

Key Words: High Risk, Naturalized, Ornamental Tree, Epiphytic strangler, Apomictic, Bird-dispersed

Family: *Clusiaceae*

Taxon: *Clusia rosea*

Synonym: *Clusia major auct. nonn.*

Common Name: copey
autograph tree
balsam apple
pitch apple

Questionnaire : current 20090513 **Assessor:** HPWRA OrgData **Designation:** H(HPWRA)
Status: Assessor Approved **Data Entry Person:** Chuck Chimera **WRA Score** **9**

101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?	y=1, n=-1	
103	Does the species have weedy races?	y=1, n=-1	
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	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	y
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)	
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	n
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic	y=1, n=0	
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals	y=1, n=0	
406	Host for recognized pests and pathogens	y=1, n=0	n
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	y
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y
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	y
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	
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	
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	n
705	Propagules water dispersed	y=1, n=-1	n
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/m2)	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	
803	Well controlled by herbicides	y=-1, n=1	
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: H(HPWRA)

WRA Score **9**

Supporting Data:

101	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Is the species highly domesticated? No evidence]
102	2013. WRA Specialist. Personal Communication.	NA
103	2013. WRA Specialist. Personal Communication.	NA
201	2013. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Species suited to tropical or subtropical climate(s) - 2-High] Native: NORTHERN AMERICA (Check conservation status in U.S. & Canada in NatureServe Explorer database) Southeastern U.S.A.: United States - Florida Southern Mexico: Mexico - Chiapas SOUTHERN AMERICA Caribbean: Anguilla; Aruba; Bahamas; Cuba; Hispaniola; Jamaica; Netherlands Antilles; Puerto Rico; Trinidad and Tobago; Virgin Islands (British); Virgin Islands (U.S.) Mesoamerica: Belize; Costa Rica; Guatemala; Nicaragua; Panama Northern South America: French Guiana; Guyana; Suriname; Venezuela Western South America: Colombia; Ecuador - Los Rios [but identity of single specimen is tentative]"
202	2013. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Quality of climate match data 2-High]
203	1988. Morton, J.F.. Pity the Pitch Apple- Treat it as a Spreading Tree. Proceedings of the Florida State Horticultural Society. 101: 122-127.	[Broad climate suitability (environmental versatility)? No] "The pitch apple is limited to tropical and subtropical climates. It is able to survive light frost and has flourished as far north as Vero Beach in Florida (38)."
203	2008. Gargiullo, M.B./Magnuson, B.L./Kimball, L.D.. A Field Guide to Plants of Costa Rica. Oxford University Press US, New York, NY	[Broad climate suitability (environmental versatility)? No] "Habitat: Wet to seasonally dry regions, often growing near shore." ... "Altitude: Sea level to 1200 m, mostly on the Pacific slope." [Elevation range exceeds 1000 m, but mostly occurs at lower elevations]
204	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Native or naturalized in regions with tropical or subtropical climates? Yes] "Native to the West Indies and Florida"
204	2013. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Native or naturalized in regions with tropical or subtropical climates? Yes] Native: NORTHERN AMERICA (Check conservation status in U.S. & Canada in NatureServe Explorer database) Southeastern U.S.A.: United States - Florida Southern Mexico: Mexico - Chiapas SOUTHERN AMERICA Caribbean: Anguilla; Aruba; Bahamas; Cuba; Hispaniola; Jamaica; Netherlands Antilles; Puerto Rico; Trinidad and Tobago; Virgin Islands (British); Virgin Islands (U.S.) Mesoamerica: Belize; Costa Rica; Guatemala; Nicaragua; Panama Northern South America: French Guiana; Guyana; Suriname; Venezuela Western South America: Colombia; Ecuador - Los Rios [but identity of single specimen is tentative]"
205	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Does the species have a history of repeated introductions outside its natural range? Yes] "It is widely cultivated in the tropics and has also become naturalized."
205	2008. Gargiullo, M.B./Magnuson, B.L./Kimball, L.D.. A Field Guide to Plants of Costa Rica. Oxford University Press US, New York, NY	[Does the species have a history of repeated introductions outside its natural range? Yes] "Widely planted in tropical regions."
301	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Naturalized beyond native range? Yes] "In Hawaii, cultivated as an ornamental, now being spread by birds, which eat the seeds, and becoming naturalized in low elevation, disturbed areas, at least on Kauai, Oahu, and in Hilo and Kona, Hawaii."

301	2000. Oppenheimer, H.L./Bartlett, R.T.. New plant records from Maui, O'ahu, and the Hawai'i Islands. Bishop Museum Occasional Papers. 64: 1-10.	[Naturalized beyond native range? Yes] "This is a popular and widely planted ornamental tree. Wagner et al. (1999: 543) report it as becoming naturalized on Kaua'i, O'ahu, and Hawai'i. Now it is spreading and becoming established outside of cultivation on Maui as well. Seedlings have also been observed, but not collected, at the foot of Kapilau Ridge, Wailuku District, West Maui, at 244–305 m, in secondary forest, and along roadcuts and as epiphytes on <i>Ficus microcarpa</i> in Honokahua, Lahaina District, at 12–24 m. Material examined: MAUI: West Maui, Lahaina District, Honokahua, near the intersection of Office Rd and Lower Honoa Pi'ilani Rd, 24 m, beginning as an epiphyte 4 m high in <i>Prosopis pallida</i> , now rooted terrestrially, 11 Aug 1999, Oppenheimer H89914; 2 m tall shrub 79 m, epiphytic on <i>Coccoloba uvifera</i> , rooted terrestrially, 17 Aug 1999, Oppenheimer H89921; 'Alaeloa, north of Ka'öpala Gulch, 37 m, volunteer growing in rotting wooden table, 24 Aug 1999, Oppenheimer H89935; Honokahua, near intersection of Office Rd and Simpson Way, 67 m, mature fruiting trees in old pineapple field with <i>Leucaena</i> , <i>Melia</i> , <i>Schefflera</i> , <i>Spathodea</i> , 1 Sep 1999, Oppenheimer H99901; East Maui, Hāna District, seedlings growing on roadcut along Hāna Hwy between Ke'anae and Honomanū, mature fruiting trees observed at Honomanū, 22 Aug 1999, Oppenheimer H89933."
301	2006. Daehler, C. C./Baker, R. F.. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers. 87: 3-18.	[Naturalized beyond native range? Yes] "Although this is not a new record for O'ahu, its status around Lyon Arboretum merits mention, as Wagner et al. (1999) indicate only that it is "becoming naturalized" on O'ahu. Naturalized <i>Clusia rosea</i> plants were found in a variety of size classes (seedlings up to 5 m tall) scattered throughout the middle and upper slopes of unmanaged parts of both Haukulu and 'Aihualama, as well as on neighboring State of Hawai'i watershed forest."
301	2007. Wysong, M./Hughes, G./Wood, K.R.. New Hawaiian plant records for the island of Moloka'i. Bishop Museum Occasional Papers. 96: 1-8.	[Naturalized beyond native range? Yes] "Native to the West Indies and Florida, <i>C. rosea</i> was first collected on O'ahu in 1934 (Grant 7507, BISH). In Hawai'i it is commonly cultivated as an ornamental but has become widely naturalized in low elevation disturbed areas, as the seeds are eaten and spread by birds. It has been previously known from Kaua'i, O'ahu, Maui, and Hawai'i (Wagner et al. 1999, 2005). On Kalaupapa peninsula there are several ornamental plantings inside the settlement. However, it has become sparingly naturalized in highly disturbed areas behind the settlement."
301	2013. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Naturalized beyond native range? Yes] Naturalized: (links to other web resources are provided for some distributions) PACIFIC North-Central Pacific: United States - Hawaii SOUTHERN AMERICA Brazil: Brazil - Bahia, Pernambuco
302	1996. Pratt, L.W./Abbott, L.L.. Vascular Plants of Pu'ukohola Heiau National Historic Site, Hawai'i Island. Technical Report 101. Pacific Cooperative Studies Unit, Honolulu, HI	[Garden/amenity/disturbance weed? Yes. Potential to damage archaeological sites] "A few obvious candidates for localized alien species control are puncture vine, African tulip tree (<i>Spathodea campanulata</i>), autograph tree (<i>Clusia rosea</i>), and Chinese banyan. All of these species have the potential to spread more widely in the Park, and both banyan and autograph tree could be very destructive to archaeological sites if they became well established."
302	1998. Pratt, L.W.. Vegetation management strategies for three national historical parks on Hawaii Island. Technical Report 121. Pacific Cooperative Studies Unit, Honolulu, HI	[Garden/amenity/disturbance weed? Yes. Management and maintenance concern of park] "The small tree is widely planted in parking lots of Kailua-Kona and may be expected to continue to spread to nearby forested areas. Only one small plant was noted during the last botanical survey of the Park; this was growing beside a stone wall separating the beach from the parking lot at Kaloko Pond. The same tree was mentioned in the previous Park survey (Canfield 1990). The plant was removed after 1996 and may be considered eradicated from the Park. However, this should be one of the localized alien plants to look for and remove if it reappears within the Park. Because of the proximity of planted ornamental trees and the attractiveness of the seeds to birds, autograph tree is a strong candidate for reinvasion of the Park."
302	2008. Gunatilleke, N./Pethiyagoda, R./Gunatilleke, S.. Biodiversity of Sri Lanka. Journal of the National Science Foundation of Sri Lanka. 36 Special Issue: 25-62.	[Garden/amenity/disturbance weed? Yes. Potential environmental weed] "During the dry months these dry patanas are purposely burnt to obtain fresh grass for fodder or to hunt animals. Their very existence is a result of fire. Much of these grasslands are now converted to agricultural land and <i>Pinus</i> and <i>Eucalyptus</i> plantations. They are also being taken over by the aggressively competitive exotic fodder grass <i>Panicum maximum</i> and invasive species like <i>Clusia rosea</i> ."
302	2010. Nelson, G.. The Trees of Florida. A Reference and Field Guide. 2nd Edition. Pineapple Press Inc, Sarasota, FL	[Garden/amenity/disturbance weed?] "Presumably but questionably native (West Indies), sometimes considered not native and potentially invasive."
303	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Agricultural/forestry/horticultural weed? No evidence]

304	1999. U.S. Fish and Wildlife Service. South Florida multi-species recovery plan. Southeast Region, Atlanta, Georgia	[Environmental weed? Potentially] "One of the downsides of the trend in landscaping with native plants is that some species are being distributed outside of their historic range, where they can become established and, potentially, invasive. For example, the pitch-apple (<i>Clusia rosea</i>), which is perhaps native to the lower Florida Keys, has been widely distributed in cultivation throughout southeastern Florida. It now has begun to naturalize throughout southeastern Florida and poses a threat to several natural communities, including tropical hardwood hammocks (Gann and Bradley 1996)."
304	2003. Motooka, P./Castro, L./Nelson, D./Nagai, G./Ching, L.. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI http://www.ctahr.hawaii.edu/invweed/weedsHi.html	[Environmental weed? Potentially] "Environmental impact: Spreading in disturbed lowland forests and roadsides by birds."
304	2010. Duff, D.. Autograph trees are invading Hawaii's forests. West Hawaii Today. December 5. http://hawaii-agriculture.com/hawaii-agriculture-blog/autograph-trees-are-invading-hawaiis-forests/#more-5473 [Accessed 22 Feb 2013]	[Environmental weed? Potentially] "When I first bought property in Holualoa, I thought the autograph tree was quite lovely," Ames said. "After a few years of experience, inspection and investigation, I began to realize this tree was capable of destroying the habitat of our ohia and other native species unless we began a proactive course against it. "After witnessing the damage it can cause, I can honestly say that I hate what this plant is capable of doing. Autograph seeds can be dropped by birds and root as much as 20 or 30 feet in the air in the crotch of an ohia tree. The autograph seedling sends its long banyan like roots toward the ground while establishing other roots into the interior of the host tree. Then the invasive, destructive autograph tree begins to suck the lifeblood from its host. Eventually, the trees this invasive alien has attacked, die."
304	2010. Hadden, K./Frank, K./Norris, K./Gass, D.. Identification Guide For Invasive Exotic Plants of the Florida Keys 2010-2012. Florida Keys Invasive Exotics Task Force, http://www.keysgreenthumb.net/Invasives_Guide_2010-2012.pdf	[Environmental weed? Potentially] "Terrestrial or epiphytic trees or shrubs. Still referred to as a native by some." ... "FLEPPC: N/A; FKlETF: 3; spreading in Key Largo, Miami-Dade, Broward, Palm Beach counties; epiphytic, lithophytic. Considered an extirpated/re established plant for lower Keys (Big Pine Key) based on one specimen reported long ago."
305	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Congeneric weed? No evidence]
401	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Produces spines, thorns or burrs? No] "Terrestrial or epiphytic trees or shrubs 7-20 m tall, bark smooth. Leaves thick and coriaceous, obovate, 8-16 cm long, 3.5-14 cm wide, lateral veins arising at an 45 degree angle or less from midrib, petioles 1-2 cm long with a margined pit on upper side near base."
402	2004. Liebman, M./Staver, C.P.. Crop diversification for weed management. Pp 322-374 in Liebman, M. et al. (eds). Ecological Management of Agricultural Weeds. Cambridge University Press, Cambridge, UK	[Allelopathic? Unknown] "Rivas, Staver & Blanco (1993) found, for example, that leaf mulches of <i>Inga paterna</i> , <i>Simarouba glauca</i> , and <i>Clusia rosea</i> decomposed four times more slowly in shaded coffee than did a <i>Glirocidia sepium</i> mulch. Mulches of <i>I. paterna</i> , <i>S. glauca</i> , and <i>C. rosea</i> suppressed weed establishment up to two months after application." [Leaf litter may possess allelopathic properties]
403	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Parasitic? No] "Terrestrial or epiphytic trees or shrubs 7-20 m tall, bark smooth." [Clusiaceae]
404	2008. Meléndez Ackerman, E.J./Cortés, C./Sustache, J./Aragón, S./Morales Vargas, M./García Bermúdez, M./Fernández, D.S.. Diet of feral goats in Mona Island Reserve, Puerto Rico. Caribbean Journal of Science. 44(2): 199-205.	[Unpalatable to grazing animals? Palatable to goats] "TABLE 1. Frequency distribution of plant species found in rumen samples of feral goats in Mona Island Reserve according to habit and plant fragment found." [Clusia rosea leaves found in the rumen samples of 2 goats]
405	2007. Nelson, L./Shih, R.D./Balick, M.J.. Handbook of poisonous and injurious plants. The New York Botanical Garden. Springer, New York, NY	[Toxic to animals? Potentially] "The golden viscous sap and the fruit are toxic." ... "Clinical Findings: Nausea, vomiting, abdominal cramping and diarrhea may occur." [Unknown how likely other animals might consume or be exposed to toxins]
405	2008. Meléndez Ackerman, E.J./Cortés, C./Sustache, J./Aragón, S./Morales Vargas, M./García Bermúdez, M./Fernández, D.S.. Diet of feral goats in Mona Island Reserve, Puerto Rico. Caribbean Journal of Science. 44(2): 199-205.	[Toxic to animals? Apparently not toxic to goats] "TABLE 1. Frequency distribution of plant species found in rumen samples of feral goats in Mona Island Reserve according to habit and plant fragment found." [Clusia rosea leaves found in the rumen samples of 2 goats]
406	1993. Gilman, E.F./Watson, D.G.. Clusia rosea - Pitch-Apple. Fact Sheet ST-172. University of Florida IFAS Extension, Gainesville, FL hort.ufl.edu/database/documents/pdf/tree_fact_sh_eets/clurosa.pdf	[Host for recognized pests and pathogens? No evidence] "Pest resistance: no pests are normally seen on the tree" ... "Pests Scale. Diseases No diseases are of major concern."

406	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Host for recognized pests and pathogens? No evidence] "...autograph tree has few pest or disease problems and is easily propagated by seed or cuttings."
407	2007. Nelson, L./Shih, R.D./Balick, M.J.. Handbook of poisonous and injurious plants. The New York Botanical Garden. Springer, New York, NY	[Causes allergies or is otherwise toxic to humans? Yes] "The golden viscous sap and the fruit are toxic." ... "Clinical Findings: Nausea, vomiting, abdominal cramping and diarrhea may occur."
407	2009. Miller, G.L./Lugo, A.E.. Guide to the ecological systems of Puerto Rico. Gen. Tech. Rep. IITF-GTR-35. USDA Forest Service, International Institute of Tropical Forestry, San Juan, PR	[Causes allergies or is otherwise toxic to humans? Yes] "The yellow-brown fruits are capsules with 7 to 9 chambers that produce numerous yellow sticky seeds that are eaten and vectored by bats and birds. They are poisonous to humans."
408	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Creates a fire hazard in natural ecosystems? No evidence]
408	2009. Kirk, T.K.. Tropical Trees of Florida and the Virgin Islands: A Guide to Identification, Characteristics and Uses. Pineapple Press Inc., Sarasota, FL	[Creates a fire hazard in natural ecosystems? No evidence]
408	2009. Miller, G.L./Lugo, A.E.. Guide to the ecological systems of Puerto Rico. Gen. Tech. Rep. IITF-GTR-35. USDA Forest Service, International Institute of Tropical Forestry, San Juan, PR	[Creates a fire hazard in natural ecosystems? No evidence]
409	1993. Francis, J.K.. <i>Clusia rosea</i> Jacq. Cupey. Clusiaceae <i>Clusia</i> family. SO-ITF-SM-69. USDA Forest Service International Institute of Tropical Forestry, Rio Piedras, PR	[Is a shade tolerant plant at some stage of its life cycle? Yes] "Cupey is moderately tolerant of shade. Seedlings and saplings survive for many years in the understory of moist secondary forests."
409	2009. Kirk, T.K.. Tropical Trees of Florida and the Virgin Islands: A Guide to Identification, Characteristics and Uses. Pineapple Press Inc., Sarasota, FL	[Is a shade tolerant plant at some stage of its life cycle? Yes] "Autograph-tree is one of the most habitat-tolerant trees in the V.I. and south Florida. It grows in deep shade and open sun, in various soils, and is very resistant to drought, salt, and wind."
410	1993. Gilman, E.F./Watson, D.G.. <i>Clusia rosea</i> - Pitch-Apple. Fact Sheet ST-172. University of Florida IFAS Extension, Gainesville, FL hort.ufl.edu/database/documents/pdf/tree_fact_sheets/clurosa.pdf	[Tolerates a wide range of soil conditions? Yes] "Soil tolerances: clay; loam; sand; acidic; alkaline; well-drained" ... "Pitch- Apple tolerates many different soil types but grows most rapidly on moist soils. It is quite tolerant of light open sands and salt spray, making it ideal for seaside locations."
410	2009. Kirk, T.K.. Tropical Trees of Florida and the Virgin Islands: A Guide to Identification, Characteristics and Uses. Pineapple Press Inc., Sarasota, FL	[Tolerates a wide range of soil conditions? Yes] "Autograph-tree is one of the most habitat-tolerant trees in the V.I. and south Florida. It grows in deep shade and open sun, in various soils, and is very resistant to drought, salt, and wind."
411	2008. Mascaro, J./Becklund, K.K./Hughes, R.F./Schnitzer, S.A.. Limited native plant regeneration in novel, exotic-dominated forests on Hawai'i. Forest Ecology and Management. 256: 593–606.	[Climbing or smothering growth habit? Yes] "Novel forests had many structural elements not present in native forests, due to their incorporation of exotic species with growth strategies that are new or uncommon on Hawai'i. These included hemiepiphytes and stranglers (e.g., <i>Schefflera actinophylla</i> [octopus tree], <i>Clusia rosea</i> , and <i>Ficus microcarpa</i> [Chinese banyan]),..."
411	2009. Miller, G.L./Lugo, A.E.. Guide to the ecological systems of Puerto Rico. Gen. Tech. Rep. IITF-GTR-35. USDA Forest Service, International Institute of Tropical Forestry, San Juan, PR	[Climbing or smothering growth habit? Yes] " <i>Clusia rosea</i> is an unusual tree species because it can start out as an epiphyte and may become a strangler as it develops." ... "In the wild, cupey often begins life as an epiphyte (air plant), much like figs, with its seeds germinating in the canopy and sending long aerial roots to the ground. The roots gradually coalesce and eventually encircle the structural host tree. The trunk of <i>Clusia</i> encases the host, which may die a few years"
412	1993. Francis, J.K.. <i>Clusia rosea</i> Jacq. Cupey. Clusiaceae <i>Clusia</i> family. SO-ITF-SM-69. USDA Forest Service International Institute of Tropical Forestry, Rio Piedras, PR	"Because branches grow aerial roots that become stems if allowed to grow long enough, cupey trees can form clonal stands in much the same way as do many tropical figs (<i>Ficus</i> spp.). Competition from surrounding trees usually prevents this condition from occurring in natural forest, but it has been observed in open-grown trees."
412	2006. Daehler, C. C./Baker, R. F.. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers. 87: 3-18.	[Forms dense thickets? Yes] "In some places in the vicinity of old planted trees, there are dense sapling thickets containing hundreds of plants 0.5–2 m tall."

501	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Aquatic? No] "...becoming naturalized in low elevation, disturbed areas"
502	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Grass? No] Clusiaceae
503	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Nitrogen fixing woody plant? No] Clusiaceae
504	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "Terrestrial or epiphytic trees or shrubs 7-20 m tall, bark smooth."
601	2009. Miller, G.L./Lugo, A.E.. Guide to the ecological systems of Puerto Rico. Gen. Tech. Rep. IITF-GTR-35. USDA Forest Service, International Institute of Tropical Forestry, San Juan, PR	[Evidence of substantial reproductive failure in native habitat? No evidence]
602	1993. Gilman, E.F./Watson, D.G.. Clusia rosea - Pitch-Apple. Fact Sheet ST-172. University of Florida IFAS Extension, Gainesville, FL hort.ufl.edu/database/documents/pdf/tree_fact_sheets/clurosa.pdf	[Produces viable seed? Yes] "These persistent fruits turn black when ripe and split open, revealing bright red seeds surrounded by a black, resinous material. The seeds are very attractive to birds and other wildlife and they germinate readily in the landscape and surrounding areas."
602	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Produces viable seed? Yes] "In Hawaii, cultivated as an ornamental, now being spread by birds, which eat the seeds, and becoming naturalized in low elevation, disturbed areas,..."
602	2000. Whistler, W.A.. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	[Produces viable seed? Yes] "Propagate by seeds or cuttings."
603	2013. WRA Specialist. Personal Communication.	[Hybridizes naturally? Unknown]
604	1976. Maguire, B.. Apomixis in the Genus Clusia (Clusiaceae). A Preliminary Report. Taxon. 25(2/3): 241-244.	[Self-compatible or apomictic? Yes] "In Clusia apomixis occurs in the C. rosea Jacq. alliance of the section Euclusia, and in the coterie of elements that may now broadly be held in the C. minor complex." ... "Further collaborative evidence for apomixis in Clusia rosea derives from observation by Dr. C. E. Wood, Jr., as recently reported by Tomlinson (1974). In personal communication to me, Dr. John Popenoe (1969) of the Fairchild Tropical Garden, Miami, Florida, writes that C. rosea, all completely female trees, fruit regular, produces functional seed in the complete absence of male trees or of pollen bearing flowers. It is appropriate to conclude, therefore, from the above evidences that Clusia rosea is wholly apomictic, and that the pathway of agamospermy is through adventitious embryony." ... "From the foregoing, it is abundantly clear that apomixis occurs in Clusia rosea"
604	1998. Steyermark, J./Berry, P./Holst, B./Yatskievych, K.. Flora of the Venezuelan Guayana. Volume 4, Caesalpinaceae-Ericaceae. Missouri Botanical Garden Press, St. Louis, MO	[Self-compatible or apomictic? Yes] "Large tree to 30 m tall, at least some populations apparently apomictic (only pistillate flowers known; stigmas 6 or 7)."
605	1976. Maguire, B.. Apomixis in the Genus Clusia (Clusiaceae). A Preliminary Report. Taxon. 25(2/3): 241-244.	[Requires specialist pollinators? No] "From the foregoing, it is abundantly clear that apomixis occurs in Clusia rosea" [No pollinators required]
605	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Requires specialist pollinators? No evidence] "Flowers 1-3 in axillary or pseudoterminal cymes, bracteoles 2-4; sepals 4-6, 1-2 cm long, persistent; petals 6-8, white or pink, broadly obovate to suborbicular, 3-4 cm long; staminate flowers with stamens in several whorls, connate at base into a ring, inner stamens connate into a solid resinous mass; pistillate flowers with staminodes connate into a cup, ovary globose, stigmas 6-9, sessile."
606	1998. Riffle, R.L.. The Tropical Look - An Encyclopedia of Dramatic Landscape Plants. Timber Press, Portland, OR	[Reproduction by vegetative fragmentation? Possibly] "The tree grows fairly rapidly and has wandering roots much like those of many Ficus species." [Wandering roots suggests that this tree might have the potential to invade areas by vegetative spread]

607	1993. Gilman, E.F./Watson, D.G.. Clusia rosea - Pitch-Apple. Fact Sheet ST-172. University of Florida IFAS Extension, Gainesville, FL hort.ufl.edu/database/documents/pdf/tree_fact_sheets/clurosa.pdf	[Minimum generative time (years)?] "Growth rate: medium"
607	2002. Criley, R.. Professor of Horticulture. Pers. Comm. University of Hawaii at Manoa. Department of Tropical Plant and Soil Sciences, Honolulu, HI	[Minimum generative time (years)? 4+]
701	2009. Kirk, T.K.. Tropical Trees of Florida and the Virgin Islands: A Guide to Identification, Characteristics and Uses. Pineapple Press Inc., Sarasota, FL	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? No evidence] "Fruits are eaten by birds and bats, spreading the seeds. Each fruit capsule contains an orange-red pulp with many 0.2-in. (0.5 cm)-long seeds. The capsule splits open into a 7-9-pointed star shape when mature." [Fruits & seeds lack means of external attachment. Unlikely to be accidentally spread]
702	1993. Gilman, E.F./Watson, D.G.. Clusia rosea - Pitch-Apple. Fact Sheet ST-172. University of Florida IFAS Extension, Gainesville, FL hort.ufl.edu/database/documents/pdf/tree_fact_sheets/clurosa.pdf	[Propagules dispersed intentionally by people? Yes] "Outstanding tree: tree has outstanding ornamental features and could be planted more"
702	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Propagules dispersed intentionally by people? Yes] "...cultivated as an ornamental..."
702	2000. Whistler, W.A.. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	[Propagules dispersed intentionally by people? Yes] "...widely cultivated for its flowers, attractive leaves, and unusual, crab-like fruits, which are used in dried flower arrangements."
703	1993. Francis, J.K.. Clusia rosea Jacq. Cupey. Clusiaceae Clusia family. SO-ITF-SM-69. USDA Forest Service International Institute of Tropical Forestry, Rio Piedras, PR	{Propagules likely to disperse as a produce contaminant? No evidence} "Seeds are dispersed by gravity and birds (author, personal observation)."
704	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Propagules adapted to wind dispersal? No] "Capsules greenish brown, somewhat fleshy, globose, 5-8 cm in diameter. Seeds with a dark red, thin, fleshy aril"
705	1993. Francis, J.K.. Clusia rosea Jacq. Cupey. Clusiaceae Clusia family. SO-ITF-SM-69. USDA Forest Service International Institute of Tropical Forestry, Rio Piedras, PR	[Propagules water dispersed? No evidence] "Seeds are dispersed by gravity and birds (author, personal observation)."
706	1971. Snow, B.K./Snow, D.W.. The Feeding Ecology of Tanagers and Honeycreepers in Trinidad. The Auk. 88(2): 291-322.	[Propagules bird dispersed? Yes] "The long bill may also be advantageous in eating the edible portions of the fruits of the strangling climber Clusia rosea, a 3-inch woody capsule that splits open into many segments partly exposing the arillate seeds within. Purple Honeycreepers probe into these capsules, even coming to the ground to eat fallen fruit. The three other honeycreepers were less often seen taking Clusia fruit, though in Costa Rica Skutch (1962) records that they do so regularly."
706	1979. van Riper, III, C./van Riper, S.G./Berger, A.J.. The Red-Whiskered Bulbul in Hawaii. The Wilson Bulletin. 91(2): 323-328.	[Propagules bird dispersed? Yes] "Red-whiskered Bulbuls have been reported feeding on the date palm (Phoenix dactylifera) (Roberts, Elepaio 30:66, 1970). We have observed its favorite fruits to be papaya (Carica papaya), mango (Magnifera indica), the fruits of the autograph tree (Clusia rosea), and berries of the several banyan (Ficus) species present here."
706	1980. Skutch, A.F.. Arils as Food of Tropical American Birds. Condor. 82: 31-42.	[Propagules bird dispersed? Yes] "Only at the Dipterodendron tree, and at the large-fruited Clusia rosea, did I notice much competition for food. The thick pods of these trees opened slowly and the birds seemed impatient for the contents."
706	2003. Carlo, T.A./Collazo, J.A./Groom, M.J.. Avian Fruit Preferences across a Puerto Rican Forested Landscape: Pattern Consistency and Implications for Seed Remova. Oecologia. 134(1): 119-131.	[Propagules bird dispersed? Yes] "Although Vireo feeds primarily on insects, it scored highest as a disperser for Clusia for most sites, and Guarea in some others. Other studies also have documented the importance of vireos as seed dispersers of other plant species (see Greenberge t al. 1995). Thus, from the plant's perspective, the functional behavior of Vireo may parallel that of a specialized frugivore"
706	2006. Daehler, C. C./Baker, R. F.. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers. 87: 3-18.	[Propagules bird dispersed? Yes] "Although this plant is known to be an epiphytic strangler, most of the naturalized seedlings were not growing epiphytically. However, one established plant was observed growing epiphytically on a Falcataria moluccana tree, indicating that it is definitely being dispersed by birds."

706	2009. Kirk, T.K.. Tropical Trees of Florida and the Virgin Islands: A Guide to Identification, Characteristics and Uses. Pineapple Press Inc., Sarasota, FL	[Propagules bird dispersed? Yes] "Fruits are eaten by birds and bats, spreading the seeds. Each fruit capsule contains an orange-red pulp with many 0.2-in. (0.5 cm)-long seeds. The capsule splits open into a 7-9-pointed star shape when mature."
707	2009. Kirk, T.K.. Tropical Trees of Florida and the Virgin Islands: A Guide to Identification, Characteristics and Uses. Pineapple Press Inc., Sarasota, FL	[Propagules dispersed by other animals (externally)? No evidence] "Fruits are eaten by birds and bats, spreading the seeds. Each fruit capsule contains an orange-red pulp with many 0.2-in. (0.5 cm)-long seeds. The capsule splits open into a 7-9-pointed star shape when mature." [Fruits & seeds lack means of external attachment. Adapted for internal dispersal]
708	2003. Riba-Hernández, P./Stoner, K.E./Lucas, P.W.. The Sugar Composition of Fruits in the Diet of Spider Monkeys (<i>Ateles geoffroyi</i>) in Tropical Humid Forest in Costa Rica. <i>Journal of Tropical Ecology</i> . 19(6): 709-716.	[Propagules survive passage through the gut? Yes. Adapted for consumption and internal dispersal] "Table 1. Soluble carbohydrate concentration in fruit pulp of species consumed by spider monkeys, per cent feeding time on each species in the fruit diet, and seed dispersal mode for each species (B: bird, P: primate, C: chiroptera)" [<i>Clusia rosea</i> - Principal dispersal agent = B:Bird & P:Primate]
708	2009. Miller, G.L./Lugo, A.E.. Guide to the ecological systems of Puerto Rico. Gen. Tech. Rep. IITF-GTR-35. USDA Forest Service, International Institute of Tropical Forestry, San Juan, PR	[Propagules survive passage through the gut? Presumably Yes] "The yellow-brown fruits are capsules with 7 to 9 chambers that produce numerous yellow sticky seeds that are eaten and vectored by bats and birds."
801	1993. Francis, J.K.. <i>Clusia rosea</i> Jacq. Cupey. Clusiaceae <i>Clusia</i> family. SO-ITF-SM-69. USDA Forest Service International Institute of Tropical Forestry, Rio Piedras, PR	[Prolific seed production (>1000/m ²)? Yes] "Fruiting cupey trees produce seeds in large numbers. One seed collection in Puerto Rico averaged 84,000 seeds per kg (author, personal observation). Seeds are dispersed by gravity and birds (author, personal observation)."
802	2001. Cubina, A./Aide, T.M.. The Effect of Distance from Forest Edge on Seed Rain and Soil Seed Bank in a Tropical Pasture. <i>Biotropica</i> . 33(2): 260-267.	[Evidence that a persistent propagule bank is formed (>1 yr)? Unknown] "TABLE 1. Species that produced fruits during the census and their presence (x) or absence in the seed rain and seed bank" [<i>Clusia rosea</i> present in the seed bank, but no information on longevity of seeds]
802	2008. Royal Botanic Gardens Kew. Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/	[Evidence that a persistent propagule bank is formed (>1 yr)? Unknown] No information on storage
803	2010. Hadden, K./Frank, K./Norris, K./Gass, D.. Identification Guide For Invasive Exotic Plants of the Florida Keys 2010-2012. Florida Keys Invasive Exotics Task Force, http://www.keysgreenthumb.net/Invasives_Guide_2010-2012.pdf	[Well controlled by herbicides? Unknown effectiveness] "Basal with 10% triclopyr ester"
804	1993. Francis, J.K.. <i>Clusia rosea</i> Jacq. Cupey. Clusiaceae <i>Clusia</i> family. SO-ITF-SM-69. USDA Forest Service International Institute of Tropical Forestry, Rio Piedras, PR	[Tolerates, or benefits from, mutilation, cultivation, or fire? Possibly Yes] "Young cupey will coppice if cut. Aerial and prop roots occaiaianal1y sprout leaves when severed and thus remain as clonal plants. Layering of branches that touch the ground is common." ... "The limited ability of cupey to recover from damage suggests that cutting or girdling the trees may be sufficient to eliminate them from forest stands during cleaning operations. However, cutting the vine-like roots of epiphytic cupey saplings will not kill them."
804	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Tolerates, or benefits from, mutilation, cultivation, or fire? Possibly Yes] "It tolerates salt spray well and requires pruning only to shape young trees and develop a strong framework for future growth."
805	2013. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown]

Summary of Risk Traits

High Risk / Undesirable Traits

- Naturalized in Hawaiian Islands
- Thrives in tropical climates
- Spreads into unwanted areas and has the potential to become an environmental weed
- Sap and fruit are toxic
- Shade tolerant
- Tolerates many soil conditions (and potentially able to exploit many different habitat types)
- Epiphytic strangler (may kill tree on which is grows)
- Can form dense thickets
- Apomictic
- Seeds dispersed by birds, and planted intentionally by people

Low Risk / Desirable Traits

- Palatable to goats
- Unarmed (no spines, thorns or burrs)
- Slow growing
- Landscaping and ornamental value