] "Extends from north of the Nambucca River on the north coast of N.S.W. to north-eastern Qld; also occurs in New Guinea. Grows in rainforest or in open areas." ... "The attractive foliage and brilliantly coloured flowers have led to this species being frequently cultivated in gardens and as a street tree in Australia and overseas."

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

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

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	CSIRO. (2010). Australian Tropical Rainforest Plants Edition 6 - <i>Stenocarpus sinuatus</i> . <a href="http://keys.trin.org.au/">http://keys.trin.org.au/</a> . [Accessed 25 Jun 2019]	"Endemic to Australia, occurs in NEQ and southwards to north-eastern New South Wales. Altitudinal range in NEQ from 700-1200 m. Grows in well developed upland and mountain rain forest but is probably more common in the drier type of rain forest associated with Kauri Pine ( <i>Agathis robusta</i> )."
	USDA, ARS, Germplasm Resources Information Network. 2019. 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 25 Jun 2019]	"Native Australasia AUSTRALIA: Australia [New South Wales (n.e.), Queensland (e.)]"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2019. 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 25 Jun 2019]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes

Qsn #	Question	Answer
	Australian Native Plant Society. (2019). <i>Stenocarpus sinuatus</i> . <a href="http://anpsa.org.au/s-sin.html">http://anpsa.org.au/s-sin.html</a> . [Accessed 28 Jun 2019]	"Despite its sub-tropical to tropical origin, <i>S.sinuatus</i> is adaptable to a range of climates and will even succeed in dry climates if additional water is available."
	Llamas, K.A. 2003. <i>Tropical Flowering Plants</i> . Timber Press, Portland, OR	"Grows in Mediterranean-type climates as well as seasonally moist, humid climates."
	Dave's Garden. (2019). <i>Stenocarpus</i> Species, Firewheel Tree - <i>Stenocarpus sinuatus</i> . <a href="https://davesgarden.com/guides/pf/go/58276/">https://davesgarden.com/guides/pf/go/58276/</a> . [Accessed 28 Jun 2019]	"Hardiness: USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F) USDA Zone 11: above 4.5 °C (40 °F)" ... "On Sep 7, 2008, swamptreenelly from Newark, CA wrote: I planted the <i>stenocarpus sinuatus</i> from a five gallon pot about 5 years ago. No damage at 24 degrees. It is getting ready to bloom for the first time. I noticed the flower wheel buds throughout the tree today. I live in Newark, Ca. which is between Oakland and San Jose."
	Gardening With Angus. (2019). <i>Stenocarpus sinuatus</i> – Firewheel Tree. <a href="https://www.gardeningwithangus.com.au/stenocarpus-sinuatus-firewheel-tree/">https://www.gardeningwithangus.com.au/stenocarpus-sinuatus-firewheel-tree/</a> . [Accessed 28 Jun 2019]	"It can grow to 30 metres tall, but will be smaller in cultivation and in cooler temperatures. Originates in subtropical to tropical climates, but will also grow in temperate areas."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	CSIRO. (2010). <i>Australian Tropical Rainforest Plants Edition 6 - Stenocarpus sinuatus</i> . <a href="http://keys.trin.org.au/">http://keys.trin.org.au/</a> . [Accessed 27 Jun 2019]	"Endemic to Australia, occurs in NEQ and southwards to north-eastern New South Wales. Altitudinal range in NEQ from 700-1200 m. Grows in well developed upland and mountain rain forest but is probably more common in the drier type of rain forest associated with Kauri Pine ( <i>Agathis robusta</i> )."
	Parker, J. (2019). BIISC Early Detection Botanist. Pers. Comm. 24 June	[ <i>Stenocarpus sinuatus</i> and <i>Cordia alliodora</i> on Hawaii Island] "They were found at the same time naturalizing in Manuka SP."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"cultivated in Hawaii"
	Llamas, K.A. 2003. <i>Tropical Flowering Plants</i> . Timber Press, Portland, OR	" <i>Stenocarpus sinuatus</i> is used for street landscaping in California and Australia."
	Glen, H. and van Wyk, B. (2016). <i>Guide to Trees Introduced into Southern Africa</i> . Struik Nature, Cape Town, South Africa	"Widely but not very commonly grown ornamental tree seen in many parts of South Africa and Zimbabwe."
	Jones, D.L. (1986). <i>Ornamental Rainforest Plants in Australia</i> , Reed Books, Frenchs Forest, Australia	It is grown in many countries and is also popular in Australia [ornamental]

301	Naturalized beyond native range	y
	Source(s)	Notes

Qsn #	Question	Answer
	Heenan, P. B., De Lange, P. J., Glenney, D. S., Breitwieser, I., Brownsey, P. J., & Ogle, C. C. (1999). Checklist of dicotyledons, gymnosperms, and pteridophytes naturalised or casual in New Zealand: additional records 1997–1998. <i>New Zealand Journal of Botany</i> , 37(4), 629–642	" <i>Stenocarpus sinuatus</i> Endl. firewheel tree, fire tree NEW RECORD: AK 233102, P. J. de Lange 3316 & R. O. Gardner, 15 Jun 1997, Auckland, Auckland City, Ellerslie, Ellerslie Racecourse . NOTES: One seedling in leaf duff beneath parent tree." [Insufficient evidence of naturalization in NZ]
	Moodley, D., Geerts, S., Rebelo, T., Richardson, D. M., & Wilson, J. R. (2014). Site-specific conditions influence plant naturalization: the case of alien Proteaceae in South Africa. <i>Acta Oecologica</i> , 59, 62-71	"Table 1. Introduced Proteaceae species recorded in South Africa and populations surveyed in this study." [ <i>Stenocarpus sinuatus</i> - Number of naturalized sites detected in this study = NA; Invasion status elsewhere = Not recorded as naturalized]
	Foxcroft, L. C., Richardson, D. M., & Wilson, J. R. 2008. Ornamental plants as invasive aliens: problems and solutions in Kruger National Park, South Africa. <i>Environmental Management</i> , 4 (1): 32-51	"Table 2 Ornamental alien plant species recorded per camp in the Kruger National Park, indicating the number of camps in which each species has been recorded, as well as mode of introduction" [Cultivated ? Yes Evidence of naturalization? No]
	Plants of South Eastern New South Wales. (2019). <i>Stenocarpus sinuatus</i> . <a href="https://apps.lucidcentral.org/plants_se_nsw">https://apps.lucidcentral.org/plants_se_nsw</a> . [Accessed 27 Jun 2019]	"Where Found: Planted, occasionally naturalised. Coast and ranges north of Wollongong. Rarely elsewhere." ... "Naturally occurs in rainforest in northern NSW and north from there." [Naturalized outside native range within Australia]
	Parker, J. (2019). BIISC Early Detection Botanist. Pers. Comm. 24 June	[ <i>Stenocarpus sinuatus</i> and <i>Cordia alliodora</i> on Hawaii Island] "They were found at the same time naturalizing in Manuka SP."
	Howell, C. J., & Sawyer, J. W. (2006). New Zealand naturalised vascular plant checklist. New Zealand Plant Conservation Network, Wellington, NZ	<i>Stenocarpus sinuatus</i> - Naturalised plant status = Casual [Casual is the name given to taxa that are: passively regenerating only in the immediate vicinity of the cultivated parent plant, or more widespread but only known as isolated or few individuals; garden escapes persisting only 2–3 years; or garden discards persisting vegetatively but not spreading sexually or asexually]

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

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

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

305	Congeneric weed	n
	Source(s)	Notes

Qsn #	Question	Answer
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[Cited as a weed. No impacts corroborated or verified] "Stenocarpus salignus" ... "References: Australia-N-945, New Zealand-N-823, New Zealand-U-919, Australia-N-354, Australia-N-1959, New Zealand-U-2048, Australia-W-1977, India-W-1977."

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	[No evidence] "Tree to 30 m tall. Branchlets terete, ferruginous-tomentose, glabrescent. Leaves variable from simple to deeply pinnately-lobed; petiole to c. 2.5 cm long; lamina with undulate margins, discolorous, dark glossy green above, paler beneath; main veins and reticulations well- defined particularly beneath; lobed leaves with lamina to 48 cm long; simple leaves with lamina obovate, oblanceolate to elliptic, to 23 cm long. Conflorescence terminal or in upper leaf axils, minutely hairy; peduncles simple, 4–10 cm long, sometimes several arising from a common axis; umbels of 6–20 flowers."

402	Allelopathic	n
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Unknown. No evidence found

403	Parasitic	n
	Source(s)	Notes
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Tree to 30 m tall." [Proteaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Goudberg, N. J. (1990). The feeding ecology of three species of north Queensland upland rainforest ringtail possums, <i>Hemibelideus lemuroides</i> , <i>Pseudocheirus herbertensis</i> and <i>Pseudocheirus archeri</i> (Marsupialia: Petauridae). PhD Dissertation. James Cook University, Townsville	"Appendix B Table 2 Feeding records for <i>H. lemuroides</i> , <i>P. herbertensis</i> , <i>P. archeri</i> . Number of leaf feeding observations are denoted by L, blossom feeding records B, fruit feeding records F and unknown items ?. Species names after Hyland (1982); families after Clifford and Ludlow (1972)." [Stenocarpus sinuatus leaves consumed by all species, although it may not be a preferred species]
	City of Los Angeles Department of Recreation and Parks. (2004). Firewheel tree. Heritage Tree.	"In addition to providing a home, my shiny leaves also serves as a source of food for many animals, including tree kangaroos and wombats."

405	Toxic to animals	n
	Source(s)	Notes
	City of Los Angeles Department of Recreation and Parks. (2004). Firewheel tree. Heritage Tree.	"In addition to providing a home, my shiny leaves also serves as a source of food for many animals, including tree kangaroos and wombats." [No evidence]

Qsn #	Question	Answer
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

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

Qsn #	Question	Answer
	<p>Polizzi, G., Aiello, D., Castello, I., Vitale, A., &amp; Parlavecchio, G. (2007). First report of southern blight on firewheel tree, bay laurel, bird of paradise, Mediterranean fan palm, and liverwort caused by <i>Sclerotium rolfsii</i> in Italy. <i>Plant Disease</i>, 91(9), 1199-1199</p>	<p>"During the summer of 2006, a widespread blight was observed on 6-month-old potted plants of firewheel tree (<i>Stenocarpus sinuatus</i> Endl.) and 3-month-old potted plants of bay laurel (<i>Laurus nobilis</i> L.) growing in a nursery in eastern Sicily, Italy. On both species, symptomatic plants initially had sunken, tan lesions at ground level where white mycelia and small (1 to 2 mm in diameter), brown, spherical sclerotia typical of <i>Sclerotium rolfsii</i> Sacc. were formed. As the disease progressed, the mycelia extended up the stem and entire plants collapsed. A sudden wilting affecting 4-month-old potted seedlings of bird of paradise (<i>Strelitzia reginae</i> Aiton) and 5-month-old potted seedlings of Mediterranean fan palm (<i>Chamaerops humilis</i> L.) was occasionally detected in other greenhouses of the same nursery. Liverwort (<i>Marchantia polymorpha</i> L.) was abundantly present on the surfaces of the containers where these plants were grown. Circular and crescent-shaped patches as much as 100 cm in diameter were observed on the massed liverwort plants. In these patches, the liverwort died and sclerotia typical of <i>S. rolfsii</i> were dispersed on white mycelial strands. Symptomatic tissues of the ornamental plants and liverwort were surface disinfested in 1% NaOCl for 1 min, rinsed in sterile water, and plated on potato dextrose agar. Tissues consistently yielded <i>S. rolfsii</i> (teleomorph <i>Athelia rolfsii</i> (Curzi) Tu &amp; Kimbrough) and typical sclerotia with internally differentiated rind, cortex, and medulla were produced within 6 or 7 days (3). Pathogenicity tests were performed by placing 30 sclerotia obtained from 10-day-old cultures in the soil below the crown portion on each of 2-month-old healthy seedlings of <i>Stenocarpus sinuatus</i>, <i>L. nobilis</i>, <i>Strelitzia reginae</i>, and <i>C. humilis</i> (20 seedlings per host). In addition, liverwort growing in 10 pots (7 cm in diameter) was inoculated with 30 sclerotia per pot. For each species, the same number of plants or pots served as control. All ornamental plants and liverwort were maintained in a growth chamber at 25 ± 1°C and enclosed for 7 days in polyethylene bags and then moved to a greenhouse where temperatures ranged from 24 to 28°C. The inoculation trial was repeated once. Symptoms of southern blight developed after 5 to 20 days on all inoculated plants of <i>Stenocarpus sinuatus</i> and sporadically (two to five plants) after 20 days on <i>L. nobilis</i>, <i>Strelitzia reginae</i>, and <i>C. humilis</i>. After 5 days, liverwort in all inoculated pots was colonized and plants died within 12 days. Control plants of all species remained symptomless. <i>S. rolfsii</i> was reisolated from symptomatic plants. <i>S. rolfsii</i> was reported for the first time in Sicily in 2004 on ornamental plants (2). <i>Strelitzia reginae</i> was previously reported as a host of <i>Corticium rolfsii</i> (synonym <i>S. rolfsii</i>) in Portugal (1). To our knowledge, this is the first report of <i>S. rolfsii</i> on <i>Stenocarpus sinuatus</i>, <i>L. nobilis</i>, and <i>C. humilis</i>. In addition, this is the first report of the susceptibility of <i>M. polymorpha</i> to <i>S. rolfsii</i>. Liverwort could provide a food source for the fungus in container-grown nursery plants."</p>
	<p>Talhouk S.N. , Fabian M., Dagher R. 2015. Landscape Plant Database. Department of Landscape Design &amp; Ecosystem Management, American University of Beirut. <a href="http://landscapeplant.aub.edu.lb">http://landscapeplant.aub.edu.lb</a>. [Accessed 28 Jun 2019]</p>	<p>"Susceptibility to Pests and Diseases: No"</p>
	<p>Australian Plants online. (2000). Wheels on Fire! <a href="http://anpsa.org.au/APOL17/mar00-14.html#photo1">http://anpsa.org.au/APOL17/mar00-14.html#photo1</a>. [Accessed 28 Jun 2019]</p>	<p>"The firewheel tree is richly ornamental and is an asset to any garden in or out of bloom. It is most adaptable and trouble free with no known problems or predators."</p>

Qsn #	Question	Answer
407	<b>Causes allergies or is otherwise toxic to humans</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Talhok S.N. , Fabian M., Dagher R. 2015. Landscape Plant Database. Department of Landscape Design & Ecosystem Management, American University of Beirut. <a href="http://landscapeplant.aub.edu.lb">http://landscapeplant.aub.edu.lb</a> . [Accessed 28 Jun 2019]	"Toxicity: No"
	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	<b>Creates a fire hazard in natural ecosystems</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Treelogic. (2019). Trees and Bushfires. <a href="https://treelogic.com.au/articles/trees-and-bushfires/">https://treelogic.com.au/articles/trees-and-bushfires/</a> . [Accessed 28 Jun 2019]	"The following fire retardant trees could be used for specimen plantings. Planting of fire retardant trees should take into consideration separation distances between buildings." [Includes <i>Stenocarpus sinuatus</i> ]
	State of Victoria. (2011). Landscaping for bushfire prone areas. Department of Education and Early Childhood Development, Melbourne	"These plants do have fire resistant qualities and should, if possible, be retained where they currently exist." [Includes <i>Stenocarpus sinuatus</i> ]
	WRA Specialist. (2019). Personal Communication	Evidence indicates that this species will not promote fires
409	<b>Is a shade tolerant plant at some stage of its life cycle</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Grows in rainforest or in open areas." [Suggests it grows in both shadier and well lit areas]
	Australian Native Plant Society. (2019). <i>Stenocarpus sinuatus</i> . <a href="http://anpsa.org.au/s-sin.html">http://anpsa.org.au/s-sin.html</a> . [Accessed 28 Jun 2019]	"It may be grown in a sunny or partly shaded location."
410	<b>Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Jones, D.L. (1986). Ornamental Rainforest Plants in Australia, Reed Books, Frenchs Forest, Australia	"Plants have proved to be adaptable to a variety of soils but grow best in deep organic loams."
	Gardening With Angus. (2019). <i>Stenocarpus sinuatus</i> – Firewheel Tree. <a href="https://www.gardeningwithangus.com.au/stenocarpus-sinuatus-firewheel-tree/">https://www.gardeningwithangus.com.au/stenocarpus-sinuatus-firewheel-tree/</a> . [Accessed 28 Jun 2019]	"Will do best in rich loamy soil, but will grow in most soil types."
411	<b>Climbing or smothering growth habit</b>	<b>n</b>

Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Tree to 30 m tall. Branchlets terete, ferruginous-tomentose, glabrescent."
<b>412</b>	<b>Forms dense thickets</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Extends from north of the Nambucca River on the north coast of N.S.W. to north-eastern Qld; also occurs in New Guinea. Grows in rainforest or in open areas." [No evidence]
<b>501</b>	<b>Aquatic</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	[Terrestrial] "Tree to 30 m tall."... "Extends from north of the Nambucca River on the north coast of N.S.W. to north-eastern Qld; also occurs in New Guinea. Grows in rainforest or in open areas."
<b>502</b>	<b>Grass</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	USDA, ARS, Germplasm Resources Information Network. 2019. 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 Jun 2019]	Proteaceae
<b>503</b>	<b>Nitrogen fixing woody plant</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	USDA, ARS, Germplasm Resources Information Network. 2019. 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 Jun 2019]	Proteaceae
<b>504</b>	<b>Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Tree to 30 m tall."

Qsn #	Question	Answer
601	<b>Evidence of substantial reproductive failure in native habitat</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Extends from north of the Nambucca River on the north coast of N.S.W. to north-eastern Qld; also occurs in New Guinea. Grows in rainforest or in open areas. Flowers Mar-June." [No evidence]

602	<b>Produces viable seed</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Follicles cylindrical, 5–10 cm long, greyish-brown, with short rusty hairs; stalk to 4 cm long overall, forming a knee-like joint at junction of pedicel and gynophore. Seeds ±oblong, to c. 36 mm long including wing."
	New Zealand Plant Conservation Network. (2014). Flora Details - <i>Stenocarpus sinuatus</i> . <a href="http://nzpcn.org.nz/flora_details.aspx?ID=4193">http://nzpcn.org.nz/flora_details.aspx?ID=4193</a> . [Accessed 28 Jun 2019]	"Long-lived tree. Reproduces exclusively by seed - but can sucker a short distance. Seed is dispersed by wind and gravity."
	Jones, D.L. (1986). Ornamental Rainforest Plants in Australia, Reed Books, Frenchs Forest, Australia	"Propagation: From fresh seed. Cuttings are difficult to strike."

603	<b>Hybridizes naturally</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"A genus of c. 25 species, mostly occurring in New Caledonia; 9 species are presently recognised in Australia with 2 species extending to New Guinea and Aru Is." [Unknown. No evidence found]

604	<b>Self-compatible or apomictic</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Ladd, P. G., Nanni, I., & Thomson, G. J. (1998). Unique stigmatic structure in three genera of Proteaceae. Australian Journal of Botany, 46(4), 479-488	"Abstract: In three closely related genera of the Proteaceae, namely, <i>Lomatia</i> R.Br., <i>Stenocarpus</i> R.Br. and <i>Strangaea</i> Meisn. the pollen presenter and stigma at anthesis are covered by specialised cells. The cells are spiral-walled, contain polyphenolic material and are produced from the stigma, and in <i>Lomatia</i> from the pollen presenter. The spiral wall-thickenings are formed on the inside of the primary wall late in the development of the cells when they are budded off from the stigma or presenter surface. Pollen from the anthers is placed onto these cells from where it is taken to other flowers for cross-pollination. The spiral-walled cells prevent contact between self-pollen and the stigma and provide a method whereby cross-pollen can only reach the stigma if self-pollen has been removed. The form of the cells and the mechanism for preventing autogamy is not found in any other plant group."

605	<b>Requires specialist pollinators</b>	

Qsn #	Question	Answer
	Source(s)	Notes
	City of Los Angeles Department of Recreation and Parks. (2004). Firewheel tree. Heritage Tree.	"My flowers have no fragrance. I depend on the bright colors of my flowers to attract my main pollinator the Australian Honeyeaters. The Honeyeaters, with their well developed sense of sight, can spot the bright color of my flowers from far away. The Honeyeaters will fly to my flowers and will drink the sweet nectar that I produce for them. As the Honeyeaters drink the nectar, their feathers will get completely cover with pollen. When the Honeyeater moves to another flower and begins to eat the nectar, the bird will transfer the pollen and achieve the pollination. In the wild, many people have even seen flying foxes, which are a type of bat, drinking the sweet nectar from my flowers."
	Ladd, P. G., Nanni, I., & Thomson, G. J. (1998). Unique stigmatic structure in three genera of Proteaceae. Australian Journal of Botany, 46(4), 479-488	"species such as <i>S. sinuatus</i> which is bird-pollinated and produces copious nectar." [Floral morphology suggests birds with longer bills may be necessary for effective pollination]
	Johnson, L. A. S., & Briggs, B. G. (1963). Evolution in the Proteaceae. Australian Journal of Botany, 11(1), 21-61	"The large bright red flowers of <i>Stenocarpus sinuatus</i> , the best known of the species, are clearly adapted to ornithophily and are a special advanced feature of the species and not characteristic of the group."

606	Reproduction by vegetative fragmentation	
	Source(s)	Notes
	Jones, D.L. (1986). Ornamental Rainforest Plants in Australia, Reed Books, Frenchs Forest, Australia	"Propagation: From fresh seed. Cuttings are difficult to strike."
	New Zealand Plant Conservation Network. (2014). Flora Details - <i>Stenocarpus sinuatus</i> . <a href="http://nzpcn.org.nz/flora_details.aspx?ID=4193">http://nzpcn.org.nz/flora_details.aspx?ID=4193</a> . [Accessed 28 Jun 2019]	"Reproduces exclusively by seed - but can sucker a short distance."
	WRA Specialist. (2019). Personal Communication	Possibly, but spread by suckers must be >1 m from base of tree to answer yes to this question

607	Minimum generative time (years)	>3
	Source(s)	Notes
	Jones, D.L. (1986). Ornamental Rainforest Plants in Australia, Reed Books, Frenchs Forest, Australia	"although they grow slowly taking up to 15 years to flower, they are still commonly planted."
	Australian Native Plant Society. (2019). <i>Stenocarpus sinuatus</i> . <a href="http://anpsa.org.au/s-sin.html">http://anpsa.org.au/s-sin.html</a> . [Accessed 27 Jun 2019]	"Plants grown from seed may take 7 years or more to flower. Cutting grown plants propagated from mature flowering plants will usually flower in 3-4 years."
	Wrigley, J. W. & Fagg, M. 2013. Australian Native Plants. Sixth Edition. New Holland Publishers, Sydney	"Slow growing for first two or three years."

Qsn #	Question	Answer
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Follicles cylindrical, 5–10 cm long, greyish-brown, with short rusty hairs; stalk to 4 cm long overall, forming a knee-like joint at junction of pedicel and gynophore. Seeds ±oblong, to c. 36 mm long including wing." [No means of external attachment]
702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Jones, D.L. (1986). Ornamental Rainforest Plants in Australia, Reed Books, Frenchs Forest, Australia	"It is grown in many countries and is also popular in Australia" [Ornamental]
	Llamas, K.A. 2003. Tropical Flowering Plants. Timber Press, Portland, OR	"Stenocarpus sinuatus is used for street landscaping in California and Australia."
703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Follicles cylindrical, 5–10 cm long, greyish-brown, with short rusty hairs; stalk to 4 cm long overall, forming a knee-like joint at junction of pedicel and gynophore. Seeds ±oblong, to c. 36 mm long including wing." [No evidence, and relatively large seeds unlikely to contaminate produce]
704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	New Zealand Plant Conservation Network. (2014). Flora Details - <i>Stenocarpus sinuatus</i> . <a href="http://nzpcn.org.nz/flora_details.aspx?ID=4193">http://nzpcn.org.nz/flora_details.aspx?ID=4193</a> . [Accessed 28 Jun 2019]	"Seed is dispersed by wind and gravity."
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Seeds ±oblong, to c. 36 mm long including wing."
705	Propagules water dispersed	n
	Source(s)	Notes
	New Zealand Plant Conservation Network. (2014). Flora Details - <i>Stenocarpus sinuatus</i> . <a href="http://nzpcn.org.nz/flora_details.aspx?ID=4193">http://nzpcn.org.nz/flora_details.aspx?ID=4193</a> . [Accessed 28 Jun 2019]	"Seed is dispersed by wind and gravity."
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Seeds ±oblong, to c. 36 mm long including wing." ... "Grows in rainforest or in open areas." [Seeds are adapted for wind dispersal. Water could potentially move seeds, but this species is not described as a riparian tree]
706	Propagules bird dispersed	n

Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Follicles cylindrical, 5–10 cm long, greyish-brown, with short rusty hairs; stalk to 4 cm long overall, forming a knee-like joint at junction of pedicel and gynophore. Seeds ±oblong, to c. 36 mm long including wing."
	New Zealand Plant Conservation Network. (2014). Flora Details - <i>Stenocarpus sinuatus</i> . <a href="http://nzpcn.org.nz/flora_details.aspx?ID=4193">http://nzpcn.org.nz/flora_details.aspx?ID=4193</a> . [Accessed 28 Jun 2019]	"Seed is dispersed by wind and gravity."

707	Propagules dispersed by other animals (externally)	n
	<b>Source(s)</b>	<b>Notes</b>
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Follicles cylindrical, 5–10 cm long, greyish-brown, with short rusty hairs; stalk to 4 cm long overall, forming a knee-like joint at junction of pedicel and gynophore. Seeds ±oblong, to c. 36 mm long including wing." [No means of external attachment]
	New Zealand Plant Conservation Network. (2014). Flora Details - <i>Stenocarpus sinuatus</i> . <a href="http://nzpcn.org.nz/flora_details.aspx?ID=4193">http://nzpcn.org.nz/flora_details.aspx?ID=4193</a> . [Accessed 28 Jun 2019]	"Seed is dispersed by wind and gravity."

708	Propagules survive passage through the gut	n
	<b>Source(s)</b>	<b>Notes</b>
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Follicles cylindrical, 5–10 cm long, greyish-brown, with short rusty hairs; stalk to 4 cm long overall, forming a knee-like joint at junction of pedicel and gynophore. Seeds ±oblong, to c. 36 mm long including wing." [Fruit and seeds unlikely to be consumed by legitimate dispersers]

801	Prolific seed production (>1000/m <sup>2</sup> )	n
	<b>Source(s)</b>	<b>Notes</b>
	Australian Biological Resources Study. (1995). Flora of Australia Volume 16, Elaeagnaceae, Proteaceae 1. CSIRO, Melbourne	"Tree to 30 m tall." ... "Follicles cylindrical, 5–10 cm long, greyish-brown, with short rusty hairs; stalk to 4 cm long overall, forming a knee-like joint at junction of pedicel and gynophore. Seeds ±oblong, to c. 36 mm long including wing." ... "Flowers Mar.–June." [Large trees could potentially produce high seed densities, but specific information on fruits per tree and seeds per fruit was not found]

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	<b>Source(s)</b>	<b>Notes</b>

Qsn #	Question	Answer
	Smith, N. J. C., Zahid, D. M., Ashwath, N., & Midmore, D. J. (2008). Seed ecology and successional status of 27 tropical rainforest cabinet timber species from Queensland. <i>Forest ecology and management</i> , 256(5), 1031-1038	"Delayed-moderate. The majority of these species germinate readily when their seedcoat imposed dormancy is broken (i.e., from three to 4 weeks after sowing—Fig. 4). Once broken, with a couple of exceptions they germinate slower than species from the delayed-moderate group but faster than those from the very delayed-low germination group. This group of species was highly responsive to pregermination treatments" ... "Stenocarpus sinuatus did not respond to pre-germination treatment."
	Australian Plants online. (2000). Wheels on Fire! <a href="http://anpsa.org.au/APOL17/mar00-14.html#photo1">http://anpsa.org.au/APOL17/mar00-14.html#photo1</a> . [Accessed 28 Jun 2019]	"Fresh seed is essential for good germination."
	Royal Botanic Gardens Kew. (2019) Seed Information Database (SID). Version 7.1. Available from: <a href="http://data.kew.org/sid/">http://data.kew.org/sid/</a> . [Accessed 28 Jun 2019]	"Storage Behaviour: Orthodox? Storage Conditions: Based on TSW, this species may show orthodox seed storage behaviour."
	WRA Specialist. (2019). Personal Communication	Orthodox storage behavior suggests potential for seed bank formation, but recommendation to use fresh seed for propagation suggests viability might be limited

803	Well controlled by herbicides	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Stocker, G. (1981). Regeneration of a North Queensland Rain Forest Following Felling and Burning. <i>Biotropica</i> , 13 (2), 86-92	[Stenocarpus sinuatus reported to coppice and sucker in felled and burned forest stands] "The regeneration modes and heights of 82 tree species reappearing after the felling and burning of a tropical rain forest were observed 23 months after the perturbation. Of these species, 74 had coppiced, 10 had produced root suckers, and 34 had developed from seed during the post-fire period. Those trees developing mainly from seed appeared to have the highest growth rates. The results are discussed in relation to the stability of the floristics of the tree component on the site and the problem of predicting successional sequences in the tropical rain forest environment." ... "TABLE 2. Regeneration modes observed in species encountered 10 or more times." [Stenocarpus sinuatus - Coppicing stumps (%) = 82; Root suckers (%) = 16; Seedlings (%) = 2]

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Unknown

**Summary of Risk Traits:**

## High Risk / Undesirable Traits

- Broad climate suitability (temperate to subtropical)
- Thrives in tropical climates
- Naturalizing on island of Hawaii (Hawaiian Islands); may be naturalized outside native range in Australia and an escape, and possibly naturalized, in New Zealand
- Tolerates many soil types
- Reproduces by seeds, and vegetatively over short distances by suckers
- Seeds dispersed by wind and intentionally by people
- Coppices and suckers following cutting and fire

## Low Risk Traits

- No reports of invasiveness or negative impacts outside native range
- Unarmed (no spines, thorns, or burrs)
- Palatable to browsing animals
- Non-toxic
- Floral morphology prevents self-pollination
- Flowers adapted for bird-pollination; seed set may be reduced where effective pollinators are limited or absent
- Reaches maturity slowly (7-15 years to flower if grown from seed)