Taxon: Grevillea robusta A. Cunn. ex R. Br. **Family:** Proteaceae

Common Name(s): Australian silky oak
silk oak
southern silky oak

Synonym(s): Grevillea umbratica A.Cunn. ex
Grevillea venusta A.Cunn. ex Meisn.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 20 Apr 2017

WRA Score: 8.0 **Designation:** H(Hawai'i) **Rating:** High Risk

Keywords: Invasive Tree, Allergenic, Light-Demanding, Self-Incompatible, 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		
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	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	y
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	n
604	Self-compatible or apomictic	y=1, n=-1	n
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/m2)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	n

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	[No evidence of domestication] "Grevillea robusta has gained widespread popularity in warm temperate, subtropical and tropical highland regions of many countries, originally as a shade tree for tea and coffee and now as an agroforestry tree for small farms (Harwood, 1989). It provides economically valuable products including timber, poles, firewood and leaf mulch; it is easy to propagate and establish and is relatively free of pests and diseases; its proteoid roots help it grow in low-fertility soils; it does not compete strongly with adjacent crops; and it tolerates heavy pruning of its roots and branches. With its fern-like pinnate leaves and prominent attractive, orange flowers, it is also popular as an ornamental. As a consequence of its colonizing abilities, G. robusta may become a noxious weed in favourable conditions."

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. 2017. Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. 2017. 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**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Grevillea robusta has gained widespread popularity in warm temperate, subtropical and tropical highland regions of many countries, originally as a shade tree for tea and coffee and now as an agroforestry tree for small farms (Harwood, 1989)."
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 20 Apr 2017]	"Native: Australasia Australia: Australia - New South Wales, - Queensland"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	

203	**Broad climate suitability (environmental versatility)**	**y**

Qsn #	Question	Answer
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"The natural habitat of G. robusta is in northern New South Wales and southern Queensland, Australia, where it occurs from the east coast to as far west as the Bunya Mountains, Queensland, some 160 km inland. The north-south range of the species is some 470 km from the Guy Fawkes and Orara Rivers (tributaries of the Clarence River in New South Wales, latitude 30°10'S) to just north of Gympie, Queensland (latitude 25°50'S). It is found across a wide range of altitudes from sea level to mountaintop occurrences at 1120 m in the Bunya Mountains (Harwood, 1992a). G. robusta is vulnerable to fire and hence is excluded from the fire-prone Eucalyptus forests and grasslands that occupy much of its natural range. "

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Grevillea robusta has gained widespread popularity in warm temperate, subtropical and tropical highland regions of many countries, originally as a shade tree for tea and coffee and now as an agroforestry tree for small farms (Harwood, 1989)." ... "The natural habitat of G. robusta is in northern New South Wales and southern Queensland, Australia, where it occurs from the east coast to as far west as the Bunya Mountains, Queensland, some 160 km inland. The north-south range of the species is some 470 km from the Guy Fawkes and Orara Rivers (tributaries of the Clarence River in New South Wales, latitude 30°10'S) to just north of Gympie, Queensland (latitude 25°50'S). It is found across a wide range of altitudes from sea level to mountaintop occurrences at 1120 m in the Bunya Mountains (Harwood, 1992a). G. robusta is vulnerable to fire and hence is excluded from the fire-prone Eucalyptus forests and grasslands that occupy much of its natural range."
	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 over 2.2 million trees were planted between 1919 and 1959 on all of the main islands except Kaho'olawe for timber. Probably naturalized on all of the islands where planted; however, we have seen naturalized specimens only from Kaua'i, O'ahu, Maui, and Hawai'i."

205	Does the species have a history of repeated introductions outside its natural 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.	"commonly planted throughout tropical and subtropical areas, especially as an ornamental or in reforestation, often naturalized; in Hawai'i over 2.2 million trees were planted between 1919 and 1959 on all of the main islands except Kaho'olawe for timber."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Grevillea robusta has been introduced to warm temperate, subtropical and tropical highland regions around the world commencing in the mid to late 19th century and is widely planted in India, Sri Lanka, Central and South America and many countries in Africa (Harwood, 1989). "

Qsn #	Question	Answer
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.	"Probably naturalized on all of the islands where planted; however, we have seen naturalized specimens only from Kaua'i, O'ahu, Maui, and Hawai'i. First collection (cultivated material) made in 1909 at the Board of Agriculture and Forestry nursery (Rock 2637, BISH). Introduced around 1880 from Australia (Little & Skolmen, 1989)."
	Oppenheimer, Hank L. 2003. New plant records from Maui and Hawai'i Counties. Bishop Museum Occasional Papers. 73: 3-30	"Probably naturalized on all the islands where it was planted, and documented from Kaua'i, O'ahu, Läna'i, Maui, and Hawai'i (Wagner et al., 1990: 1086; Herbarium Pacificum Staff, 1999: 8). It was previously reported as quite widespread in dry areas on all major islands (Smith, 1985: 191). Staples (2001: 90) considered it to be probably planted and naturalized on all main islands and Holt (1992: 528) had listed it from Kamakou Preserve. The following collection represents a new island record for Moloka'i. Material examined: MOLOKA'I: Kualapu'u, 340 m, common in pastures, roadsides, and alien vegetation, 18 Nov 2001, Oppenheimer H110129."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	widely naturalized

302	**Garden/amenity/disturbance weed**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Primarily an environmental weed

303	**Agricultural/forestry/horticultural weed**	
	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.	"Another noxious tree, silk-oak (Grevillea robusta), has taken over large areas of pasture in Ka'u, Kona, and near Waimea on Kauai."
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Environmental impact: Widely planted and a prolific seeder, it is a weed of drier mesic pastures and forests. Pollen may trigger hay fever."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Pastures"
	WRA Specialist. 2017. Personal Communication	Potentially yes, although impacts unspecified

304	**Environmental weed**	**y**
	Source(s)	**Notes**
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Environmental impact: Widely planted and a prolific seeder, it is a weed of drier mesic pastures and forests. Pollen may trigger hay fever."

Qsn #	Question	Answer
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"G. robusta is a tree which is an effective colonizer and has demonstrated invasive behaviour in Australia (New South Wales), New Zealand, French Polynesia, Jamaica, Zimbabwe, and notably in South Africa and the United States (i.e., Hawaii). Contributing to its behaviour is likely to be its early and prolific seed producing habit, and the production of potentially allelopathic compounds. In South Africa, G. robusta has been declared a category 3 invader (Henderson, 2001). It is also invasive in Hawaii (Holm et al., 1979; Cronk and Fuller, 1995; Space and Flynn, 2001), a common weed in Micronesia (Space and Falanruw, 1999) and cultivated in Niue (Space and Flynn, 2000). It seeds heavily and regenerates strongly after disturbance in rainforests and along riverbanks. Several years ago, Binggeli (1999) classified G. robusta as a moderately invasive species: currently, it is listed as invasive and potentially invasive in many countries in South America, Africa, Asia, and on many islands in the West Indies and the Indian and Pacific Oceans (Harwood, 1997; Kairo et al., 2003; Oviedo Prieto et al., 2012; PIER, 2015; PROTA, 2015). "
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"G. robusta is an effective colonizing species and, in some cases, threatens to be a noxious weed (e.g. in Hawaii, Nelson and Schubert, 1976)."
	Queensland Government. (2017). Weeds of Australia. Grevillea robusta. http://keyserver.lucidcentral.org. [Accessed 20 Apr 2017]	"Silky oak (Grevillea robusta) is regarded as an environmental weed in New South Wales and as a minor environmental weed or potential environmental weed in Victoria. This species grows naturally in sub-tropical rainforests and in wet sclerophyll forests on the coast and inland ranges north of the Coffs Harbour district in New South Wales. It is widely cultivated as a garden ornamental and street tree in Australia and has escaped cultivation and become invasive outside its natural range. Silky oak (Grevillea robusta) is currently of particular concern throughout the wider Sydney and Blue Mountains region in central New South Wales. For example, it is mentioned as a common environmental weed at Hunts Creek in western Sydney and has become naturalised in Lane Cove National Park in northern Sydney. It is also a known weed in the lower Blue Mountains and is one of three native plants that are problem weed species in the Shoalhaven Shire, to the south of Sydney. In Victoria, silky oak (Grevillea robusta) is also beginning to demonstrate weedy tendencies. It appears on the environmental weed list for the Goulburn Broken Catchment and is listed as a minor environmental weed in the City of Boroondara in Melbourne. Overseas, silky oak (Grevillea robusta) is listed among Hawaii's most invasive horticultural plants, is reported to be invasive in Florida, and is classed as a "Category 3 invader" in South Africa."
	Rubenstein, T. & Berkowitz, P. 2009. Three Mountain Alliance Weed Management Plan. Three Mountain Alliance. http://threemountainalliance.org/. [Accessed]	"This species is present throughout the TMA but doesn't appear to spread as quickly and modify more intact wet forest habitat. It currently poses the greatest threat to the dry and mesic forests of the NKMA and is a potential threat to the drier portions of the KKMA."

Qsn #	Question	Answer
	Santos, G.L., Kageler, D., Gardner, D.E., Cuddihy, L.W. & Stone, C.P. 1992. Herbicidal Control of Selected Alien Plant Species in Hawai`i Volcanoes National Park. Pp. 341-375 in Stone, C.P. et al. (eds.) Alien Plant Invasions in Native Ecosystems of Hawai`i. University of Hawaii CPSU, Honolulu, HI	"Two species of silk oak (Grevillea robusta and G. banksii) are currently invading the Park's southwestern boundary. Grevillea robusta, a robust, partly deciduous tree native to Australia, was introduced to the State of Hawai`i for reforestation purposes in 1938 (Skolmen 1979). It is found in a wide variety of habitats and from sea level to over 4,265 ft (1,300 m) elevation. Grevillea banksii, also native to Australia, is a small tree to 20 ft (6 m) tall and was officially designated a noxious weed by the Hawai`i Department of Agriculture in 1978 (Regulation NW 10, updated by Title 4, Chapter 68 Administrative Rules, 1981). Both species of Grevillea are aggressive, drought-tolerant, have the ability to establish in little or no soil, and may form dense, monotypic stands. If unmanaged, these trees may eventually displace dry forest and shrubland in Hawai`i Volcanoes National Park."
	Invasive Species South Africa. 2017. Australian silky oak - Grevillea robusta . http://www.invasives.org.za/. [Accessed 20 Apr 2017]	"Why is it a problem? It competes with and has the potential to replace indigenous species"

305	Congeneric weed	y
	Source(s)	**Notes**
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Grevillea banksii ... Declared noxious in Regulations 2 and NW 10. Can spread rapidly, replacing forage plants. Poisonous flowers and fruit cause a skin reaction like that of poison ivy or mango."
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"Grevillea banksii ... This noxious, medium-sized, evergreen tree is similar to silky oak in most features. There is a major infestation in the Ka'u District, Hawaii."

401	Produces spines, thorns or burrs	n
	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.	[No evidence] "Trees 10-25(-40) m tall, trunk large in old trees; young branches rusty tomentose. Leaves fern-like, bipinnatifid into (4-)10- 21 segments, these lanceolate or rarely linear, upper surface glabrous or sparsely appressed pubescent, lower surface brownish becoming whitish silky pubescent, margins entire or sometimes lobed, recurved."

402	Allelopathic	y
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"G. robusta drops much leaf and fruit litter (Gilman and Watson, 1993). Its leaves produce an allelopathic substance that inhibits the establishment and development of native species. G. robusta also causes changes in patterns of nutrient cycling (ISSG, 2015)."
	Webb, L. J., Tracey, J. G., & Haydock, K. P. (1967). A factor toxic to seedlings of the same species associated with living roots of the non-gregarious subtropical rain forest tree Grevillea robusta. Journal of Applied Ecology, 4(1): 13 -25	"It was concluded that G. robusta fails to regenerate in G. robusta plantations because of some water-transferable factor associated with the rhizosphere of this species, in which antagonistic microflora may be involved."

Qsn #	Question	Answer
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"This large, evergreen tree has been used extensively in reforestation programs. The leaves produce an allelopathic substance which inhibits the establishment of all species, including itself."

403	Parasitic	n
	Source(s)	**Notes**
	Australian Biological Resources Study. (2000). Flora of Australia Volume 17A, Proteaceae 2, Grevillea. CSIRO Publishing, Melbourne	"Tree 8-40 m tall. Leaves 10-34 cm long, 90-150 mm wide, deeply dissected with 11-24 (-31) primary lobes" [Proteaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Goats will control silver oak (An Peischel)."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"In addition to their use as a soil mulch, the leaves of G. robusta are used by some farmers in the Embu district of Kenya as a fodder supplement for cattle in the dry season when other fodder sources are scarce (Spiers and Stewart, 1992). They are also used as bedding in livestock stalls."

405	Toxic to animals	n
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	[No evidence] "In addition to their use as a soil mulch, the leaves of G. robusta are used by some farmers in the Embu district of Kenya as a fodder supplement for cattle in the dry season when other fodder sources are scarce (Spiers and Stewart, 1992). They are also used as bedding in livestock stalls."

406	Host for recognized pests and pathogens	n
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 20 Apr 2017]	"In humid regions, G. robusta is vulnerable to attack by fungal diseases such as Corticium salmoniclor. Fungi such as Amphichaeta grevilleae, Cercospora spp. and Phyllostica spp. have been observed to cause considerable damage to leaves and stems of young plants in Sri Lanka, particularly if they are overwatered in the nursery. Under lowland conditions in the Caribbean, it is severely attacked by the scale insect Asterolecanium pustulans. Attack by termites can be a problem when planted on dry sites in Africa. In Peninsular Malaysia, the big white ant Termes gestroi destroyed experimental trees. The wood is susceptible to marine borer and pinhole borer. Sapwood is susceptible to Lyctus."

Qsn #	Question	Answer
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"it is easy to propagate and establish and is relatively free of pests and diseases" Pests recorded Insects: Asterolecanium pustulans (akee fringed scale) [1] Euwallacea fornicatus (tea shot-hole borer) Glyptotermes dilatatus (live-wood tea termite (Sri Lanka)) Homona coffearia (tea tortrix) Icerya seychellarum (Seychelles scale) Nipaecoccus viridis (spherical mealybug) Postelectrotermes militaris (dry wood termite) Scirtothrips aurantii (South African citrus thrips) Xylosandrus crassiusculus (Asian ambrosia beetle) Xylosandrus discolor Nematodes: Pratylenchus penetrans (nematode, northern root lesion) Fungus diseases: Amphichaeta grevilleae [2] Armillaria luteobubalina (armillaria root rot) Armillaria tabescens (armillaria root rot) Botryosphaeria dothidea (canker: almond) [3] Cercospora Corticium salmonicolor (damping off) [4] Physimerus

407	Causes allergies or is otherwise toxic to humans	y
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 20 Apr 2017]	"Poison: The flower buds, fruit and seeds are cyanogenic. Through contact with the leaves, sensitive persons may develop contact dermatitis due to tridecylresorcinol, a chemical compound related to the allergen toxicodendron."
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Pollen may trigger hay fever."
	Cook, D. K., & Freeman, S. (1997). Allergic contact dermatitis to multiple sawdust allergens. Australasian Journal of Dermatology, 38(2), 77-79	"SUMMARY: A 73-year-old man presented with an 8-year history of a dermatitis affecting his face, dorsum of hands, and forearms. He was a retired cabinet maker but still carried out some timber work at home. He was patch tested and found to be positive to colophony and sawdust samples from four different timbers: Silky Oak, Queensland Hoop Pine, Radiata Pine and Australian red cedar."
	Australian Biological Resources Study. (2000). Flora of Australia Volume 17A, Proteaceae 2, Grevillea. CSIRO Publishing, Melbourne	"The sawdust and occasionally foliage have been reported as causing contact dermatitis."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"The sawdust from G. robusta wood causes a skin allergy in some people of Caucasian descent, particularly those with fair hair and light skin colouring (Skolmen, 1974)."

408	Creates a fire hazard in natural ecosystems	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"G. robusta is vulnerable to fire and hence is excluded from the fire-prone Eucalyptus forests and grasslands that occupy much of its natural range."
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"G. robusta is vulnerable to fire, which may be used as a means of control."

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	**Notes**
	Harwood, C. E., Moran, G. F., & Bell, J. C. (1997). Genetic differentiation in natural populations of Grevillea robusta. Australian Journal of Botany, 45(4), 669-678	"It is a light-demanding species, and is unable to regenerate in undisturbed rainforest (Swain 1928; Harwood 1992)."
	Burns, R.M. & Honkala, B.H. 1990. Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	"Silk-oak is classed as very intolerant of shade."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Burns, R.M. & Honkala, B.H. 1990. Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	"Silk-oak is tolerant of a wide range of soils if they are well drained (16). It will grow on neutral to strongly acid soils but does best on those that are slightly acid (2,12). In Hawaii, good growth is achieved on soils of a wide range of orders. Silk-oak grows well on Histosols, Inceptisols, and Ultisols. The majority of the best stands are on Dystrandepts and Tropofolists developed on gentle to moderate slopes of basalt lava rock or ash."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"The species is more common on rather fertile soils such as those derived from river alluvia or basalts but will grow on shallower, less fertile soils derived from sedimentary material. The pH range for good growth is around 4.5 to 7.5. Best growth is obtained on sandy loam, loam and clay loam textures. Heavy clay soils and prolonged waterlogging are not tolerated. In highly acid soils, symptoms of boron deficiency (Smith, 1960) and manganese toxicity (Child and Smith, 1960) have been observed."

411	Climbing or smothering growth habit	n
	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 10-25(-40) m tall, trunk large in old trees; young branches rusty tomentose."

412	Forms dense thickets	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Santos, G.L., Kageler, D., Gardner, D.E., Cuddihy, L.W. & Stone, C.P. 1992. Herbicidal Control of Selected Alien Plant Species in Hawai`i Volcanoes National Park. Pp. 341-375 in Stone, C.P. et al. (eds.) Alien Plant Invasions in Native Ecosystems of Hawai`i. University of Hawaii CPSU, Honolulu, HI	"Both species of Grevillea are aggressive, drought-tolerant, have the ability to establish in little or no soil, and may form dense, monotypic stands. If unmanaged, these trees may eventually displace dry forest and shrubland in Hawai`i Volcanoes National Park."
	Burns, R.M. & Honkala, B.H. 1990. Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	"The toxic substance has not been investigated in Hawaii, but it has been observed that reproduction is lacking within dense stands or directly beneath individual trees."

501	Aquatic	n
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	[Terrestrial tree] "Grevillea robusta is commonly found in small, discontinuous stands along the banks of rivers and streams, usually within 30 m of the water's edge. The riverine gallery rainforest of the Castanospermum australe (black bean) alliance which was the natural vegetation along the larger rivers generally has moderate to good soil fertility and water availability. G. robusta is also associated with river she-oak (Casuarina cunninghamiana) along smaller streams where rainforest has not developed."

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 20 Apr 2017]	Family: Proteaceae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	Australian Biological Resources Study. (2000). Flora of Australia Volume 17A, Proteaceae 2, Grevillea. CSIRO Publishing, Melbourne	Proteaceae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	Australian Biological Resources Study. (2000). Flora of Australia Volume 17A, Proteaceae 2, Grevillea. CSIRO Publishing, Melbourne	"Tree 8-40 m tall. Leaves 10-34 cm long, 90-150 mm wide, deeply dissected with 11-24 (-31) primary lobes, these entire to 5-partite, sometimes with tertiary division; ultimate lobes oblong to elliptic or subtriangular, 0.5-5 cm long, 2-10 mm wide; margins shortly recurved; lower surface subsericeous to subvillous."

601	Evidence of substantial reproductive failure in native habitat	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	[No evidence] "Flowering commences in October in lowland occurrences in the natural range, and seed is mature by the end of December. At high elevations flowering and seed production occur 4-6 weeks later (Harwood, 1992a). In the equatorial highlands where rainfall distributions are bimodal, flowering is much less synchronized. In Western Kenya, for example, there are two main flowering peaks in March-May and August-October, with some trees flowering throughout the year (Kalinganire et al., 1996). In its natural range, the species is partly deciduous, losing much of its canopy in the dry spring months (September-October) and recovering in early summer. In the equatorial highlands there is no clear seasonal pattern of foliage loss."
	Australian Biological Resources Study. (2000). Flora of Australia Volume 17A, Proteaceae 2, Grevillea. CSIRO Publishing, Melbourne	[No evidence] "Occurs on the coast and coastal ranges of southern Qld and northern N.S.W. from about Coffs Harbour N to about Bundaberg, and inland to the Ebor area and Bonya Mtns. Grows usually in basaltic soils in three distinct habitats: riverine gallery rainforest and rainforest margins; riverine sclerophyll communities with Allocasuarina cunninghamiana; and Araucaria forest and vine thickets on higher slopes. Regenerates from seed. Flowers mainly Sept.-Nov."

602	Produces viable seed	y
	Source(s)	**Notes**
	Australian Biological Resources Study. (2000). Flora of Australia Volume 17A, Proteaceae 2, Grevillea. CSIRO Publishing, Melbourne	"Regenerates from seed."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"The species seeds heavily and regenerates strongly after site disturbance in rainforests and along river banks, so younger-aged individuals are common in most natural occurrences." ... "Propagation is usually from seed. There are about 40,000 viable seeds/kg. Seed will retain viability for at least five years if dried to below 8% moisture content and stored in a dry, cool (20°C or lower) environment (Jones, 1967; B.V. Gunn, CSIRO Forestry and Forest Products, P.O.Box E4008, Kingston 2604, Australia, personal communication, 1998). No pre-treatment is required for germination. Seeds are usually germinated on loamy soil under a shallow covering of sand."

603	Hybridizes naturally	n
	Source(s)	**Notes**
	Harwood, C. E., Moran, G. F., & Bell, J. C. (1997). Genetic differentiation in natural populations of Grevillea robusta. Australian Journal of Botany, 45(4), 669-678	"It does not appear to be closely related to other species in the genus Grevillea and natural hybrids with other species have not been detected."

604	Self-compatible or apomictic	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Kalinganire, A., Harwood, C. E., Slee, M. U., & Simons, A. J. (2000). Floral structure, stigma receptivity and pollen viability in relation to protandry and self-incompatibility in silky oak (Grevillea robusta A. Cunn.). Annals of Botany, 86 (1), 133-148	"Although a very low rate of selfng may occur, G. robusta presents a self-incompatibility system and allogamy is its primary breeding behaviour."
	Kalinganire, A., Harwood, C. E., Slee, M. U., & Simons, A. J. (2001). Pollination and fruit-set of Grevillea robusta in western Kenya. Austral Ecology, 26(6), 637-648	"Inflorescences bagged to exclude birds set no fruits, and unmanipulated flowers and flowers bagged with self-pollen set no fruits, indicating a self incompatibility mechanism."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Harwood, C. E., Moran, G. F., & Bell, J. C. (1997). Genetic differentiation in natural populations of Grevillea robusta. Australian Journal of Botany, 45(4), 669-678	"Pollinating agents could also probably be flying foxes which have been observed to frequent the flowers of G. robusta."
	Kalinganire, A., Harwood, C. E., Slee, M. U., & Simons, A. J. (2001). Pollination and fruit-set of Grevillea robusta in western Kenya. Austral Ecology, 26(6), 637-648	"The flowers are visited mainly by birds and insects. The likely pollinators of G. robusta are sunbirds (Nectarinia amethystina, N. cyanolaema, N. olivacea, N. superba and N. venusta) and white-eyes (Zosterops kikuyuensis and Z. senegalensis). Very little aggressive behaviour between birds was recorded. No nocturnal pollinators were observed. Nectar was the major floral reward for pollinators, but is likely depleted by ants and honey bees, the foraging behaviour of which confirmed them to be nectar-robbers."

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Propagation is usually from seed." ... "Vegetative propagation by cuttings; air layering; grafting; tissue culture"
	Burns, R.M. & Honkala, B.H. 1990. Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[See 8.04] "Vegetative Reproduction- Silk-oak coppices when cut. After being damaged by fire, a 5-year-old stand in Karnataka State, India, was cut. One year later, 93 percent of the stumps had coppiced. After 2 years 72 percent of the stumps still retained the coppice shoots, which by then averaged 4 m (13 ft) in height (1). As far as is known, vegetative propagation has not been practiced with the species."

607	Minimum generative time (years)	>3
	Source(s)	**Notes**
	Moodley, D. (2013). Determinants of introduction and invasion success for Proteaceae. MSc Thesis. Stellenbosch University, Stellenbosch, South Africa	"Table S4. Raw data of all introduced, naturalized and invasive species and the fourteen traits that were measured." [Grevillea robusta - Maturity = 6 (The number of years a species takes to first flowering)]
	Bonner, F.T. & Karrfalt, R.P. (eds.). 2008. The Woody Plant Seed Manual. USDA FS Agriculture Handbook 727. Government Printing Office, Washington, D.C.	"Trees in Hawaii usually begin producing flowers and seeds when they are 10 to 15 years old (Wong 1974). In Jamaica, trees seed profusely from 10 years of age (Streets 1962)."

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

Qsn #	Question	Answer
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Fruits are two-seeded follicles 2 cm in length, with a slender persistent style. Seeds are winged, 13-19 mm long x 8-10 mm wide and 0.8-0.9 mm thick, with a papery wing around the brown, ovate central seed body." [Probably not - no evidence that the propagules have any means of attachment.]

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Grevillea robusta has gained widespread popularity in warm temperate, subtropical and tropical highland regions of many countries, originally as a shade tree for tea and coffee and now as an agroforestry tree for small farms (Harwood, 1989). It provides economically valuable products including timber, poles, firewood and leaf mulch; it is easy to propagate and establish and is relatively free of pests and diseases; its proteoid roots help it grow in low-fertility soils; it does not compete strongly with adjacent crops; and it tolerates heavy pruning of its roots and branches. With its fern-like pinnate leaves and prominent attractive, orange flowers, it is also popular as an ornamental."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Fruits are two-seeded follicles 2 cm in length, with a slender persistent style. Seeds are winged, 13-19 mm long x 8-10 mm wide and 0.8-0.9 mm thick, with a papery wing around the brown, ovate central seed body." [Unlikely. No evidence, and seed relatively large]

704	Propagules adapted to wind dispersal	y
	Source(s)	**Notes**
	Bonner, F.T. & Karrfalt, R.P. (eds.). 2008. The Woody Plant Seed Manual. USDA FS Agriculture Handbook 727. Government Printing Office, Washington, D.C.	"Its prolific seeding, wide dissemination of the seeds by wind, and its tolerance of diverse site conditions have enhanced its ability to proliferate (Wong 1974)."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Seeds are winged, 13-19 mm long x 8-10 mm wide and 0.8-0.9 mm thick, with a papery wing around the brown, ovate central seed body."

705	Propagules water dispersed	y
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Grevillea robusta is commonly found in small, discontinuous stands along the banks of rivers and streams, usually within 30 m of the water's edge. The riverine gallery rainforest of the Castanospermum australe (black bean) alliance which was the natural vegetation along the larger rivers generally has moderate to good soil fertility and water availability."

Qsn #	Question	Answer
	Harwood, C. E., Moran, G. F., & Bell, J. C. (1997). Genetic differentiation in natural populations of Grevillea robusta. Australian Journal of Botany, 45(4), 669-678	"The seed are light and winged and might be carried long distances by water flow, seed could be washed downslope to watercourses and then downstream before being deposited and germinating on flood banks (young individuals of Grevillea have been observed growing on flood banks distant from adult stands). Long distance wind dispersal might also be affected by violent summer storms..."

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Fruits are two-seeded follicles 2 cm in length, with a slender persistent style. Seeds are winged, 13-19 mm long x 8-10 mm wide and 0.8-0.9 mm thick, with a papery wing around the brown, ovate central seed body."
	Bonner, F.T. & Karrfalt, R.P. (eds.). 2008. The Woody Plant Seed Manual. USDA FS Agriculture Handbook 727. Government Printing Office, Washington, D.C.	"Its prolific seeding, wide dissemination of the seeds by wind, and its tolerance of diverse site conditions have enhanced its ability to proliferate"

707	Propagules dispersed by other animals (externally)	n
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Fruits are two-seeded follicles 2 cm in length, with a slender persistent style. Seeds are winged, 13-19 mm long x 8-10 mm wide and 0.8-0.9 mm thick, with a papery wing around the brown, ovate central seed body." [No means of external attachment]

708	Propagules survive passage through the gut	n
	Source(s)	**Notes**
	Gordon, D. R., Mitterdorfer, B., Pheloung, P. C., Ansari, S., Buddenhagen, C., Chimera, C., ... & Williams, P. A. 2010). Guidance for addressing the Australian Weed Risk Assessment questions. Plant Protection Quarterly, 25(2): 56-74	"Answer 'no' where the taxon is unlikely to be eaten by animals or if seeds are not viable following passage through the gut."
	Bonner, F.T. & Karrfalt, R.P. (eds.). 2008. The Woody Plant Seed Manual. USDA FS Agriculture Handbook 727. Government Printing Office, Washington, D.C.	[Wind-dispersed] "Its prolific seeding, wide dissemination of the seeds by wind, and its tolerance of diverse site conditions have enhanced its ability to proliferate"

Qsn #	Question	Answer
801	**Prolific seed production (>1000/m2)**	**n**
	Source(s)	**Notes**
	Burns, R.M. & Honkala, B.H. 1990. Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	"Silk-oak is a prolific seeder. Seeds are about 10 mm (0.4 in) long, flattened, and surrounded by a membranous wing. There are reported to be 64,000 to 154,000 seeds per kilogram (29,000 to 70,000/lb). Because of their relatively large wing, the lightweight seeds are widely disseminated by wind." [Possibly. Densities unknown]
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"The species seeds heavily and regenerates strongly after site disturbance in rainforests and along river banks, so younger-aged individuals are common in most natural occurrences."

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Orwa C,, Mutua, A., Kindt R., Jamnadass, R, & Anthony, S. 2009 Agroforestree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org. [Accessed 20 Apr 2017]	"Collection of seeds from mature trees is very difficult because the seeds are borne on thin and inaccesible branches at great heights and are easily lost during collection. Seed storage behaviour is orthodox; whole seed have 28.5% mc; 60- 70% germination following 2 years of hermetic storage at -7 deg. C with 10% mc; 35% germination following 12 months of open storage. Seeds were maintained for 4 years in commercial storage conditions; viability was maintained for 2 years in hermetic air-dry storage at 3 deg. C. There are between 24 000 and 105 000 seeds/kg."
	Merritt, D. J. et al. (2014). A continental-scale study of seed lifespan in experimental storage examining seed, plant, and environmental traits associated with longevity. Biodiversity and Conservation, 23(5), 1081-1104	"Management of seed banks conserving the biodiversity of phylogenetically diverse species requires insight into seed longevity. This study determined the seed longevity of 172 species sourced from across the mega-diverse flora of the Australia continent." ... "The viability of seeds aged at either 45 or 60 ?C declined with time, following a negative sigmoidal curve (Fig. 1), and seeds aged more rapidly at 60 ?C than at 45 ?C. Across all species, the calculated p50 values of seeds varied by three orders of magnitude" ... "In some families there was a large variation in p50 values. For example, within the Proteaceae (n = 12), five species (Banksia attenuata, Banksia ericifolia, Banksia menziesii, Banksia prionotes, and Hakea petiolaris) were amongst the longest-lived (p50[150 days), whereas three species (Grevillea robusta, Lomatia myricoides, and Telopea speciosissima) were amongst the shortest-lived (p50\20 days)."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Propagation is usually from seed. There are about 40,000 viable seeds/kg. Seed will retain viability for at least five years if dried to below 8% moisture content and stored in a dry, cool (20°C or lower) environment (Jones, 1967; B.V. Gunn, CSIRO Forestry and Forest Products, P.O.Box E4008, Kingston 2604, Australia, personal communication, 1998). No pre-treatment is required for germination. Seeds are usually germinated on loamy soil under a shallow covering of sand."
	Bonner, F.T. & Karrfalt, R.P. (eds.). 2008. The Woody Plant Seed Manual. USDA FS Agriculture Handbook 727. Government Printing Office, Washington, D.C.	"Seeds of silk-oak are orthodox in storage behavior and are easy to store in cool, dry conditions (Schaefer 1991). Seeds stored for 2 years at –7 and 3 °C had germination rates ranging from 60 to 70% when seed moisture was maintained below 10% during storage in airtight containers (Jones 1967)."

Qsn #	Question	Answer
803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching,L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Management: Has value as timber. Sensitive to triclopyr ester (2.5% product in diesel oil) applied to frill cuts(66). HAVO staff reported control with triclopyr Grevillea robusta ester at 5% product in diesel oil applied to basal bark (Zimmer, HAVO). Susceptible to cut-surface and continuous frill applications of picloram and glyphosate and tolerant of 2,4-D and dicamba(45). Applications of glyphosate and triclopyr to drilled holes in unreplicated demonstrations were very effective."
804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"It tolerates repeated heavy pruning and pollarding, enabling farmers to regulate the degree of competition with adjacent crops." ... "G. robusta coppices well after being cut back to ground level at ages of up to two years, but coppicing ability declines sharply thereafter, so management on a coppicing rotation is not feasible."
	Burns, R.M. & Honkala, B.H. 1990. Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	"Vegetative Reproduction- Silk-oak coppices when cut. After being damaged by fire, a 5-year-old stand in Karnataka State, India, was cut. One year later, 93 percent of the stumps had coppiced. After 2 years 72 percent of the stumps still retained the coppice shoots, which by then averaged 4 m (13 ft) in height (1). As far as is known, vegetative propagation has not been practiced with the species."
805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	**n**
	Source(s)	**Notes**
	Little Jr, E. L., Woodbury, R. O., & Wadsworth, F. H. (1974). Trees of Puerto Rico and the Virgin Islands. Second Volume. Agriculture Handbook 449, US Department of Agriculture, Washington, D.C.	"Silk-oak has been widely planted in various parts of Puerto Rico for shade and ornament, such as along roads. However, planting is no longer recommended. The trees are heavily attacked by scale insects, and the silky foliage becomes dirty."
	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] "Probably naturalized on all of the islands where planted; however, we have seen naturalized specimens only from Kaua'i, O'ahu, Maui, and Hawai'i."
	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.	[No evidence] "The trees are propagated readily from the great quantities of seeds, grow rapidly, and are drought resistant. Along the road to Kokee State Park, Kauai, trees are unhealthy with ragged crowns. Elsewhere, trees have full crowns." ... "Introduced into Hawaii about 1880 from Australia, it is now seen as a shade tree and street tree through the islands from sea level to 4,000 ft (1,219 m). This species is the second most commonly planted tree in Hawaii"

Summary of Risk Traits:

High Risk / Undesirable Traits
• Elevation range exceeds 1000 m, demonstrating environmental versatility
• Grows in tropical climates
• Naturalized in the Hawaiian Islands and several other locations worldwide
• Potential pasture weed
• Environmental weed
• Grevillea banksii also invasive
• Allelopathic
• Allergenic sawdust and pollen
• Tolerates many soil types
• Capable of forming dense stands
• Reproduces by seed
• Seeds dispersed by wind, water & intentionally by people
• Prolific seed production (densities unknown)
• Able to coppice & resprout after cutting

Low Risk Traits
• Unarmed (no spines, thorns, or burrs)
• Palatable to goats and used as a livestock fodder
• Ornamental
• Light-demanding (shade intolerant)
• Not reported to spread vegetatively
• Self-incompatible
• Reaches maturity in 6+ years
• Herbicides may provide effective control