Taxon: Cordia alliodora (Ruiz & Pav.) Oken **Family:** Boraginaceae

Common Name(s): cypre
Ecuador laurel
salmwood
Spanish elm

Synonym(s): Cerdana alliodora Ruiz & Pav.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 28 Jul 2019

WRA Score: 11.0 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Tropical Tree, Environmental Weed, Pure Stands, 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		
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic	y=1, n=0	n
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems		

Qsn #	Question	Answer Option	Answer
409	Is a shade tolerant plant at some stage of its life cycle		
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic	y=1, n=-1	n
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation		
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	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	y
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Trial results clearly show the potential for increased production of C. alliodora, through utilization of the most productive provenances as the basis for tree improvement programmes." [Breeding research has been conducted, but no evidence of extreme modification through domestication]

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

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

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**High**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"C. alliodora is the most widespread species in the genus, occurring naturally from northern Mexico through Central and South America to Paraguay, southern Brazil and northern Argentina (27°N-25°S; Boshier and Lamb, 1997). C. alliodora is also found on most of the Caribbean Islands from Cuba to Trinidad, but is almost certainly not native to Jamaica (Johnston, 1950). As a successful colonizer of disturbed sites after forest clearance, its numbers have undoubtedly increased under human influence."
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 25 Jul 2019]	"Native Northern America NORTHERN MEXICO: Mexico [Sinaloa] SOUTHERN MEXICO: Mexico [Guerrero, Jalisco, Michoacán de Ocampo, Oaxaca, Tabasco, Veracruz de Ignacio de la Llave] Southern America CARIBBEAN: Antigua and Barbuda, [Antigua] Cuba, Dominica, Dominican Republic, Guadeloupe, Haiti, Martinique, Montserrat, St. Vincent and Grenadines, [Saint Vincent] United States, [Puerto Rico, Virgin Islands, U.S.] Virgin Islands (British) CENTRAL AMERICA: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama NORTHERN SOUTH AMERICA: French Guiana, Guyana, Suriname, Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Bolivia, Colombia, Ecuador, Peru"

Qsn #	Question	Answer
202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 25 Jul 2019]	

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Throughout its native range C. alliodora occurs under a wide variety of ecological conditions, varying from very wet (as much as 6000 mm precipitation per year) to seasonally dry (as low as 600 mm precipitation and seven months dry season per year), and from sea level to as high as 1400 masl in Central America and 2,000 masl at lower latitudes in Colombia. The best growth occurs on well-drained, medium-textured soils where the mean annual rainfall exceeds 2000 mm and the mean annual temperature is about 24°C. Under drier conditions growth is slower, while stem and crown form are poorer. Climatic amplitude (estimates) - Altitude range: 0 - 2000 m - Mean annual rainfall: 600 - 6000 mm - Rainfall regime: summer; bimodal; uniform - Dry season duration: 0 - 6 months - Mean annual temperature: 18 - 27ºC - Mean maximum temperature of hottest month: 20 - 33ºC - Mean minimum temperature of coldest month: 14 - 22ºC - Absolute minimum temperature: > 5ºC"

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 25 Jul 2019]	"Native Northern America NORTHERN MEXICO: Mexico [Sinaloa] SOUTHERN MEXICO: Mexico [Guerrero, Jalisco, Michoacán de Ocampo, Oaxaca, Tabasco, Veracruz de Ignacio de la Llave] Southern America CARIBBEAN: Antigua and Barbuda, [Antigua] Cuba, Dominica, Dominican Republic, Guadeloupe, Haiti, Martinique, Montserrat, St. Vincent and Grenadines, [Saint Vincent] United States, [Puerto Rico, Virgin Islands, U.S.] Virgin Islands (British) CENTRAL AMERICA: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama NORTHERN SOUTH AMERICA: French Guiana, Guyana, Suriname, Venezuela BRAZIL: Brazil WESTERN SOUTH AMERICA: Bolivia, Colombia, Ecuador, Peru Cultivated (also cult.) Naturalized Pacific SOUTHWESTERN PACIFIC: Samoa, Tonga, Vanuatu Southern America WESTERN SOUTH AMERICA: Ecuador [Galápagos]"
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Throughout its native range C. alliodora occurs under a wide variety of ecological conditions, varying from very wet (as much as 6000 mm precipitation per year) to seasonally dry (as low as 600 mm precipitation and seven months dry season per year), and from sea level to as high as 1400 masl in Central America and 2,000 masl at lower latitudes in Colombia."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"C. alliodora has been introduced to a large number of countries in species and provenance trials (e.g. Stead, 1980). Outside of its native range, however, it has only been planted to any extent in Vanuatu."
	Bakeo, R. and Qarani, F. (2003). Country report on the forestry invasive species situation in Vanuatu. Pp. 130-136 in P. McKenzie, C. Brown, S. Jianghua and W. Jian (eds). The unwelcome guests: Proceedings of the Asia-Pacific Forest Invasive Species Conference. Kunming, Yunnan Province, China 17 - 23 August 2003	"Of all invasive plants in Vanuatu, perhaps the most widely cited pest is Cordia alliodora (Ecuador laurel or salmwood). Introduced as a forestry tree to Vanuatu in the 1970s, this species has now become dominant and is considered a serious pest in locations where it was planted. Planting trials were initiated on the islands of Santo, Vanua Lava, Mota Lava, Ureparapara, Malekula, Ambae, Maewo, Pentecost, Efate, Epi and Eromango. These are the major islands of Vanuatu...It is becoming a nuisance as it slowly penetrates natural forests. It is a species that is multiplying at a faster rate than it is being harvested. Communities on a number of islands, particularly, Eromango and Maewo, have made formal complaints. Cordia alliodora is widely distributed meaning that if unchecked it could trigger an immense biodiversity problem."

Qsn #	Question	Answer
	Richardson, D. M., Binggeli, P. and Schroth, G. (2004). Invasive agroforestry trees: problems and solutions. Pp. 371- 396 in G. Schroth et al. (eds.). Agroforestry and biodiversity conservation in tropical landscapes. Island Press, Washington, D.C.	"Some tree and shrub species that are widely used in AF are among the most widespread and damaging plant invaders, including Acacia karroo, Acacia seyal, Balanites aegyptiaca, Calliandra calothyrsus, Cordia alliodora, Gliricidia sepium, Leucaena spp., Parkia biglobosa, Prosopis spp., and Vitellaria paradoxa syn. Butyrospermum paradoxum. Some species that were deemed safe even a decade ago are now known to be invasive."
	Richardson, D. M. (1998). Forestry trees as invasive aliens. Conservation biology, 12(1), 18-26	"Two of these (Cedrela odorata and Cordia alliodora) were introduced for timber, one for its fruits (Psidium guajava), and one for quinine (Cinchona succirubra)."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Space, J.C. & Flynn, T. 2002. Report to the Government of Samoa on invasive plant species of environmental concern. USDA Forest Service, Honolulu, HI	"Cordia alliodora (kotia, Ecuador laurel, salmwood) was introduced to Samoa as a forestry tree. It was similarly introduced into Vanuatu and has become a pest there (Tolfts, 1997) as well as in Tonga. It is spreading where it is present in Samoa and will, over time, undoubtedly become a major component of Samoa's forests."
	Edward, E., Munishi, P., & Hulme, P. (2009). Relative Roles of Disturbance and Propagule Pressure on the Invasion of Humid Tropical Forest by Cordia alliodora (Boraginaceae) in Tanzania. Biotropica, 41(2), 171-178	"Given an annual population growth rate of ca 3.5 percent, equivalent to the population doubling every 20 yr, C. alliodora poses a significant threat to the East Usambaras as well as other humid forests where it is promoted for agroforestry."… "It has been widely planted in other tropical regions including Africa and, the Pacific region and has been reported to naturalize and/or become invasive in Vanuatu, Tonga, Samoa and the Galapagos islands (Haysom & Murphy 2003)."
	Oahu Army Natural Resource Program. (2010). Status Report for the Makua and Oahu Implementation Plans. PCSU, Schofield Barracks, HI	"Last year, Oahu Early Detection (OED) staff identified a potentially invasive tree, Cordia alliodora, at the beginning of the Board of Water Supply (BWS) road in Makaha Valley. The Makaha locality is one of only two known locations on Oahu (Waimea Valley is the other)." … "On 12 October 2009, OANRP and BWS staff conducted a survey of the C. alliodora infestation. The survey delineated the extent of the infestation, which centered around the Kaneaki Heiau. The infestation stretched up and down gulch from the heiau, as well as to the east of the heiau. Some plants are growing out of the heiau. The total size of the infestation is approximately 33.4 acres. While some of this area is sparsely populated with C. alliodora, portions of it contain very dense C. alliodora stands. No aerial surveys were conducted, but staff are confident that the core of the infestation was accurately mapped."
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 25 Jul 2019]	"Naturalized Pacific SOUTHWESTERN PACIFIC: Samoa, Tonga, Vanuatu Southern America WESTERN SOUTH AMERICA: Ecuador [Galápagos]"

Qsn #	Question	Answer
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"References: southeast Asia-W-191, Galpagos Islands-EW-257, Pacific-W-3, Pacific-E-621, Global-W-629, Global-N- 714, Ecuador-N-875, Tanzania-I-970, Africa-W-990, Gal pagos Islands-CN-1157, United States of America-Q-1197, Global- W-1324, Global-W-1376, Global-I-1404, New Caledonia-I-1507, Global-Q-1572, Global-CD-1611, East Africa-I-1723, United States of America-N-742, Honduras-W-1892, -I-, United States of America-N-2092, Argentina-W-1977, Bolivia-W-1977, Brazil-W-1977, Colombia-W-1977, Dominica-W-1977, Dominican Republic-W-1977, Ecuador-W- 1977, Fiji-W-1977, Haiti-W-1977, Kenya- W-1977, Micronesia (Federated States of)- W-1977, Samoa-W-1977, Tonga-W-1977, United Republic of Tanzania-W-1977, Vanuatu-W-1977, Venezuela-W-1977."
	Parker, J. (2019). BIISC Early Detection Botanist. Pers. Comm. 24 June	"Stenocarpus sinuatus … Cordia alliodora ... They were found at the same time naturalizing in Manuka SP." [First record of naturalization on Hawaii Island. Unpublished]
	Lau, A. and Frohlich, D. 2012. New plant records from O'ahu for 2009. Bishop Museum Occasional Papers 113: 7-26	"This collection of Cordia alliodora represents the first record of naturalization for this species in the state. it is unclear how the species was introduced to the area. it was locally common within a 200 m radius. individuals of varying sizes were seen, many established in deep shade, growing in riparian areas including in the bed of a seasonal stream, valley floors and slopes, as well as seedlings and saplings growing among the stones of a maintained heiau. it is also reported to be naturalized in Waimea Botanical Garden. Cordia alliodora can be distinguished by its oblong or lanceolate to elliptic leaf blades, 10–20 × 3–8 cm, stellate-pilose or glabrate on both surfaces; loosely-branched inflorescences, 10–30 cm across; cylindric, densely stellate-tomentose calyx, 4–6 mm long with 10 prominent ribs; white (drying to brown and persisting) corolla with lobes 5–7 mm long; and cylindrical fruit about 5 mm long, enveloped by the persistent corolla and calyx tube (Smith 1991). Material examined. O'AHU: Mākaha Valley, along road to Kāne'ākī Heiau, UTM 584242, 2376748. Mesic lowland secondary forest. Tree about 15 ft tall, branch nodes swollen and hollow, ant domatia. Fruits within a dry, persistent corolla which is both wind dispersed and buoyant. Species is very common within about 200 m radius, there may be more further up the valley. individuals of various sizes seen; grows to a height of 50–70 ft. Has been planted as a forestry species in Hawai'i (from Skolman.), 10 Feb 2009, OED 2009021001."

302	Garden/amenity/disturbance weed	
	Source(s)	**Notes**

Qsn #	Question	Answer
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Weediness: In Vanuatu, use of the young plantations for pasture, as was common practice under coconuts, with overgrazing in the dry season, left areas of bare soil ideal for regeneration of C. alliodora (Tolfts, 1997; Tschinkel, 1965). A mass of C. alliodora seedlings grew up, eliminating ground cover and spreading to neighbouring pastures where these were overgrazed. Only a very small area has been affected outside the plantations, but this is potentially an expensive problem for local cattle producers. Within its native range, C. alliodora is a successful colonizer of disturbed sites (e.g. pasture, coffee, cacao), sometimes forming monospecific stands. There is, however, no record of weediness, probably owing to the poorer soil conditions (nutrients, compaction etc.) into which it is dispersed. Given C. alliodora's ecological characteristics, its capacity to invade undisturbed closed forest habitats is probably limited. The restrictions in its use as an exotic are more likely to be related to its limitations as a plantation species rather than its potential as a weed." [A weed of disturbed areas with negative impacts on natural areas. See 3.04]

303	Agricultural/forestry/horticultural weed	n
	Source(s)	**Notes**
	BioNET-EAFRINE. (2011). Cordia alliodora (Salmwood). https://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cordia_alliodora_(Salmwood).htm. [Accessed 26 Jul 2019]	"Cordia alliodora grows occurs at forest edges and gaps."... "In areas where it was introduced for wood, Cordia alliodora multiplies much faster than it can be harvested; it outcompetes indigenous vegetation to become a problematic invasive species. It is moderately resistant to fire." [Most references cite this species as a plantation tree that escapes and invades adjacent lands. Answer is Yes to 3.04]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

304	Environmental weed	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Richardson, D. M., Binggeli, P. and Schroth, G. (2004). Invasive agroforestry trees: problems and solutions. Pp. 371- 396 in G. Schroth et al. (eds.). Agroforestry and biodiversity conservation in tropical landscapes. Island Press, Washington, D.C.	"Abstract: A preliminary assessment of the problem of plant invasions associated with agroforestry (AF) is presented and the terms of alien plant invasions such as alien plants, casual plants, naturalized plants, weeds, invasive plants, and transformer species are defined. The current knowledge of plant invasions that are the direct result of AF is fragmentary. Some tree and shrub species that are widely used in AF are among the most widespread and damaging plant invaders, including Acacia karroo, Acacia seyal, Balanites aegyptiaca, Calliandra calothyrsus, Cordia alliodora, Gliricidia sepium, Leucaena spp., Parkia biglobosa, Prosopis spp., and Vitellaria paradoxa syn. Butyrospermum paradoxum. Some species that were deemed safe even a decade ago are now known to be invasive. A thorough global survey of problems and the perspectives of interested and affected parties is urgently needed. Guidelines to reduce the problems must be reviewed at regular intervals. Biotechnology has been proposed as a way of reducing problems of invasiveness by controlling flowering and thereby reducing or eliminating seed production in forestry plantations. This approach may not be compatible with AF by small-scale producers, also considering the possible dependency on external seed suppliers and the poorly understood risks of genetic engineering."
	BioNET-EAFRINE. (2011). Cordia alliodora (Salmwood). https://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cordia_alliodora_(Salmwood).htm. [Accessed 26 Jul 2019]	"Cordia alliodora grows occurs at forest edges and gaps."... "In areas where it was introduced for wood, Cordia alliodora multiplies much faster than it can be harvested; it outcompetes indigenous vegetation to become a problematic invasive species. It is moderately resistant to fire."
	Richardson, D. M. (1998). Forestry trees as invasive aliens. Conservation biology, 12(1), 18-26	"In the Galapagos archipelago, for example, four alien trees are highly invasive in natural systems. Two of these (Cedrela odorata and Cordia alliodora) were introduced for timber, one for its fruits (Psidium guajava), and one for quinine (Cinchona succirubra)."
	Bakeo, R. and Qarani, F. (2003). Country report on the forestry invasive species situation in Vanuatu. Pp. 130-136 in P. McKenzie, C. Brown, S. Jianghua and W. Jian (eds). The unwelcome guests: Proceedings of the Asia-Pacific Forest Invasive Species Conference. Kunming, Yunnan Province, China 17 - 23 August 2003	"Of all invasive plants in Vanuatu, perhaps the most widely cited pest is Cordia alliodora (Ecuador laurel or salmwood). Introduced as a forestry tree to Vanuatu in the 1970s, this species has now become dominant and is considered a serious pest in locations where it was planted. Planting trials were initiated on the islands of Santo, Vanua Lava, Mota Lava, Ureparapara, Malekula, Ambae, Maewo, Pentecost, Efate, Epi and Eromango. These are the major islands of Vanuatu...It is becoming a nuisance as it slowly penetrates natural forests. It is a species that is multiplying at a faster rate than it is being harvested. Communities on a number of islands, particularly, Eromango and Maewo, have made formal complaints. Cordia alliodora is widely distributed meaning that if unchecked it could trigger an immense biodiversity problem."

305	Congeneric weed	y
	Source(s)	**Notes**
	Perrow, M. R. and Davy, A. J. (2002). Handbook of Ecological Restoration: Principles of Restoration. Cambridge University Press, Cambridge, UK	"Biological control of plants is more likely to succeed in constrained, isolated areas such as on oceanic islands. Cordia curassavica, one of the worst introduced weeds, has been effectively controlled on Mauritius."

Qsn #	Question	Answer
	CABI. (2019). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"C. obliqua is a perennial fastgrowing small tree included in the Global Compendium of Weeds (Randall, 2012). This species has been intentionally introduced throughout the tropics where it is cultivated mostly for its fruits. It produces yellow or pinkish-yellow shining drupes which are dispersed by birds and by humans when they consume its fruits. C. obliqua has been listed as invasive in Cuba and Puerto Rico where it is principally invading coastal areas, coastal hills, open forests, and thickets (Kairo et al., 2003; Oviedo Prieto et al., 2012; Rojas-Sandoval and Acevedo-Rodriguez, 2014). In Cuba it is listed as one of the 100 worst invasive species for the island and it is also considered an environmental transformer species (Oviedo Prieto et al., 2012)."
	Edward, E., Munishi, P., & Hulme, P. (2009). Relative Roles of Disturbance and Propagule Pressure on the Invasion of Humid Tropical Forest by Cordia alliodora (Boraginaceae) in Tanzania. Biotropica, 41(2), 171-178	"Given an annual population growth rate of ca 3.5 percent, equivalent to the population doubling every 20 yr, C. alliodora poses a significant threat to the East Usambaras as well as other humid forests where it is promoted for agroforestry."
	Fowler, S. V., Ganeshan, S., Mauremootoo, J., & Mungroo, Y. (2000). Biological Control of Weeds in Mauritius: Past Successes Revisited and Present Challenges. Pp. 43-50 in Neal R. Spencer [ed.].Proceedings of the X International Symposium on Biological Control of Weeds 4-14 July 1999, Montana State University, Bozeman, Montana	"The other fully successful weed biocontrol program in Mauritius targeted the woody shrub, black sage (Cordia curassavica) which, by the 1930s, was covering large tracts of the island in dense scrub. The first agent introduced from the native range of the target weed in the Caribbean was a chrysomelid beetle, Physonota alutacea, in 1947. Despite over 30,000 individuals being released as adults, larvae, or eggs, the insect failed to establish, possibly because of interference from ants (Williams 1950, Greathead 1971) A progressive feature of this program was the extensive host range testing of both this agent and the subsequently released chrysomelid Metrogaleruca obscura. For example, M. obscura was tested on 122 non target plant species in the beetle's native range in the Caribbean, and 86 non-target plant species after the importation of the beetle into confinement in Mauritius (Simmonds 1950, Williams 1951). Extensive ecological studies were also carried out on M. obscura. These included a study of the life history and natural enemies of M. obscura in Trinidad (Simmonds 1950), experiments using simulated herbivory to examine the effect of M. obscura on the seed production of C. curassavica (Callan 1948), and trials using field cages to show that M. obscura was capable of severely defoliating the host plant in the absence of natural enemies, particularly 2 species of parasitoids (Simmonds 1948). Historically, it is noteworthy that prior to the introduction of P. alutacea into Mauritius, a highly critical article was published in Nature suggesting that this attempt at biological control was misguided and ecologically dangerous (Maulik 1947)."

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Woodson, R., Schery, R., & Nowicke, J. (1969). Flora of Panama. Part IX. Family 167. Boraginaceae. Annals of the Missouri Botanical Garden, 56(1), 33-69	[No evidence] "Trees, to 20 m, stems and branches with stellate hairs, nodes swollen and inhabited by ants. Leaves alternate, ovate-elliptic, occasionally ovate, entire, acute or acute-mucronate, the bases obtuse or oblique, to 18 cm long and 8 cm wide, sparsely to densely covered with stellate hairs, especially on the undersurface; petioles to ca 3.5 cm long."

Qsn #	Question	Answer
402	**Allelopathic**	**n**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Despite features which are desirable for agroforestry uses (narrow open crown and self pruning), C. alliodora does not tolerate competition and requires wide spacings to achieve continued growth in plantations...Effective control of the high levels of weed growth under pure plantations is essential to achieve potential growth, but increases costs, although application of taungya methods of establishment has been shown to be effective in trials (Platen, 1996)." [No evidence, and weeds will grow under trees, suggesting it is not allelopathic]

403	**Parasitic**	**n**
	Source(s)	**Notes**
	Woodson, R., Schery, R., & Nowicke, J. (1969). Flora of Panama. Part IX. Family 167. Boraginaceae. Annals of the Missouri Botanical Garden, 56(1), 33-69	"Trees, to 20 m, stems and branches with stellate hairs, nodes swollen and inhabited by ants." [No evidence]

404	**Unpalatable to grazing animals**	
	Source(s)	**Notes**
	Greaves, A., & McCarter, P. S. (1990). Cordia alliodora: A Promising Tree for Tropical Agroforestry. Oxford Forestry Institute, University of Oxford, Oxford, UK	"Cattle-grazing under C. alliodora also showed promise. The bark appeared to be unpalatable to the animals and the trees were not damaged, provided they were old enough to avoid being trampled (Neil & Jacovelli, 1985)." [Palatability of foliage unspecified. The presence of this tree in pastures suggests the plant may be unpalatable to browsing and grazing animals]

405	**Toxic to animals**	**n**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	No evidence
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

406	**Host for recognized pests and pathogens**	
	Source(s)	**Notes**
	Hanum, I.F. & Van der Maesen, L.J.G. (eds.). 1997. PROSEA : Plant Resources of South-East Asia 11, Auxiliary Plants. Prosea Foundation, Bogor, Indonesia	"Diseases and pests The rust fungus Puccinia cordiae is economically damaging to C. alliodora in its natural range. Other diseases noted to cause damage are a root disease caused by Phellinus noxius and a stem canker caused by Corticium salmonicolor in Vanuatu."

Qsn #	Question	Answer
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Under high humidity conditions in its natural distribution, C. alliodora is susceptible to large stem cankers caused by the rust fungus Puccinia cordiae (Briton-Jones, 1930, Spaulding, 1961; Johnson and Morales, 1972). The cankers are usually confined to one side of the tree, but several may coalesce to girdle the stem, sometimes leading to stem snap and even death. In international provenance trials this stem canker was only prominent at a Costa Rican site; the Limón (Costa Rica) provenance being by far the worst affected, with over half of the surviving trees afflicted. All provenances were, however, affected to some degree(6-23% of trees), with the San Francisco provenance (Honduras) the least badly affected. The incidence of canker was highest in the areas of the trial with poorest soil conditions suggesting that trees under stress were more susceptible to attack. In Costa Rica attack by a mistletoe parasite is common; Phoradendron robustissimum being the most abundant species, causing deformation to the wood and sometimes death. Attempts to identify a herbicide (including 2,4-D, 2,4,5-T and MCP) that could be used systemically to control the mistletoe were unsuccessful (Echandi,1958)."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	**Notes**
	Salazar, R. & Jøker, D. (2000). Cordia alliodora (Ruiz & Pavón) Oken. Seed Leaflet No. 25. Danida Forest Seed Centre, Denmark	"Also used in agroforestry where it is grown with coffee and cocoa. Flowers and fruits are used in medicine and the leaves in ointments and tonics." [Medicinal uses, but no mention of toxicity]
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	No evidence
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	
	Source(s)	**Notes**
	Boshier, D.H. and Lamb, A.T. (eds.). (1997). Cordia alliodora. Genetics and Tree Improvement. Oxford Forestry Institute, University of Oxford, Oxford, UK	"It is, however, moderately fire resistant and able to compete in the dry forest where both crown competition and species diversity are more restricted." [If fire resistant, probably won't carry fire very well, but ability to form monocultures could potentially increase risk]

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"It will survive under light shade but full overhead light is necessary for full vigour, and on fertile sites the species is capable of rapid early growth. It falls into the ecological group of long lived, shade-intolerant trees, variously referred to as late secondary species, small gap specialists, or big pioneers."

Qsn #	Question	Answer
	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.	"Reaction to Competition- Silvicultural research of laurel is still in its infancy. Advances are being made as more countries recognize the value of laurel wood products and the species' potential for fast growth. Any silvicultural technique must consider that laurel is classed as an intolerant pioneer species, demanding lots of light for best growth."
	Lau, A. and Frohlich, D. 2012. New plant records from O'ahu for 2009. Bishop Museum Occasional Papers 113: 7-26	[Reported to be shade intolerant, but establishing in shaded areas on Oahu] "This collection of Cordia alliodora represents the first record of naturalization for this species in the state. it is unclear how the species was introduced to the area. it was locally common within a 200 m radius. individuals of varying sizes were seen, many established in deep shade, growing in riparian areas including in the bed of a seasonal stream, valley floors and slopes, as well as seedlings and saplings growing among the stones of a maintained heiau."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Hanum, I.F. & Van der Maesen, L.J.G. (eds.). 1997. PROSEA : Plant Resources of South-East Asia 11, Auxiliary Plants. Prosea Foundation, Bogor, Indonesia	"A range of soil types is tolerated. Fertile, freely-drained conditions are preferred. Growth on degraded soils and on sites with poor drainage is reduced. C. alliodora is particularly suitable for calcareous soils in the more humid tropics."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Soil and physiography C. alliodora will survive under a range of nutrient conditions, as is shown by its widespread occurrence on degraded and abandoned areas once used for pasture or shifting cultivation. The range extends from flat, coastal lowlands, having deep infertile sands and little organic matter (Entisols or Oxisols), as in Surinam (Vega, 1977), to very dissected mountainous uplands, with deep, fertile volcanic soils high in organic matter (Andepts), as in Colombia and Costa Rica (Salas, 1981). The species does not tolerate either poor internal drainage, soil compaction, water-logging or very acidic soils with high aluminium saturation (Centro Agronomico Tropicale de Investigación y Enseñanza,1994a). Soil descriptors - Soil texture: light; medium; heavy - Soil drainage: free - Soil reaction: acid; neutral - Soil types: alfisols; calcareous soils; ferralsols; ultisols; volcanic soils; alluvial soils"

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Woodson, R., Schery, R., & Nowicke, J. (1969). Flora of Panama. Part IX. Family 167. Boraginaceae. Annals of the Missouri Botanical Garden, 56(1), 33-69	"Trees, to 20 m, stems and branches with stellate hairs, nodes swollen and inhabited by ants."

412	Forms dense thickets	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"C. alliodora is a prolific seeder and regenerates easily, readily colonising exposed fertile soil, often being found following forest clearance, as pure stands of varying densities...Within its native range, C. alliodora is a successful colonizer of disturbed sites (e.g. pasture, coffee, cacao), sometimes forming monospecific stands. There is, however, no record of weediness, probably owing to the poorer soil conditions (nutrients, compaction etc.) into which it is dispersed."
	Greaves, A., & McCarter, P. S. (1990). Cordia alliodora: A Promising Tree for Tropical Agroforestry. Oxford Forestry Institute, University of Oxford, Oxford, UK	"The most abundant regeneration occurs on sites cleared by man. It is on such sites that extensive, almost pure stands are encountered. They may occur either as an early stage in secondary forest succession following logging or as an invasion of land cleared for agriculture."

501	Aquatic	n
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	[Terrestrial] "In lowland humid tropical regions, C. alliodora is generally a tall, thin tree, with a narrow, open crown, and shows minimal forking, forming a single stem to 15-20 m. Trees may reach a height of over 40 m, and a diameter at breast height (dbh) of over 1 m at overmaturity, although diameters of around 50 cm are more usual for mature trees (Somarriba and Beer, 1987). In seasonally dry deciduous and semi-deciduous forest, it is smaller and more poorly formed, rarely reaching more than 20 m in height and 30 cm dbh."

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 26 Jul 2019]	Family: Cordiaceae Alternate family(ies): Boraginaceae, Ehretiaceae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 26 Jul 2019]	Family: Cordiaceae Alternate family(ies): Boraginaceae, Ehretiaceae

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

Qsn #	Question	Answer
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"In lowland humid tropical regions, C. alliodora is generally a tall, thin tree, with a narrow, open crown, and shows minimal forking, forming a single stem to 15-20 m. Trees may reach a height of over 40 m, and a diameter at breast height (dbh) of over 1 m at overmaturity, although diameters of around 50 cm are more usual for mature trees (Somarriba and Beer, 1987). In seasonally dry deciduous and semi-deciduous forest, it is smaller and more poorly formed, rarely reaching more than 20 m in height and 30 cm dbh."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**
	Linsky, J. (2014). Cordia alliodora. The IUCN Red List of Threatened Species 2014: e.T56496514A56503971. http://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T56496514A56503971.en. [Accessed 26 Jul 2019]	"Cordia alliodora has a large native distribution from Mexico to northern South America, thus not qualifying for the threatened criteria based on geographic range. It is planted for use in construction and agroforestry and it grows naturally inside protected areas. It is not under any specific major threat has therefore been assessed as Least Concern."

602	Produces viable seed	y
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"C. alliodora is a prolific seeder and regenerates easily, readily colonising exposed fertile soil, often being found following forest clearance, as pure stands of varying densities...Although seed (40-100,000 seed per kg) is never in short supply, the timing of collection is critical to ensure high germination. "
	Hanum, I.F. & Van der Maesen, L.J.G. (eds.). 1997. PROSEA : Plant Resources of South-East Asia 11, Auxiliary Plants. Prosea Foundation, Bogor, Indonesia	"C. alliodora is readily propagated by seed or by stem cuttings. Timing of seed collection is important to ensure a high germination rate, generally up to 80%. Shaking of branches to allow mature seed with a high viability to drop is the best method. Viability of fresh seed decreases rapidly under natural conditions; dried to below 10% moisture it may be stored at 2°C for up to 10 years. Seed germinates in 5-20 days."

603	Hybridizes naturally	
	Source(s)	**Notes**
	Boshier, D.H. and Lamb, A.T. (eds.). (1997). Cordia alliodora. Genetics and Tree Improvement. Oxford Forestry Institute, University of Oxford, Oxford, UK	Unknown. No natural hybrids reported

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

Qsn #	Question	Answer
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"A strong incompatibility mechanism is evident in C. alliodora, there being two incompatibility groups, with roughly equal numbers of trees per group. Trees within each group are incompatible with one another, but are compatible with any tree from the other group. The incompatibility mechanism operates in the same way within and between families: selfing is prevented but related matings are not reduced in favour of unrelated matings (Boshier, 1995). Results from allozyme studies showed a high rate of outcrossing in natural stands (Boshier et al., 1995)."
	Boshier, D.H. and Lamb, A.T. (eds.). (1997). Cordia alliodora. Genetics and Tree Improvement. Oxford Forestry Institute, University of Oxford, Oxford, UK	"Flowers are heterostylous (i. e. style length is variable) and an incompatibility mechanism operates that prevents selfing and also crossing between some trees."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Boshier, D.H. and Lamb, A.T. (eds.). (1997). Cordia alliodora. Genetics and Tree Improvement. Oxford Forestry Institute, University of Oxford, Oxford, UK	"Flower morphology, in particular the presence of landing platforms. the production of nectar and observations of flower visitors. indicate insects as the principal pollination vector of C. alliodora." … "A range of species have been observed to pollinate C. alliodora, probably reflecting the preliminary nature of most studies and that for species with a prolonged flowering season. such as C. alliodora, different insects may act as pollinators during the season."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"In the Caribbean C. alliodora flowers are known to bee keepers as a major source of nectar (Crane et al., 1984) that give a viscous extra-white honey (Mulzac, 1979)."
	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 25 Jul 2019]	"Pollination is predominantly entomophilous, with the small, unspecialized flowers attracting a wide variety of insect pollinators, especially Lepidoptera."
	Salazar, R. & Jøker, D. (2000). Cordia alliodora (Ruiz & Pavón) Oken. Seed Leaflet No. 25. Danida Forest Seed Centre, Denmark	"The flowers have a nectariferous disk and are pollinated by butterflies like the other species in this genus; self-pollination is rare."

606	Reproduction by vegetative fragmentation	
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Vegetative propagation has only been used to establish seed orchards (grafting) and experimentally (cuttings)"
	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.	[Potential spread from root sprouts] "Vegetative Reproduction-Coppicing and epicormic branching on injured young trees have been reported in Costa Rica (12). Sprouting was seen from lateral roots in Trinidad (21). But research in this particular area seems nonexistent except for us of stem and branch sets in laurel tree improvement work in Colombia (14,35)."

607	Minimum generative time (years)	3
	Source(s)	**Notes**

Qsn #	Question	Answer
	Salazar, R. & Jøker, D. (2000). Cordia alliodora (Ruiz & Pavón) Oken. Seed Leaflet No. 25. Danida Forest Seed Centre, Denmark	"Flowering begins when the tree is only 2-3 year old and viable seed is produced from its 5th year."
	Hanum, I.F. & Van der Maesen, L.J.G. (eds.). 1997. PROSEA : Plant Resources of South-East Asia 11, Auxiliary Plants. Prosea Foundation, Bogor, Indonesia	"Flowering may start when the trees are only 2 years old, but more commonly between 5-10 years after planting."
	Greaves, A., & McCarter, P. S. (1990). Cordia alliodora: A Promising Tree for Tropical Agroforestry. Oxford Forestry Institute, University of Oxford, Oxford, UK	"Trees in plantations are reported to have begun flowering at an early age, just as they do in natural stands. Viable seed was produced in Vanuatu 3-4 years after planting and this gave rise to profuse natural regeneration (Neil, 1983a)."

701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	**n**
	Source(s)	**Notes**
	Salazar, R. & Jøker, D. (2000). Cordia alliodora (Ruiz & Pavón) Oken. Seed Leaflet No. 25. Danida Forest Seed Centre, Denmark	"Fruit: brown at maturity, 1 cm long, 6 mm wide. Floral parts persistent. Seed: white, 7 mm long, 5 mm wide. Seed weight is variable." [No evidence, and no means of external attachment]
	Boshier, D.H. and Lamb, A.T. (eds.). (1997). Cordia alliodora. Genetics and Tree Improvement. Oxford Forestry Institute, University of Oxford, Oxford, UK	[Wind and water] "Seed dispersal was found to be heavily influenced by the prevailing wind, such that the seed shadow was not circular. Long distance dispersal of C. alliodora seed may occur via very strong winds and, probably, via water as a secondary dispersal agent. Dispersal distances of the order of kilometres are feasible"

702	**Propagules dispersed intentionally by people**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Cordia alliodora is an important neotropical tree, which combines timber of high quality and value with fast growth on good quality soils. The wood of C. alliodora is of great importance throughout its natural range, both for local use by farmers and as a commercial timber in national markets. The species is a prolific seeder, regenerates easily, and is often found, following forest clearance, as pure stands of varying densities. Farmers favour natural regeneration of C. alliodora within agroforestry systems, for which its light crown and self pruning habit make it particularly suited, allowing some timber production without excessive competition with the crops. More recently, plantations have been established in a number of countries, both within its natural range and as an exotic, although its potential as an exotic may be limited. Survival and growth is particularly dependent on site fertility (Centro Agronomico Tropicale de Investigación y Enseñanza, 1994a; Corporacion Nacional de Investigación y Fomento Forestal, 1983; Kapp and Beer, 1995; Lujan, 1994; Somarriba and Beer, 1987), and therefore effective, economically viable planting of the species will be limited to fertile sites. Given the pressures on land, particularly the fertile land which is most suited to this species, C. alliodora is as likely to be planted in agroforestry systems as in pure plantations. Much research has been carried out, particularly in Costa Rica and Colombia, and the species has been the subject of various reviews (e.g. Johnson and Morales, 1972; Fenton et al., 1977; Greaves and McCarter, 1990; Centro Agronomico Tropicale de Investigación y Enseñanza, 1994a, Boshier and Lamb, 1997), an annotated bibliography (Greaves and McCarter, 1988) and extension material (e.g. Centro Agronomico Tropicale de Investigación y Enseñanza, 1994b; Forest Conservation Tree Improvement Project Honduras, 1998; FEDECAFE, 1992)."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	**Notes**
	Salazar, R. & Jøker, D. (2000). Cordia alliodora (Ruiz & Pavón) Oken. Seed Leaflet No. 25. Danida Forest Seed Centre, Denmark	"The corolla is persistent and serves as an agent of wind dispersal when dry." … "Fruit: brown at maturity, 1 cm long, 6 mm wide. Floral parts persistent. Seed: white, 7 mm long, 5 mm wide." [No evidence and seeds relatively large]

704	Propagules adapted to wind dispersal	y
	Source(s)	**Notes**
	Salazar, R. & Jøker, D. (2000). Cordia alliodora (Ruiz & Pavón) Oken. Seed Leaflet No. 25. Danida Forest Seed Centre, Denmark	"Flower petals are persistent, acting as wings in wind dispersal of the generally single-seeded fruit."
	Boshier, D.H. and Lamb, A.T. (eds.). (1997). Cordia alliodora. Genetics and Tree Improvement. Oxford Forestry Institute, University of Oxford, Oxford, UK	"Seed dispersal was found to be heavily influenced by the prevailing wind, such that the seed shadow was not circular. Long distance dispersal of C. alliodora seed may occur via very strong winds and, probably, via water as a secondary dispersal agent. Dispersal distances of the order of kilometres are feasible"

705	Propagules water dispersed	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Boshier, D.H. and Lamb, A.T. (eds.). (1997). Cordia alliodora. Genetics and Tree Improvement. Oxford Forestry Institute, University of Oxford, Oxford, UK	"In C. alliodora this may occur via very strong winds and, probably, as a secondary event, via water (rivers or temporary rainfall rivulets). The persistent petals make the seed buoyant for some time and, where seed is carried by rivers, dispersal distances of the order of kilometres are feasible."
	Lau, A. and Frohlich, D. 2012. New plant records from O'ahu for 2009. Bishop Museum Occasional Papers 113: 7-26	[Dispersed along a riparian corridor on Oahu] "individuals of varying sizes were seen, many established in deep shade, growing in riparian areas including in the bed of a seasonal stream, valley floors and slopes, as well as seedlings and saplings growing among the stones of a maintained heiau."

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	Salazar, R. & Jøker, D. (2000). Cordia alliodora (Ruiz & Pavón) Oken. Seed Leaflet No. 25. Danida Forest Seed Centre, Denmark	"Flower petals are persistent, acting as wings in wind dispersal of the generally single-seeded fruit."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	**Notes**
	Salazar, R. & Jøker, D. (2000). Cordia alliodora (Ruiz & Pavón) Oken. Seed Leaflet No. 25. Danida Forest Seed Centre, Denmark	"Fruit: brown at maturity, 1 cm long, 6 mm wide. Floral parts persistent. Seed: white, 7 mm long, 5 mm wide. Seed weight is variable." [No evidence, and no means of external attachment]
	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.	"Rodents and birds destroy much of the seed in forest clearings or on direct seeded areas where seeds are not protected or covered (31)." [Rodents could potentially transport and cache seeds for later consumption, but no reports of this behavior have been documented]
	Boshier, D.H. and Lamb, A.T. (eds.). (1997). Cordia alliodora. Genetics and Tree Improvement. Oxford Forestry Institute, University of Oxford, Oxford, UK	"Seed are predated prior to dispersal by bruchid beetles (Amblycerus spp.), with as much as 50% of seed killed (Opler and Janzen, 1983), although levels of attack vary between trees and years. The larva eats the developing seed embryo and attacked seed are evident from the round hole left in the calyx by the emerging adult beetle."

Qsn #	Question	Answer
708	**Propagules survive passage through the gut**	**n**
	Source(s)	**Notes**
	Salazar, R. & Jøker, D. (2000). Cordia alliodora (Ruiz & Pavón) Oken. Seed Leaflet No. 25. Danida Forest Seed Centre, Denmark	"Flowers small, 8-12 mm, white. The corolla is persistent and serves as an agent of wind dispersal when dry." … "Fruit: brown at maturity, 1 cm long, 6 mm wide. Floral parts persistent. Seed: white, 7 mm long, 5 mm wide." [No evidence of ingestion by animals]
	Boshier, D.H. and Lamb, A.T. (eds.). (1997). Cordia alliodora. Genetics and Tree Improvement. Oxford Forestry Institute, University of Oxford, Oxford, UK	"The calyx does not continue to grow after pollination, and the mature fruit is shed complete with calyx and marcescent corolla. The latter acts as a parachute aiding dispersal by wind. Although the term seed is used principally in the literature to describe the unit of dispersal, technically it is a fruit."
	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.	[Seeds depredated by birds and rodents] "Rodents and birds destroy much of the seed in forest clearings or on direct seeded areas where seeds are not protected or covered (31)."

801	**Prolific seed production (>1000/m2)**	**y**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"C. alliodora is a prolific seeder and regenerates easily, readily colonising exposed fertile soil, often being found following forest clearance, as pure stands of varying densities...Although seed (40-100,000 seed per kg) is never in short supply, the timing of collection is critical to ensure high germination."

Qsn #	Question	Answer
802	**Evidence that a persistent propagule bank is formed (>1 yr)**	**n**
	Source(s)	**Notes**
	Salazar, R. & Jøker, D. (2000). Cordia alliodora (Ruiz & Pavón) Oken. Seed Leaflet No. 25. Danida Forest Seed Centre, Denmark	"The seed is orthodox, but if not stored properly it loses viability fast. It is especially important to use bags that are completely airtight, either heavy plastic or aluminium. In Costa Rica experience is that after two weeks at room temperature the germination is down to 40%. Best storage is at 5 C and moisture content 7-10%. An experiment from Colombia showed that seed stored at 5°C and 8.5% moisture content retained 76% germination after 14 months."
	Hanum, I.F. & Van der Maesen, L.J.G. (eds.). 1997. PROSEA : Plant Resources of South-East Asia 11, Auxiliary Plants. Prosea Foundation, Bogor, Indonesia	"Viability of fresh seed decreases rapidly under natural conditions;"
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	[Seeds can be stored for long periods, but apparently lose viability quickly in field conditions or if not stored properly] "Tests in Costa Rica showed seed can be stored for several years at low temperature (below 5 C), in hermetically sealed containers that effectively maintain a low moisture content. A reduction in moisture content is best carried out by drying in the shade or a drying room, as drying directly in the sun `cooks' the seed (Boshier and Lamb, 1997). Shade drying reduced the moisture content to some 6 to 7% in four to six days depending on ambient conditions, while an artificial dryer achieved this in 2.5 days (Samaniego et al., 1997; Trivino et al., 1990). No pretreatment of seed is required prior to germination, which occurs within 10-28 days of sowing."

803	**Well controlled by herbicides**	
	Source(s)	**Notes**
	Gustine Lee, J., Beachy, J. & Leary, J. 2015. Efficacy of Undiluted Herbicide Injections on Tropical Woody Tree Species in Hawaii. Poster Presentation. Ecology and Management of Alien Plant Invasions 13th International Conference, September 20-24, 2015, Kona, HI	"Background: The Incision Point Application (IPA) method is a calibrated, clean, and efficient field technique for administering lethal herbicide doses directly to the exposed vascular systems of invasive woody species. The IPA technique is a refinement of the more traditional “frill cut” or “hack-n-squirt” basal application methods by minimizing the cutting action to small incisions around the base of the tree at equidistant points, less than a complete girdle. It also precisely delivers known amounts of herbicide to each incision. This technique utilizes a small, sharp implement (e.g. a hatchet) for making the incision and either a veterinary draw-off syringe or calibrated dropper (Fig.1) for metering the herbicide. Knowing the most effective herbicides for each target species optimizes the IPA technique with the smallest lethal dose, allowing applicators to carry less weight into the field and leave the smallest chemical footprint in the environment." [Imazapyr recommended to control Cordia alliodora. Triclopyr and Aminopyralid may also be effective]
	BioNET-EAFRINE. (2011). Cordia alliodora (Salmwood). https://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cordia_alliodora_(Salmwood).htm. [Accessed 28 Jul 2019]	"Control is very difficult as plants sprout readily from cut stems. The editors could not find any information on chemical or biological control of this species."

Qsn #	Question	Answer
804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Although not reported widely in the literature, it coppices readily, even from large mature trees. A strong tap root is produced at an early stage, but a spreading root system also develops (Schlönvoight, 1993), and has been suggested as allowing the tree to withstand exposed conditions (Marshall, 1930), although the evidence from Fiji, the Solomon Islands and Vanuatu is contradictory. Overall, C. alliodora was considered to be of average susceptibility to windthrow and snap, with several other species rated as more resistant. Even in areas that are not particularly prone to strong winds, stem snap may occur in mature C. alliodora trees and may be a feature of the narrow stem, weakness from disease, or increased crown weight after rain, particularly during flowering/seeding (Boshier and Lamb, 1997). - Tolerates drought; termites - Ability to regenerate rapidly; self-prune; coppice"
	BioNET-EAFRINE. (2011). Cordia alliodora (Salmwood). https://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cordia_alliodora_(Salmwood).htm. [Accessed 28 Jul 2019]	"Control is very difficult as plants sprout readily from cut stems."
	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- Coppicing and epicormic branching on injured young trees have been reported in Costa Rica (12). Sprouting was seen from lateral roots in Trinidad (21)."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	Elevitch, C. R. (ed.). (2006). Traditional Trees of Pacific Islands: Their Culture, Environment, and Use. Permanent Agriculture Resources, Honolulu, HI	[Unknown if pests of Cordia subcordata or other Cordia species would impact C. alliodora] "Kou is highly susceptible to damage from the kou leaf worm (Ethmia nigroapicella). The small moth has pinkish forewings with black spots and yellowish hind wings. Isolated trees in exposed areas may be killed by this pest. The tree was once more common in Hawai‘i before the introduction of the moth, which was first recorded there in 1883 (Swezey 1943)."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Broad climate suitability and environmentally versatile
• Thrives in tropical climates
• Naturalized on Oahu, and Hawaii (Hawaiian Islands), Samoa, Tonga, Vanuatu, the Galapagos, and possibly elsewhere
• Environmental weed in Vanuatu (and possibly elsewhere), competing with native vegetation
• Other Cordia species have become invasive
• Possibly unpalatable
• Tolerates many soil types
• Able to form pure stands
• Reproduces by seeds and possibly from lateral roots
• Able to reach maturity in three years (but typically in 5+ years)
• Seeds dispersed by wind, secondarily by water and intentionally by people
• Prolific seed production
• Able to coppice and resprout after cutting

Low Risk Traits
• Unarmed (no spines, thorns, or burrs)
• Non-toxic
• Reported to be shade-intolerant (but reports from Oahu suggest plants are able to establish in some shaded sites)
• Self-incompatible (but some sources suggest some selfing may occur)
• Seeds rapidly lose viability under natural conditions, and are not known to form a persistent seed bank