

Taxon: <i>Nicotiana glauca</i> Graham	Family: Solanaceae
Common Name(s): glaucous-leaf tobacco mustard tree tobacco-bush tree tobacco wild tobacco	Synonym(s):

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 7 Aug 2018
WRA Score: 17.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Toxic Shrub, Disturbance-Adapted, Unpalatable, Self-Compatible, 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		
303	Agricultural/forestry/horticultural weed		
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed		
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	y
405	Toxic to animals	y=1, n=0	y
406	Host for recognized pests and pathogens	y=1, n=0	y
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	y

Qsn #	Question	Answer Option	Answer
408	Creates a fire hazard in natural ecosystems		
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
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		
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	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
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		
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)		
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m ²)	y=1, n=-1	y
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
	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.	[Widespread weed. No evidence of domestication] "Native to Argentina, now widely naturalized in warm temperate regions of the world; in Hawai'i naturalized in open, arid, disturbed sites, 3-350 m, on O'ahu, Lana'i, Maui, and Kaho'olawe."

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

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 7 Aug 2018]	"Native Southern America WESTERN SOUTH AMERICA: Bolivia SOUTHERN SOUTH AMERICA: Argentina [Cordoba, Mendoza, Buenos Aires, Catamarca, Corrientes, Entre Rios, Formosa, Jujuy, La Rioja, Salta, San Luis, Santa Fe, Santiago del Estero, Tucuman, Federal District]"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 7 Aug 2018]	

Qsn #	Question	Answer
203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Drought-tolerant and can survive under a wide range of growing conditions, but is most commonly found in sandy or gravelly soils along riparian areas, near cultivated areas, around old dwellings and ditch banks."
	Tropicos.org. 2018. Missouri Botanical Garden. http://www.tropicos.org/ . [Accessed 7 Aug 2018]	Collected from 4 m elevation, 22°12'00"N latitude to 3600 m elevation, 16°31'00"S latitude

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 7 Aug 2018]	"Native Southern America WESTERN SOUTH AMERICA: Bolivia SOUTHERN SOUTH AMERICA: Argentina [Cordoba, Mendoza, Buenos Aires, Catamarca, Corrientes, Entre Rios, Formosa, Jujuy, La Rioja, Salta, San Luis, Santa Fe, Santiago del Estero, Tucuman, Federal District] Naturalized Africa MACARONESIA: Cape Verde, Portugal, [Madeira Islands] Spain [Canary Islands] NORTHERN AFRICA: Algeria, Egypt, Morocco, Tunisia NORTHEAST TROPICAL AFRICA: Eritrea, Ethiopia SOUTH TROPICAL AFRICA: Mozambique, Zambia, Zimbabwe SOUTHERN AFRICA: Botswana, Lesotho, Namibia, South Africa Asia-Temperate WESTERN ASIA: Egypt, [Sinai] Israel, Lebanon, Turkey Australasia AUSTRALIA: Australia NEW ZEALAND: New Zealand Europe SOUTHEASTERN EUROPE: Greece (incl. Crete), Italy (incl. Sardinia, Sicily) SOUTHWESTERN EUROPE: France (incl. Corsica), Portugal, Spain Europe Northern America Mexico, United States Pacific NORTH-CENTRAL PACIFIC: U.S. Outlying Islands, [Johnston Atoll] United States [Hawaii] Southern America BRAZIL: Brazil [Mato Grosso do Sul, Rio Grande do Sul] WESTERN SOUTH AMERICA: Ecuador, Peru SOUTHERN SOUTH AMERICA: Chile, Paraguay, Uruguay"

205	Does the species have a history of repeated introductions outside its natural range?	y
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Qsn #	Question	Answer
	Source(s)	Notes
	<p>USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 7 Aug 2018]</p>	<p>"Naturalized Africa MACARONESIA: Cape Verde, Portugal, [Madeira Islands] Spain [Canary Islands] NORTHERN AFRICA: Algeria, Egypt, Morocco, Tunisia NORTHEAST TROPICAL AFRICA: Eritrea, Ethiopia SOUTH TROPICAL AFRICA: Mozambique, Zambia, Zimbabwe SOUTHERN AFRICA: Botswana, Lesotho, Namibia, South Africa Asia-Temperate WESTERN ASIA: Egypt, [Sinai] Israel, Lebanon, Turkey Australasia AUSTRALIA: Australia NEW ZEALAND: New Zealand Europe SOUTHEASTERN EUROPE: Greece (incl. Crete), Italy (incl. Sardinia, Sicily) SOUTHWESTERN EUROPE: France (incl. Corsica), Portugal, Spain Europe Northern America Mexico, United States Pacific NORTH-CENTRAL PACIFIC: U.S. Outlying Islands, [Johnston Atoll] United States [Hawaii] Southern America BRAZIL: Brazil [Mato Grosso do Sul, Rio Grande do Sul] WESTERN SOUTH AMERICA: Ecuador, Peru SOUTHERN SOUTH AMERICA: Chile, Paraguay, Uruguay"</p>

301	Naturalized beyond native range	y
	Source(s)	Notes
	<p>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.</p>	<p>"Native to Argentina, now widely naturalized in warm temperate regions of the world; in Hawai'i naturalized in open, arid, disturbed sites, 3-350 m, on O'ahu, Lana'i, Maui, and Kaho'olawe. First collected on O'ahu (cultivated material) in 1864-1865 (Mann & Brigham 296, BISH)."</p>
	<p>Oppenheimer, Hank L. 2003. New plant records from Maui and Hawai'i Counties. Bishop Museum Occasional Papers. 73: 3-30</p>	<p>"Naturalized on O'ahu, Lāna'i, Maui, Kaho'olawe (Wagner et al., 1990: 1262) and Hawai'i (Wagner & Herbst, 1995: 26), tree tobacco was recently collected on Moloka'i. It is fairly common along the south side of the island at least from Kaunakakai to Kamalō. This alien species is a known host plant for the endangered Hawaiian sphinx moth, <i>Manduca blackburni</i>, on Maui, Kaho'olawe, and Hawai'i (A.C. Medeiros, pers. comm.). However, a survey of several dozen Moloka'i plants on two occasions revealed no eggs, larva, or feeding damage. Material examined: MOLOKA'I: Kaunakakai, near sea level, 14 Jul 2001, Oppenheimer H70113."</p>

Qsn #	Question	Answer
	<p>USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 7 Aug 2018]</p>	<p>Naturalized Africa MACARONESIA: Cape Verde, Portugal, [Madeira Islands] Spain [Canary Islands] NORTHERN AFRICA: Algeria, Egypt, Morocco, Tunisia NORTHEAST TROPICAL AFRICA: Eritrea, Ethiopia SOUTH TROPICAL AFRICA: Mozambique, Zambia, Zimbabwe SOUTHERN AFRICA: Botswana, Lesotho, Namibia, South Africa Asia-Temperate WESTERN ASIA: Egypt, [Sinai] Israel, Lebanon, Turkey Australasia AUSTRALIA: Australia NEW ZEALAND: New Zealand Europe SOUTHEASTERN EUROPE: Greece (incl. Crete), Italy (incl. Sardinia, Sicily) SOUTHWESTERN EUROPE: France (incl. Corsica), Portugal, Spain Europe Northern America Mexico, United States Pacific NORTH-CENTRAL PACIFIC: U.S. Outlying Islands, [Johnston Atoll] United States [Hawaii] Southern America BRAZIL: Brazil [Mato Grosso do Sul, Rio Grande do Sul] WESTERN SOUTH AMERICA: Ecuador, Peru SOUTHERN SOUTH AMERICA: Chile, Paraguay, Uruguay"</p>

302	Garden/amenity/disturbance weed	
	Source(s)	Notes
	<p>Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI</p>	<p>"A common weed in lowland pastures, along roadsides and in coral fills or sandy places."</p>
	<p>DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA</p>	<p>"Disturbed places, roadsides, urban waste areas, gravel quarries, landscaped sites, and many natural communities, including riparian areas, grassland, and woodland." [A disturbance-adapted weed with negative environmental impacts. See 3.04]</p>

303	Agricultural/forestry/horticultural weed	
	Source(s)	Notes
	<p>Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall</p>	<p>[Possibly, although impacts on natural environment are typically reported. See 3.04] "Weed of: Cucurbits/Melons, Orchards & Plantations, Pastures, Vegetables"</p>

304	Environmental weed	y
	Source(s)	Notes

Qsn #	Question	Answer
	BioNET-EAFRINE. 2011. <i>Nicotiana glauca</i> (Tree Tobacco). https://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Nicotiana_glauca_(Tree_Tobacco).htm . [Accessed 7 Aug 2018]	" <i>Nicotiana glauca</i> poses a threat to biodiversity by competing with native species for resources and displacing native plants. All parts of the plant are poisonous. <i>N. glauca</i> has been included in the Global Invasive Species Database (GISD 2010). It has been listed as a noxious weed in South Africa (prohibited plants that must be controlled. They serve no economic purpose and possess characteristics that are harmful to humans, animals or the environment)."
	Weber, E. 2003. <i>Invasive Plant Species of the World. A Reference Guide to Environmental Weeds</i> . CABI Publishing, Wallingford, UK	"Riverbanks, desert scrub, arid grassland, coastal beaches, rocky places. A drought resistant plant that grows in a wide range of conditions, either as a stunted shrub or as a tree. The vigorous growth leads to dense pure stands that crowd out native species and prevent natural regeneration. The large leaves shade out all vegetation below its canopies. Little is known on the ecology of this shrub"
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. <i>Weed Control in Natural Areas in the Western United States</i> . Weed Research and Information Center, University of California, Davis, CA	"Tree tobacco grows rapidly and forms dense stands. It displaces native vegetation used by wildlife and contributes to bank erosion and flooding. Large infestations can decrease water flow and reduce recreational uses. Tree tobacco is toxic to humans and animals."

305	Congeneric weed	
	Source(s)	Notes
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	" <i>Nicotiana bigelovii</i> ... Weed of: Cotton, Cucurbits/Melons, Orchards & Plantations, Vegetables" ... " <i>Nicotiana plumbaginifolia</i> ... Weed of: Cereals, Orchards & Plantations, Vegetables" ... " <i>Nicotiana tabacum</i> ... Weed of: Cereals" ... " <i>Nicotiana trigonophylla</i> ... Weed of: Grapevines"

401	Produces spines, thorns or burrs	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.	[No evidence] "Shrubs or small spindly trees, glabrous except for corolla tube. Leaves simple, alternate, glaucous, ovate to ovate-lanceolate, often 4-10 cm long, 2-8 cm wide, glabrous, margins entire, apex obtuse to broadly acuminate, base obtuse, petioles terete, 1-6 cm long."

402	Allelopathic	
	Source(s)	Notes
	Florentine, S. K., & Westbrooke, M. E. (2005). Invasion of the noxious weed <i>Nicotiana glauca</i> R. Graham after an episodic flooding event in the arid zone of Australia. <i>Journal of Arid Environments</i> , 60(4), 531-545	[Leachates may be allelopathic] "We investigated (i) the distribution of <i>Nicotiana glauca</i> in relation to the 1997 flooding event (ii) the variation in density of <i>N. glauca</i> soil-stored seed between soil in control and enclosure plots (iii) the allelopathic effects of <i>N. glauca</i> on germination of <i>Lactuca sativa</i> seeds." ... "Leachates obtained from dry leaves and twigs had a significantly greater negative impact (p40.001) on germination of <i>L. sativa</i> seeds than leachates obtained from fresh leaves and bark."

403	Parasitic	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.	"Shrubs or small spindly trees, glabrous except for corolla tube." [Solanaceae. No evidence]

404	Unpalatable to grazing animals	y
	Source(s)	Notes
	Florentine, S. K., Westbrooke, M. E., Gosney, K., Ambrose, G., & O'Keefe, M. (2006). The arid land invasive weed <i>Nicotiana glauca</i> R. Graham (Solanaceae): Population and soil seed bank dynamics, seed germination patterns and seedling response to flood and drought. <i>Journal of Arid Environments</i> , 66(2), 218-230	"The species is usually avoided, as it is unpalatable. However, during drought, when food resources are scarce, livestock may consume the plant and die (Cunningham et al., 1981)."
	Merlin, M. D., & Juvik, J. O. (1992). Relationships among native and alien plants on Pacific islands with and without significant human disturbance and feral ungulates. Pp. 597-624 in Stone, C.P., Smith, C.W. & Tunison, J.T. (eds.). <i>Alien Plant Invasions in Native Ecosystems of Hawai'i: Management and Research</i> . University of Hawaii CPSU, Honolulu, HI	"Tree tobacco" (<i>Nicotiana glauca</i>), now found in severely eroded areas, is also resistant to ungulates (Fig. 4). Toxic substances produced by this tree generally discourage feral goat browsing." ... "Figure 4. The central plateau of Kaho'olawe has been stripped of both vegetation and soil under the impact of almost two centuries of large domestic and feral ungulate populations. The alien "tree tobacco" (<i>Nicotiana glauca</i>) has survived the intense browse pressure by virtue of its unpalatable (toxic) leaves, a defense mechanism generally lacking in native Hawaiian plants"

405	Toxic to animals	y
	Source(s)	Notes
	Quattrocchi, U. 2012. <i>CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	"Leaves and flowers poisonous, highly toxic, may be fatal if eaten. A topical analgesic, anesthetic, vulnerary, vesicant, antirheumatic, antihemorrhoidal. For ticks and chest colds. Anabasine is the major alkaloid of <i>Nicotiana glauca</i> , in the southern United States, and it has caused teratogenic problems in calves, sheep, and swine. Aphicide"
	Plumlee, K. H., Holstege, D. M., Blanchard, P. C., Fiser, K. M., & Galey, F. D. (1993). <i>Nicotiana glauca</i> toxicosis of cattle. <i>Journal of Veterinary Diagnostic Investigation</i> , 5(3), 498-499	" <i>Nicotiana glauca</i> (tree tobacco) is a small tree or shrub found in low-elevation areas of Arizona and California. ³ This plant contains anabasine and nicotine, which are related pyridine alkaloids that can cause death or act as teratogens when ingested. ¹ A case of <i>Nicotiana glauca</i> toxicosis in a herd of cattle is reported here."
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. <i>Handbook of Hawaiian Weeds</i> . University of Hawaii Press, Honolulu, HI	"Poisonous to man and livestock."
	Florentine, S. K., Westbrooke, M. E., Gosney, K., Ambrose, G., & O'Keefe, M. (2006). The arid land invasive weed <i>Nicotiana glauca</i> R. Graham (Solanaceae): Population and soil seed bank dynamics, seed germination patterns and seedling response to flood and drought. <i>Journal of Arid Environments</i> , 66(2), 218-230	"Studies have demonstrated that <i>N. glauca</i> is highly toxic to humans (Mizrachi et al., 2000) and other animals (Panter et al., 2000). The species is usually avoided, as it is unpalatable. However, during drought, when food resources are scarce, livestock may consume the plant and die (Cunningham et al., 1981). The plant contains the alkaloid anabasine, which is considerably more toxic than nicotine (Sims et al., 1999). Panter et al. (2000) found that <i>N. glauca</i> causes defects in foetal goats and sheep if the mother does not die from consumption of the plant."

Qsn #	Question	Answer
406	Host for recognized pests and pathogens	y
	Source(s)	Notes
	Cho, J. J., Mau, R. F. L., Mitchell, W. C., Gonsalves, D., & Yudin, L. S. (1987). Host list of plants susceptible to tomato spotted wilt virus (TSWV). Research Extension Series 078. CTAHR, UH Manoa, Honolulu, HI	"In Hawaii, TSWV has seriously affected production of lettuce, tomato, and bell pepper in the major vegetable-production areas of the state." [N. glauca is a widespread alternate host]

407	Causes allergies or is otherwise toxic to humans	y
	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	"Nicotiana glauca ... Leaves and flowers poisonous, highly toxic, may be fatal if eaten. A topical analgesic, anesthetic, vulnerary, vesicant, antirheumatic, antihemorrhoidal. For ticks and chest colds. Anabasine is the major alkaloid of Nicotiana glauca, in the southern United States, and it has caused teratogenic problems in calves, sheep, and swine."
	Florentine, S. K., Westbrooke, M. E., Gosney, K., Ambrose, G., & O'Keefe, M. (2006). The arid land invasive weed <i>Nicotiana glauca</i> R. Graham (Solanaceae): Population and soil seed bank dynamics, seed germination patterns and seedling response to flood and drought. <i>Journal of Arid Environments</i> , 66(2), 218-230	"Studies have demonstrated that <i>N. glauca</i> is highly toxic to humans (Mizrachi et al., 2000) and other animals (Panter et al., 2000)."

408	Creates a fire hazard in natural ecosystems	
	Source(s)	Notes
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	[May increase fuel load if dense stands are formed. Unknown if fire risk is increased within invaded habitats] "Tree tobacco grows rapidly and forms dense stands. It displaces native vegetation used by wildlife and contributes to bank erosion and flooding. Large infestations can decrease water flow and reduce recreational uses." ... "Burning is also not considered to be an effective control method, as plants will resprout from the base."

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	Plants for a Future. (2018). <i>Nicotiana glauca</i> . https://pfaf.org/user/Plant.aspx?LatinName=Nicotiana+glauca . [Accessed 7 Aug 2018]	"It cannot grow in the shade."
	Dave's Garden. (2018). Tree Tobacco. <i>Nicotiana glauca</i> . https://davesgarden.com/guides/pf/go/51448/ . [Accessed 7 Aug 2018]	"Sun Exposure: Full Sun"
	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 high light environments] "naturalized in open, arid, disturbed sites,"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
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Qsn #	Question	Answer
	Source(s)	Notes
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Drought-tolerant and can survive under a wide range of growing conditions, but is most commonly found in sandy or gravelly soils along riparian areas, near cultivated areas, around old dwellings and ditch banks."
	Dave's Garden. (2018). Tree Tobacco. <i>Nicotiana glauca</i> . https://davesgarden.com/guides/pf/go/51448/ . [Accessed 7 Aug 2018]	"Soil pH requirements: 6.1 to 6.5 (mildly acidic) 6.6 to 7.5 (neutral) 7.6 to 7.8 (mildly alkaline)"
	Plants for a Future. (2018). <i>Nicotiana glauca</i> . https://pfaf.org/user/Plant.aspx?LatinName=Nicotiana+glauca . [Accessed 7 Aug 2018]	"Suitable for: light (sandy), medium (loamy) and heavy (clay) soils and prefers well-drained soil. Suitable pH: acid, neutral and basic (alkaline) soils."

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.	"Shrubs or small spindly trees, glabrous except for corolla tube."

412	Forms dense thickets	y
	Source(s)	Notes
	Ollerton, J., Watts, S., Connerty, S., Lock, J., Parker, L., Wilson, I., Schueller, S., Nattero, J., Cocucci, A. A., Izhaki, I., Geerts, S., Pauw, A. and Stout, J. C. (2012) Pollination ecology of the invasive tree tobacco <i>Nicotiana glauca</i> : comparisons across native and non-native ranges. <i>Journal of Pollination Ecology</i> . 9, pp. 85-95. 1920-7603	"In its native range, <i>Nicotiana glauca</i> usually forms dense stands only in disturbed sites with recent soil exposure, for example dry river beds and road sides (Nattero & Cocucci 2007). Outside of its native range <i>N. glauca</i> is clearly a successful invasive weed of disturbed areas where it forms dense, monodominant colonies because of the high rate of fruit and seed set, the viability of seeds and the frequent recruitment of seedlings into the population."
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Tree tobacco grows rapidly and forms dense stands. It displaces native vegetation used by wildlife and contributes to bank erosion and flooding. Large infestations can decrease water flow and reduce recreational uses."

501	Aquatic	n
	Source(s)	Notes
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"A common weed in lowland pastures, along roadsides and in coral fills or sandy places."
	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] "Shrubs or small spindly trees... naturalized in open, arid, disturbed sites"

502	Grass	n
	Source(s)	Notes

Qsn #	Question	Answer
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 7 Aug 2018]	Family: Solanaceae Subfamily: Nicotianoideae
503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 7 Aug 2018]	Family: Solanaceae Subfamily: Nicotianoideae
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	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.	"Shrubs or small spindly trees, glabrous except for corolla tube."
601	Evidence of substantial reproductive failure in native habitat	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] "Native to Argentina, now widely naturalized in warm temperate regions of the world"
602	Produces viable seed	y
	Source(s)	Notes
	Florentine, S. K., & Westbrooke, M. E. (2005). Invasion of the noxious weed <i>Nicotiana glauca</i> R. Graham after an episodic flooding event in the arid zone of Australia. <i>Journal of Arid Environments</i> , 60(4), 531-545	"Flowering commences approximately one year after germination and a fully-grown plant can produce 10,000–1,000,000 seeds."
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Plants reproduce only by seed. An individual tree can produce 10,000 to 1,000,000 seeds per year with viability approaching 100%."
	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.	"Seeds numerous, reniform to oblong-reniform, 0.5-0.9 mm long, testa honeycombed or with wrinkles. Self-compatible"
603	Hybridizes naturally	
	Source(s)	Notes
	WRA Specialist. 2018. Personal Communication	Unknown. No evidence found

Qsn #	Question	Answer
604	Self-compatible or apomictic	y
	Source(s)	Notes
	Nattero, J., & Cocucci, A. A. (2007). Geographical variation in floral traits of the tree tobacco in relation to its hummingbird pollinator fauna. <i>Biological Journal of the Linnean Society</i> , 90(4), 657-667	" <i>Nicotiana glauca</i> individuals are tall shrubs, 1–4 m in height, with dense inflorescences distributed all over the plants, each one having dozens of flowers opening at the same time. Plants are self fertile, but do not always self-pollinate spontaneously because anthers may be at the same or at a lower level than the stigma."
	Schueller, S. K. (2004). Self-pollination in island and mainland populations of the introduced hummingbird-pollinated plant, <i>Nicotiana glauca</i> (Solanaceae). <i>American Journal of Botany</i> , 91(5), 672-681	"Self-compatibility—Fruit set did not differ between self- and outcross-pollinated flowers ... nor did sites differ in treatment effects (treatment-site interaction: ... indicating that both mainland and island populations of <i>N. glauca</i> are self-compatible."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Schueller, S. K. (2004). Self-pollination in island and mainland populations of the introduced hummingbird-pollinated plant, <i>Nicotiana glauca</i> (Solanaceae). <i>American Journal of Botany</i> , 91(5), 672-681	" <i>Nicotiana glauca</i> Graham (tree tobacco, Solanaceae) is a cosmopolitan bird-pollinated plant native to Argentina (Goodspeed, 1954; Hernandez, 1981)." ... " <i>Nicotiana glauca</i> is hummingbird-pollinated (Woods, 1927; Stiles, 1973; Russell, 1996; Mitchell, 2000), and hummingbirds were present on the Channel Islands well before the initial colonization of <i>N. glauca</i> (Johnson, 1972). Thus, pollinator scarcity due to an absence of required pollinators is not a factor in this species."
	Geerts, S., & Pauw, A. (2009). African sunbirds hover to pollinate an invasive hummingbird-pollinated plant. <i>Oikos</i> , 118(4), 573-579	"Why do hummingbirds hover while Old World nectar-feeding birds perch? A unique opportunity to explore this question is presented by the invasion into Africa of a plant adapted for pollination by hovering hummingbirds. Like other hover-pollinated plants of the New World, the flowers of the tree tobacco <i>Nicotiana glauca</i> lack perches and are oriented towards open space. We find that Old World nectarivores, especially the malachite sunbird, <i>Nectarinia famosa</i> , hover 80% of the time when taking nectar from these flowers. They hover for up to 30 s, and are able to sustain this hovering lifestyle in an area where native nectar plants are absent. <i>Nicotiana glauca</i> greatly increases the local abundance of sunbirds compared with uninvaded areas. In turn, flowers visited by sunbirds formed significantly more capsules and set significantly more seed than sunbird-excluded flowers, possibly facilitating the invasion. The results suggest a prominent role for plant, rather than bird traits in determining the occurrence of hover-pollination, begging the question of why plants adapted for hover pollination do not occur outside the New World."
	Ollerton, J., Watts, S., Connerty, S., Lock, J., Parker, L., Wilson, I., Schueller, S., Nattero, J., Cocucci, A. A., Izhaki, I., Geerts, S., Pauw, A. and Stout, J. C. (2012) Pollination ecology of the invasive tree tobacco <i>Nicotiana glauca</i> : comparisons across native and non-native ranges. <i>Journal of Pollination Ecology</i> . 9, pp. 85-95. 1920-7603	[Does not require hummingbirds for pollination] "We conclude that <i>Nicotiana glauca</i> is a successful invasive species outside of its native range, despite its functionally specialised hummingbird pollination system, because it has evolved to become more frequently self pollinating in areas where it is introduced. Its invasion success is not predictable from what is known of its interactions with pollinators in its home range."

606	Reproduction by vegetative fragmentation	n
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Qsn #	Question	Answer
	Source(s)	Notes
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Plants reproduce only by seed. An individual tree can produce 10,000 to 1,000,000 seeds per year with viability approaching 100%."

607	Minimum generative time (years)	1
	Source(s)	Notes
	Florentine, S. K., & Westbrooke, M. E. (2005). Invasion of the noxious weed <i>Nicotiana glauca</i> R. Graham after an episodic flooding event in the arid zone of Australia. <i>Journal of Arid Environments</i> , 60(4), 531-545	"Flowering commences approximately one year after germination and a fully-grown plant can produce 10,000–1,000,000 seeds."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	Notes
	Florentine, S. K., Westbrooke, M. E., Gosney, K., Ambrose, G., & O’Keefe, M. (2006). The arid land invasive weed <i>Nicotiana glauca</i> R. Graham (Solanaceae): Population and soil seed bank dynamics, seed germination patterns and seedling response to flood and drought. <i>Journal of Arid Environments</i> , 66(2), 218-230	[Unknown. Occurs in heavily trafficked areas, so small size may facilitate dispersal] "The most effective mode of long-distance seed dispersal is through hydrochory. <i>N. glauca</i> is found in open and disturbed areas including wastelands, roadsides and creek lines (Boylard et al., 1985)."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Ollerton, J., Watts, S., Connerty, S., Lock, J., Parker, L., Wilson, I., Schueller, S., Nattero, J., Cocucci, A. A., Izhaki, I., Geerts, S., Pauw, A. and Stout, J. C. (2012) Pollination ecology of the invasive tree tobacco <i>Nicotiana glauca</i> : comparisons across native and non-native ranges. <i>Journal of Pollination Ecology</i> . 9, pp. 85-95. 1920-7603	"This paper focuses on the invasive tree tobacco <i>Nicotiana glauca</i> Graham (Solanaceae), a native of central and north west Argentina and Bolivia (Goodspeed 1954) which has been widely introduced to the subtropics as a garden ornamental, only to escape and densely colonise native habitats across the globe"

Qsn #	Question	Answer
703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Animals, Livestock, Sheep, Water, Escapee"
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"The minute seeds (0.6 mm long) are chiefly spread by water movement; however, animals also serve as dispersal agents."
	Florentine, S. K., Westbrooke, M. E., Gosney, K., Ambrose, G., & O'Keefe, M. (2006). The arid land invasive weed <i>Nicotiana glauca</i> R. Graham (Solanaceae): Population and soil seed bank dynamics, seed germination patterns and seedling response to flood and drought. <i>Journal of Arid Environments</i> , 66(2), 218-230	"The most effective mode of long-distance seed dispersal is through hydrochory."

704	Propagules adapted to wind dispersal	
	Source(s)	Notes
	Florentine, S. K., Westbrooke, M. E., Gosney, K., Ambrose, G., & O'Keefe, M. (2006). The arid land invasive weed <i>Nicotiana glauca</i> R. Graham (Solanaceae): Population and soil seed bank dynamics, seed germination patterns and seedling response to flood and drought. <i>Journal of Arid Environments</i> , 66(2), 218-230	"The most effective mode of long-distance seed dispersal is through hydrochory (Horton, 1985)."
	Parolin, P. (2006). Ombrohydrochory: Rain-operated seed dispersal in plants—With special regard to jet-action dispersal in Aizoaceae. <i>Flora-Morphology, Distribution, Functional Ecology of Plants</i> , 201(7), 511-518	[Wind may shake capsules & aid in release of seeds. Long distance dispersal is by water] "Also in <i>Nicotiana glauca</i> (Brandes, 2002) the big shrubs are able to produce about 10,000 to 1 Mio very small seeds which fall out of the fruit by shaking through wind or animals. Only with the aid of running water get these seeds dispersed over long-distances – a very effective method as shown by the efficient colonization strategy of this weed (Brandes, 2002)."

705	Propagules water dispersed	y
	Source(s)	Notes
	Florentine, S. K., Westbrooke, M. E., Gosney, K., Ambrose, G., & O'Keefe, M. (2006). The arid land invasive weed <i>Nicotiana glauca</i> R. Graham (Solanaceae): Population and soil seed bank dynamics, seed germination patterns and seedling response to flood and drought. <i>Journal of Arid Environments</i> , 66(2), 218-230	"The most effective mode of long-distance seed dispersal is through hydrochory (Horton, 1985). This species is found in open and disturbed areas, including wastelands, roadsides and creek lines (Horton, 1985). Cunningham et al. (1981) reported that in Australian arid and semi-arid landscapes, extensive stands of <i>N. glauca</i> may persist on stream floodplains and drainage channels after summer floods for some years."

Qsn #	Question	Answer
706	Propagules bird dispersed	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. Not fleshy-fruited] "Capsules ovoid-ellipsoid to nearly subglobose, equalling or shorter than calyx, 7-13 mm long. Seeds numerous, reniform to oblong-reniform, 0.5-0.9 mm long, testa honeycombed or with wrinkles."

707	Propagules dispersed by other animals (externally)	
	Source(s)	Notes
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"The minute seeds (0.6 mm long) are chiefly spread by water movement; however, animals also serve as dispersal agents." [Possibly yes. Small seed size may facilitate attachment, if stuck in soil or fur]
	Parolin, P. (2006). Ombrohydrochory: Rain-operated seed dispersal in plants—With special regard to jet-action dispersal in Aizoaceae. <i>Flora-Morphology, Distribution, Functional Ecology of Plants</i> , 201(7), 511-518	[Animals may shake capsules & aid in release of seeds. Long distance dispersal is by water] "Also in <i>Nicotiana glauca</i> (Brandes, 2002) the big shrubs are able to produce about 10,000 to 1 Mio very small seeds which fall out of the fruit by shaking through wind or animals. Only with the aid of running water get these seeds dispersed over long-distances – a very effective method as shown by the efficient colonization strategy of this weed (Brandes, 2002)."

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	Florentine, S. K., Westbrooke, M. E., Gosney, K., Ambrose, G., & O'Keefe, M. (2006). The arid land invasive weed <i>Nicotiana glauca</i> R. Graham (Solanaceae): Population and soil seed bank dynamics, seed germination patterns and seedling response to flood and drought. <i>Journal of Arid Environments</i> , 66(2), 218-230	[Unknown if seeds survive gut passage, but internal dispersal, if seeds do survive, would be a rare event due to unpalatability of plant] "The species is usually avoided, as it is unpalatable. However, during drought, when food resources are scarce, livestock may consume the plant and die (Cunningham et al., 1981)."

801	Prolific seed production (>1000/m2)	y
	Source(s)	Notes
	Florentine, S. K., Westbrooke, M. E., Gosney, K., Ambrose, G., & O'Keefe, M. (2006). The arid land invasive weed <i>Nicotiana glauca</i> R. Graham (Solanaceae): Population and soil seed bank dynamics, seed germination patterns and seedling response to flood and drought. <i>Journal of Arid Environments</i> , 66(2), 218-230	"Flowering commences approximately 1 year after germination and a fully grown plant can produce 10,000–1,000,000 seeds."
	Florentine, S. K., & Westbrooke, M. E. (2005). Invasion of the noxious weed <i>Nicotiana glauca</i> R. Graham after an episodic flooding event in the arid zone of Australia. <i>Journal of Arid Environments</i> , 60(4), 531-545	"The soil-stored seed study revealed that larger numbers of <i>N. glauca</i> seeds were recovered from the flooded open plot (1936 ± 968) than in flooded fenced plots (856 ± 428.12) but none was found in the control plots."

802	Evidence that a persistent propagule bank is formed (>1 yr)	

Qsn #	Question	Answer
	Source(s)	Notes
	Royal Botanic Gardens Kew. (2018) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/ . [Accessed 7 Aug 2018]	[Possibly Yes. Orthodox storage] "Storage Behaviour: Orthodox Storage Conditions: Seeds maintained for 3-4 years in commercial storage conditions (Priestley, 1986); long-term storage under IPGRI preferred conditions at RBG Kew, WP. Oldest collection 11 years; average germination change 100 to 98%, mean storage period 10 years, 2 collections"
	Florentine, S. K., & Westbrooke, M. E. (2005). Invasion of the noxious weed <i>Nicotiana glauca</i> R. Graham after an episodic flooding event in the arid zone of Australia. <i>Journal of Arid Environments</i> , 60(4), 531-545	[Present in seed bank, but longevity unknown] "The soil-stored seed study revealed that larger numbers of <i>N. glauca</i> seeds were recovered from the flooded open plot (1936 ± 968) than in flooded fenced plots (856 ± 428.12) but none was found in the control plots." ... "Although our study shows that a large quantity of seed is stored in the soil, the dynamics and longevity of small seed is unknown. From the methodology used here it cannot be said whether seeds germinated from the soil seed bank are transient (seeds germinate soon after they are shed) or persistent (seeds can remain dormant in the soil for several years (Thompson and Grime, 1979; Simpson et al., 1989))."

803	Well controlled by herbicides	y
	Source(s)	Notes
	Cronk, Q.C.B. & Fuller, J.L. 2013. <i>Plant Invaders: The Threat to Natural Ecosystems</i> . Earthscan, New York, NY	"In South Africa the plants are cut and stumps treated with 2,4,5-T"
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. <i>Weed Control in Natural Areas in the Western United States</i> . Weed Research and Information Center, University of California, Davis, CA	Chemical control by herbicides such as triclopyr, imazapyr or glyphosate is effective for controlling <i>N. glauca</i>

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. <i>Weed Control in Natural Areas in the Western United States</i> . Weed Research and Information Center, University of California, Davis, CA	[Resprouts after cutting or fire without herbicide treatment] "Hand pulling can remove seedlings and small saplings. For larger established shrubs, a weed wrench or other woody weed extractor can be used. Care must be taken to extract the entire root or stump sprouting will occur." ... "Cutting tree tobacco off before it flowers will reduce seed production and deplete the plant's energy reserves. Resprouts are common after treatment. Cutting at the end of the dry season can help reduce resprouting from the root crown. Cutting should be combined with an herbicide treatment or with multiple cuttings over a period of years. Cut trees at ground level with power or manual saws." ... "Burning is also not considered to be an effective control method, as plants will resprout from the base."

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

Qsn #	Question	Answer
	<p>Rubinoff, D., & San Hose, M. (2010). Life history and host range of Hawaii's Endangered Blackburn's Sphinx Moth (<i>Manduca blackburni</i> Butler). <i>Proceedings of the Hawaiian Entomological Society</i> 42: 53-59</p>	<p>[Blackburn's sphinx moth larvae feed on but do not control <i>N. glauca</i>] "<i>Manduca blackburni</i>, the Blackburn's sphinx moth (BSM), is Hawaii's largest endemic insect." ... "BSM larvae are known to readily feed on the widespread, invasive tobacco weed, <i>Nicotiana glauca</i>. This weed would seem to provide an abundant and resilient host, and in some areas, it may be the main host plant used by BSM larvae. Yet, the range of <i>N. glauca</i> across Hawaii far exceeds that of the moth and includes all the islands from which BSM has disappeared, suggesting the influence of other factors, besides host plant availability, in BSM's decline."</p>
	<p>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.</p>	<p>[No evidence of effective control] "in Hawai'i naturalized in open, arid, disturbed sites, 3-350 m, on O'ahu, Lana'i, Maui, and Kaho'olawe."</p>
	<p>Merlin, M. D., & Juvik, J. O. (1992). Relationships among native and alien plants on Pacific islands with and without significant human disturbance and feral ungulates. Pp. 597-624 in Stone, C.P., Smith, C.W. & Tunison, J.T. (eds.). <i>Alien Plant Invasions in Native Ecosystems of Hawai'i: Management and Research</i>. University of Hawaii CPSU, Honolulu, HI</p>	<p>[Persists in areas where all other plants have been eliminated] "Tree tobacco" (<i>Nicotiana glauca</i>), now found in severely eroded areas, is also resistant to ungulates (Fig. 4). Toxic substances produced by this tree generally discourage feral goat browsing." ... "Figure 4. The central plateau of Kaho`olawe has been stripped of both vegetation and soil under the impact of almost two centuries of large domestic and feral ungulate populations. The alien "tree tobacco" (<i>Nicotiana glauca</i>) has survived the intense browse pressure by virtue of its unpalatable (toxic) leaves, a defense mechanism generally lacking in native Hawaiian plants"</p>

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Thrives in tropical climates
- Naturalize on Oahu, Lanai, Maui, Kahoolawe, Molokai, & Hawaii (Hawaiian Islands) & widely naturalized elsewhere
- Regarded as an environmental weed (but primarily a weed of disturbed sites in Hawaiian Islands)
- Toxic to animals & people
- Unpalatable to animals
- Host of plant pathogens
- Tolerates many soil types
- Forms dense stands
- Reproduces by seeds
- Self-compatible
- Reaches maturity in 1 year
- Seeds dispersed by water, facilitated by wind & animals & intentionally by people
- Prolific seed production (>1000/m²)
- Resprouts after cutting & fire
- No effective natural enemies present in Hawaiian Islands

Low Risk Traits

- Primarily a weed of disturbed habitats in Hawaiian Islands
- Unarmed (no spines, thorns or burrs)
- Importance alternate host for the endangered Blackburn's sphinx moth (*Manduca blackburni*)
- Ornamental uses
- Restricted to sunny, high light environments
- Not reported to spread vegetatively
- Herbicides provide effective control