

Taxon: <i>Citharexylum caudatum</i> L.	Family: Verbenaceae
Common Name(s): fiddlewood juniper berry	Synonym(s): <i>Citharexylum album</i> Mill. <i>Citharexylum berteroi</i> Spreng. <i>Citharexylum erectum</i> Sw. <i>Citharexylum lindenii</i> Turcz.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 14 Mar 2016
WRA Score: 15.0	Designation: H(Hawai'i)	Rating: High Risk

Keywords: Tropical Tree, Environmental Weed, Ornamental, , Thicket-Forming, Bird-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		
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	y=1, n=0	y
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)		
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	y
604	Self-compatible or apomictic	y=1, n=-1	n
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)		
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	y=1, n=-1	n
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
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
	Woodson, Jr., R.E., Schery, R.W. and Moldenke, H.N. 1973. Flora of Panama. Part IX. Family 168. Verbenaceae. Annals of the Missouri Botanical Garden 60(1): 41-148	No evidence of domestication
102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	NA
103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2016. 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
	Woodson, Jr., R.E., Schery, R.W. and Moldenke, H.N. 1973. Flora of Panama. Part IX. Family 168. Verbenaceae. Annals of the Missouri Botanical Garden 60(1): 41-148	"In forests and thickets, hammocks and pastures, on brushy slopes and hillsides, in swamps and on beaches, ranging from the Bahamas and Mexico through the West Indies and Central America to Colombia and Peru."
202	Quality of climate match data	High
	Source(s)	Notes
	Woodson, Jr., R.E., Schery, R.W. and Moldenke, H.N. 1973. Flora of Panama. Part IX. Family 168. Verbenaceae. Annals of the Missouri Botanical Garden 60(1): 41-148	
203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	McDonald, M. A., Hofny-Collins, A., Healey, J. R., & Goodland, T. C. R. (2003). Evaluation of trees indigenous to the montane forest of the Blue Mountains, Jamaica for reforestation and agroforestry. Forest Ecology and Management, 175(1), 379-401	"Citharexylum caudatum ... Altitudinal range in Jamaica (m) = 210 - 1710" [Elevation range exceeds 1000 m in Jamaica]
	Tropicos.org. 2016. Tropicos [Online Database]. Missouri Botanical Garden. http://www.tropicos.org/ . [Accessed 14 Mar 2016]	Collected from 0 - 2500 m elevation and from 08°14'00"N to 23°37'00"N latitude, demonstrating environmental versatility in tropical latitudes

Qsn #	Question	Answer
204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i cultivated and now naturalized and rapidly spreading via bird dispersal out of Manoa Valley into the Ko'olau Mountains, O'ahu."
	Woodson, Jr., R.E., Schery, R.W. and Moldenke, H.N. 1973. Flora of Panama. Part IX. Family 168. Verbenaceae. Annals of the Missouri Botanical Garden 60(1): 41-148	"ranging from the Bahamas and Mexico through the West Indies and Central America to Colombia and Peru."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Little Jr., E.L. & Skolmen, R.G. 1989. Common forest trees of Hawaii: (native and introduced). USDA Agriculture Handbook No. 679. USDA Forest Service, Washington, D.C.	"An introduced ornamental in Hawaii, it is a common street tree in Honolulu. When young, highly susceptible to wind damage. Naturalized locally, for example, in wet forests at 2,000 ft (610 m) altitude on Oahu."
	Whistler, W.A. 2000. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	"widely cultivated elsewhere in the tropics as an ornamental tree."

Qsn #	Question	Answer
301	Naturalized beyond native range	y
	Source(s)	Notes
	Starr, F., Starr, K. & Loope, L.L. 2004. New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 79: 20-30	"Citharexylum caudatum L. New island record Previously known from O'ahu, Maui, and Hawai'i (Wagner et al., 1990; Starr et al., 1999; Oppenheimer, 2003), C. caudatum is now also known from Hilo, Hawai'i and from the eastern coast of Kaua'i along Ke'alia Rd. This collection represent new island record for Kaua'i. Material examined: KAUA'I: Kawaihau Distr, Anahola, locally established along Ke'alia Rd. near Kūhiō Hwy, 175 ft [53 m], 25 Feb 2002, Starr & Starr 020225-2."
	Starr, F., Martz, K. & Loope, L.L. 1999. New plant records from East Maui for 1998. Bishop Museum Occasional Papers 59(2): 11-15	"Citharexylum caudatum, a native of Central and South America, is previously known from O'ahu where it is "spreading rapidly via bird dispersal out of Mānoa Valley into the Ko'olau Mountains" (Wagner et al., 1990: 1317). This collection represents a new island record of this species from Maui. It has also been observed near Kōlea Stream on the Hāna Hwy. Material examined. MAUI: Makawao District, East Maui, Ha'ikū, Pauwela, in bamboo thicket off W. Kuiaha Rd., 720 ft [220 m], 2 Apr 1998, Starr & Martz 980402-49."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i cultivated and now naturalized and rapidly spreading via bird dispersal out of Manoa Valley into the Ko'olau Mountains, O'ahu. First introduced to the Hawaiian Sugar Planters' Association Arboretum (now Harold L. Lyon Arboretum) in Manoa Valley from seed obtained by E. L. Caum in 1931"
	Oppenheimer, Hank L. 2003. New plant records from Maui and Hawai'i Counties. Bishop Museum Occasional Papers. 73: 3-30	"Naturalized on O'ahu (Wagner et al., 1990: 1317) and East Maui (Starr et al., 1999: 14), C. caudatum was noted to be escaping from roadside plantings and invading open fields and pastures on Hawai'i island. Material examined: HAWAII: S. Hilo Dist, along Hwy 19, 159 m, 29 Jul 2001, Oppenheimer H70137; near UH Hilo campus, 60 m, 1 Aug 2001, Starr & Martz 010801-2 (BISH)."

302	Garden/amenity/disturbance weed	
	Source(s)	Notes
	Follett, P. A., Anderson-Wong, P., Johnson, M. T., & Jones, V. P. (2003). Revegetation in dead Dicranopteris (Gleicheniaceae) fern patches associated with Hawaiian rain forests. Pacific Science, 57 (4), 347-357	[Invades disturbed habitats with negative environmental impacts] "In Hawai'i, opportunistic alien weeds, such as Clidemia hirta (L.) D. Don (Koster's curse), Citharexylum caudatum L. (fiddlewood), Nephrolepis spp. (swordfern), Lantana camera L., Psidium cattleianum Sabine (strawberry guava), Rubus rosifolius Sm. (thimbleberry) and others, can invade disturbed sites and form large monotypic stands, preventing native species replacement (Cuddihy and Stone 1993)."

Qsn #	Question	Answer
303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching, L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Displacing existing vegetation in mesic to humid lowland forests and other non-cropland." [Forest & disturbance weed]
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

304	Environmental weed	y
	Source(s)	Notes
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching, L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Environmental impact: Prolific seeder, spread by birds. Displacing existing vegetation in mesic to humid lowland forests and other non-cropland."
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"This evergreen shrub to small tree forms dense thickets in wet habitats. It has many characteristics in common with <i>C. spinosum</i> ."

305	Congeneric weed	y
	Source(s)	Notes
	Soria, M., Gardener, M. R., & Tye, A. (2002). Eradication of potentially invasive plants with limited distributions in the Galapagos Islands. Turning the tide: the eradication of invasive species, 287-292	" <i>Citharexylum gentryi</i> : This species (white wood) is a 20 m tall tree native to lowland coastal and Amazonian Ecuador and is common in humid and littoral forests (Jørgensen and León-Yanez 1999). The seeds of <i>C. gentryi</i> were introduced accidentally around 1950 in the leaves of a bromeliad that were used as a living fence (D. Uribe pers. comm.). It apparently has medicinal properties and can be used as an anti-inflammatory (D. Uribe pers. comm.). <i>Citharexylum gentryi</i> is naturalised in the agricultural lands of Santa Cruz and has a huge potential to spread into the transition zone dry forests of the National Park. This species is considered highly invasive as it is reproductive from a young age, produces many fleshy fruits, has great dispersal ability, and can colonise relatively-undisturbed areas. Two other species of the same genus, <i>C. spinosum</i> and <i>C. caudatum</i> , are invasive in Pacific islands such as Fiji, French Polynesia, and Hawaii, with <i>Citharexylum spinosum</i> mainly invasive in arid habitats below 500 m (Smith 1985)."
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	" <i>Citharexylum spinosum</i> ... This evergreen, medium-sized tree does not have the spines that its scientific name suggests. It forms crowded stands even in undisturbed habitats and is dispersed by alien frugivorous birds."

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

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence] "Large shrubs or small trees up to 20 m tall; branches nearly terete, glabrous. Leaves somewhat leathery, oblong to obovate or elliptic-oblongate, 7-16 cm long, 3.5-5 cm wide, glabrous, upper surface glossy, lower surface dull, apex rounded or obtuse, base cuneate, petioles green, 1-2 cm long. "

402	Allelopathic	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	Unknown

403	Parasitic	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.	"Large shrubs or small trees up to 20 m tall; branches nearly terete, glabrous." [Verbenaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	Unknown

405	Toxic to animals	n
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	y
	Source(s)	Notes
	Daehler, C. C., & Dudley, N. (2002). Impact of the black twig borer, an introduced insect pest, on <i>Acacia koa</i> in the Hawaiian Islands. <i>Micronesica Suppl.</i> 6: 35–53	"Observations on other plants attacked by the black twig borer near our field plots, including <i>Coffea arabica</i> L. (Rubiaceae), <i>Citharexylum caudatum</i> L. (Verbenaceae), and <i>Desmodium tortuosum</i> (Sw.) DC. (Fabaceae), indicated that necrosis was similarly limited to the distal portion of the branch containing the gallery; necrosis rarely extended more than 10 cm from the bore hole in the direction of the main trunk."
	Little Jr., E.L. & Skolmen, R.G. 1989. Common forest trees of Hawaii: (native and introduced). USDA Agriculture Handbook No. 679. USDA Forest Service, Washington, D.C.	"This species is reported to be one of the many hosts of the black twig-borer, a major insect pest."

407	Causes allergies or is otherwise toxic to humans	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Medicinal uses] "Leaves anti-hemorrhagic. antidote. antibacterial. against snake venoms."
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"This evergreen shrub to small tree forms dense thickets in wet habitats." [No evidence. Unlikely. Invades wet habitats where fire risk is presumably low]

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Woodcock, D. W., Perry, J. L., & Giambelluca, T. W. (1999). Occurrence of indigenous plant species in a middle-elevation Melaleuca plantation on O'ahu (Hawaiian Islands). Pacific Science, 53(2), 159-167	"There are numerous seedlings and saplings of <i>Citharexylum caudatum</i> present in the stand and it appears to share with <i>Psidium cattleianum</i> the ability to become established in full sunlight or some degree of shade."
	Ostertag, R., Giardina, C. P., & Cordell, S. (2008). Understory colonization of Eucalyptus plantations in Hawaii in relation to light and nutrient levels. Restoration Ecology, 16(3), 475-485	[<i>Citharexylum caudatum</i> invades understory in higher & lower light regimens] "Exotic tree plantations may serve as catalysts for native forest regeneration in agriculturally degraded landscapes. In 2001, we evaluated plant species regeneration in the understory of a 7-year-old experimental <i>Eucalyptus saligna</i> forest in Hawaii approximately 1 year after the cessation of 5 years of herbicide. These forests were organized in a 2 3 2-factorial design of planting density (1 3 1- or 3 3 3-m spacing) and fertilization (unfertilized control and regular fertilization), which resulted in varying resource availabilities. We found that understory biomass was highest under high light conditions, regardless of fertilization treatment, whereas species richness was lowest under fertilized 1 3 1-m plots. The understory was dominated by species exotic to Hawaii. The most common tree species, the noxious weed <i>Citharexylum caudatum</i> , was particularly successful because high light-saturated photosynthesis rates and a low light compensation point allowed for high growth and survival under both light conditions."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	
	Source(s)	Notes
	Whistler, W.A. 2000. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	'Relatively moist soils...'

411	Climbing or smothering growth habit	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Large shrubs or small trees up to 20 m tall; branches nearly terete, glabrous."
412	Forms dense thickets	y
	Source(s)	Notes
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"This evergreen shrub to small tree forms dense thickets in wet habitats."
501	Aquatic	n
	Source(s)	Notes
	Woodson, Jr., R.E., Schery, R.W. and Moldenke, H.N. 1973. Flora of Panama. Part IX. Family 168. Verbenaceae. Annals of the Missouri Botanical Garden 60(1): 41-148	[Terrestrial tree] "In forests and thickets, hammocks and pastures, or brushy slopes and hillsides, in swamps and on beaches, ranging from the Bahamas and Mexico through the West Indies and Central America to Colombia and Peru."
502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 11 Mar 2016]	"Family: Verbenaceae"
503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 11 Mar 2016]	"Family: Verbenaceae"
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Woodson, Jr., R.E., Schery, R.W. and Moldenke, H.N. 1973. Flora of Panama. Part IX. Family 168. Verbenaceae. Annals of the Missouri Botanical Garden 60(1): 41-148	"Open, graceful shrub or small, slender, straggling, rounded tree to 20 m tall, occasionally vine-like; stems to 20 inches d.b.h.; bark white; branches and branchlets tetragonal or subterete, often striate, glabrous, brownish, or the young shoots drying dark; leaf-scars large, borne on corky large sterigmata."
601	Evidence of substantial reproductive failure in native habitat	n

Qsn #	Question	Answer
	Source(s)	Notes
	Woodson, Jr., R.E., Schery, R.W. and Moldenke, H.N. 1973. Flora of Panama. Part IX. Family 168. Verbenaceae. Annals of the Missouri Botanical Garden 60(1): 41-148	"In forests and thickets, hammocks and pastures, on brushy slopes and hillsides, in swamps and on beaches, ranging from the Bahamas and Mexico through the West Indies and Central America to Colombia and Peru. This species' is introduced on Guam, and it is cultivated for ornament elsewhere. It is a very variable species."

602	Produces viable seed	y
	Source(s)	Notes
	Chimera, C. G., & Drake, D. R. (2010). Effects of pulp removal on seed germination of five invasive plants in Hawaii. Plant Protection Quarterly, 25(3), 137-140	"As part of the processing of fleshy fruits, many frugivores remove pulp from seeds by external handling or internal processing in the digestive system. External processing was simulated for five fleshy-fruited, non-native invasive trees in Hawaii through manual removal of pulp from seeds." ... "The germination rate of de-pulped fruits of fiddlewood was slower by 4% compared with pulped fruits. These results suggest that frugivores may facilitate establishment of fleshy-fruited invasive plants not only through dispersal, but also through seed processing that ultimately enhances seed germination and reduces germination time."
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i cultivated and now naturalized and rapidly spreading via bird dispersal out of Manoa Valley into the Ko'olau Mountains, O'ahu."

603	Hybridizes naturally	y
	Source(s)	Notes
	Moldenke, H. N. (1958). Hybridity in the Verbenaceae. American Midland Naturalist, 59(2), 333-370	"It seems rather certain, moreover, that Perkins 419 represents an as yet unnamed natural hybrid between <i>Citharexylum caudatum</i> and <i>C. fruticosum</i> , while the same collector's no. 1320 represents an as yet undescribed hybrid between <i>C. caudatum</i> and <i>C. spinosum</i> ."

604	Self-compatible or apomictic	n
	Source(s)	Notes
	Nadkarni, N.M. & Wheelwright, N.T. 2000. Monteverde: Ecology and Conservation of a Tropical Cloud Forest. Oxford University Press, New York	"Appendix 1 Vascular Plants of Monteverde" [<i>Citharexylum caudatum</i> - Sex = DI = dioedous]
	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.	"Flowers in narrow, elongate-recurved racemes 4-10 cm long, pedicels usually 2-5 mm long; calyx campanulate, ca. 3 mm long, the rim unlobed and truncate in fruit; corolla white."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Useful Tropical Plants Database. 2016. <i>Citharexylum caudatum</i> . http://tropical.theferns.info/viewtropical.php?id=Citharexylum+caudatum . [Accessed 14 Mar 2016]	"Pollinators: Bees"

Qsn #	Question	Answer
	Little Jr., E.L. & Skolmen, R.G. 1989. Common forest trees of Hawaii: (native and introduced). USDA Agriculture Handbook No. 679. USDA Forest Service, Washington, D.C.	"This species is a honey plant." [Utilized by honey bees, & presumably pollinated]
	Nadkarni, N.M. & Wheelwright, N.T. 2000. Monteverde: Ecology and Conservation of a Tropical Cloud Forest. Oxford University Press, New York	Pollination - IN = Insect (insects of several orders or insect types not known specifically)

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Tangalin, N. 2011. Featured Invasive Pest: Fiddlewood - <i>Citharexylum caudatum</i> . <i>Kia'i Moku</i> 4(1): 4	" <i>C. caudatum</i> propagates itself from seeds and cuttings and roots at the nodes when on the ground." [Limited vegetative spread]

607	Minimum generative time (years)	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	Unknown

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	Notes
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching, L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"common as street ornamentals in downtown Honolulu" ... "Prolific seeder, spread by birds. Displacing existing vegetation in mesic to humid lowland forests and other non-cropland." [Fleshy-fruited. Fruits & pyrenes lack means of external attachment, but could possibly stick to shoes or vehicles]

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching, L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"A common landscape ornamental, juniper berry trees are also common as street ornamentals in downtown Honolulu, on Hotel St. near Bishop St., and around the main police station. It is also a common ornamental in the Kona area."
	Whistler, W.A. 2000. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	"widely cultivated elsewhere in the tropics as an ornamental tree."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching, L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Prolific seeder, spread by birds. Displacing existing vegetation in mesic to humid lowland forests and other non-cropland." [No evidence. Invades non-cropland]

704	Propagules adapted to wind dispersal	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Woodson, Jr., R.E., Schery, R.W. and Moldenke, H.N. 1973. Flora of Panama. Part IX. Family 168. Verbenaceae. Annals of the Missouri Botanical Garden 60(1): 41-148	[Fleshy-fruited] "Fruit reddish-green or yellow to orange or red, finally shiny black when mature and in drying, oblong or globose-oblong to obovate or subglobose, 6-12 mm long, 5-10 mm wide, glabrous, pyrenes 1-celled; fruiting-pedicels to 3 mm long; fruiting-calyx cupuliform or eventually patelliform, herbaceous or indurated, to 3 mm long and 4 mm wide, 5-angled, glabrous, apically sub truncate, 5-apiculate or eventually splitting irregularly and erose."

705	Propagules water dispersed	
	Source(s)	Notes
	Woodson, Jr., R.E., Schery, R.W. and Moldenke, H.N. 1973. Flora of Panama. Part IX. Family 168. Verbenaceae. Annals of the Missouri Botanical Garden 60(1): 41-148	"In forests and thickets, hammocks and pastures, on brushy slopes and hillsides, in swamps and on beaches, ranging from the Bahamas and Mexico through the West Indies and Central America to Colombia and Peru." [Possibly if occurring in swamps or other water-inundated areas. Primarily bird-dispersed]
	Smith, C.W. 1985. Impact of Alien Plants on Hawaii's Native Biota. Pp. 180-250 in Stone & Scott (eds.). Hawaii's terrestrial ecosystems: preservation & management. CPSU, Honolulu, HI	"This evergreen shrub to small tree forms dense thickets in wet habitats." [Possibly, if occurring in riparian areas, but primarily bird-dispersed]

706	Propagules bird dispersed	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Fruit purplish black, oblong-globose, ca. 5-8 mm long" ... "in Hawai'i cultivated and now naturalized and rapidly spreading via bird dispersal out of Manoa Valley into the Ko'olau Mountains, O'ahu."
	Woodson, Jr., R.E., Schery, R.W. and Moldenke, H.N. 1973. Flora of Panama. Part IX. Family 168. Verbenaceae. Annals of the Missouri Botanical Garden 60(1): 41-148	"Fruit reddish-green or yellow to orange or red, finally shiny black when mature and in drying, oblong or globose-oblong to obovate or subglobose, 6-12 mm long, 5-10 mm wide, glabrous, pyrenes 1-celled"
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching, L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Prolific seeder, spread by birds"

707	Propagules dispersed by other animals (externally)	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.	"Fruit purplish black, oblong-globose, ca. 5-8 mm long." ... "in Hawai'i cultivated and now naturalized and rapidly spreading via bird dispersal out of Manoa Valley into the Ko'olau Mountains" [Fruit & pyrenes lack means of external attachment. Adapted for ornithochory]

708	Propagules survive passage through the gut	y
	Source(s)	Notes

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"now naturalized and rapidly spreading via bird dispersal out of Manoa Valley into the Ko'olau Mountains" [Presumably yes]
801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching, L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	"Prolific seeder, spread by birds." [Densities unknown]
802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Royal Botanic Gardens Kew. (2016) Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/ . [Accessed]	"Storage Behaviour: No data available for species. Of 1 known taxa of genus <i>Citharexylum</i> , 100.00% Orthodox(p/?)"
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	[Herbicides evaluated in this study were not effective] "To identify more efficient and effective control techniques for invasive trees, trials were installed on Oahu in 2010 to examine the efficacy of low doses of four active ingredients (imazapyr, aminopyralid, glyphosate, and triclopyr). The treatment technique, Incision Point Application (IPA), involves making discrete, regularly spaced cuts around the trunk of a tree, and applying a measured amount of undiluted herbicide to each cut. Treated trees were monitored for up to two years. Performance was measured by recording defoliation and cambium health over time. Surprisingly, triclopyr was the least effective product tested. Imazapyr exhibited the greatest success, providing the most effective control across the greatest number of species. Using the results of these trials, OANRP has begun controlling canopy weeds across large acreages." ... "No herbicide was effective enough to recommend for: <i>Acacia confusa</i> , <i>Citharexylum caudatum</i> or <i>Syzygium cumini</i> ."
804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	Little Jr., E.L. & Skolmen, R.G. 1989. Common forest trees of Hawaii: (native and introduced). USDA Agriculture Handbook No. 679. USDA Forest Service, Washington, D.C.	"When young, highly susceptible to wind damage."
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	

Qsn #	Question	Answer
	Source(s)	Notes
	<p>Daehler, C. C., & Dudley, N. (2002). Impact of the black twig borer, an introduced insect pest, on <i>Acacia koa</i> in the Hawaiian Islands. <i>Micronesica Suppl.</i> 6: 35–53</p>	<p>[Black twig borer affects <i>C. caudatum</i>, but presumably is not effective at controlling its spread] "Observations on other plants attacked by the black twig borer near our field plots, including <i>Coffea arabica</i> L. (Rubiaceae), <i>Citharexylum caudatum</i> L. (Verbenaceae), and <i>Desmodium tortuosum</i> (Sw.) DC. (Fabaceae), indicated that necrosis was similarly limited to the distal portion of the branch containing the gallery; necrosis rarely extended more than 10 cm from the bore hole in the direction of the main trunk."</p>

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Thrives in tropical climates
- Naturalized on Oahu, Maui, Hawaii & Kauai, Hawaiian Islands
- Environmental weed in mesic to wet forests
- Other *Citharexylum* species have become invasive
- Light-demanding, but does tolerate & invade shaded forest understory
- Forms dense thickets
- Reproduces by seeds, & roots at nodes when contacting ground
- Seeds dispersed by birds & intentionally by people
- Some herbicides may be ineffective at control

Low Risk Traits

- Unarmed (no spines, thorns or burrs)
- Ornamental & medicinal uses
- Reportedly dioecious