

Family: *Papaveraceae*

Taxon: *Bocconia frutescens*

Synonym: *Bocconia integrifolia* Bonpl. **Common Name:** Plume poppy
Bocconia frutescens var. *cernua* Moc. & Sess. Tree poppy
Bocconia glauca Salisb. bocconia
Bocconia pearcei Hutch. parrotweed
Bocconia quercifolia Moench
Bocconia sinuatifolia Stokes
Bocconia subtomentosa L'Hér. ex Stahl

Questionnaire :	current 20090513	Assessor:	Chuck Chimera	Designation:	H(Hawai'i)
Status:	Assessor Approved	Data Entry Person:	Chuck Chimera	WRA Score	18
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	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	n
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)	
303	Agricultural/forestry/horticultural weed			n=0, y = 2*multiplier (see Appendix 2)	y
304	Environmental weed			n=0, y = 2*multiplier (see Appendix 2)	y
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	y
405	Toxic to animals			y=1, n=0	
406	Host for recognized pests and pathogens			y=1, n=0	
407	Causes allergies or is otherwise toxic to humans			y=1, n=0	
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	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	
604	Self-compatible or apomictic	y=1, n=-1	
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	>3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	
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	
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	y
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	n

Designation: H(Hawai'i)

WRA Score 18

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.	No evidence
102	2011. WRA Specialist. Personal Communication.	NA
103	2011. WRA Specialist. Personal Communication.	NA
201	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 range: Central and South America, West Indies."
202	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 range: Central and South America, West Indies."
203	2008. Magnuson, B.L./Kimball, L.D.. A field guide to plants of Costa Rica. Oxford University Press US, New York, NY	"Altitude: 100-3200 m, usually above 700 m " [broad elevational range >1000 m]
203	2009. Francis, J.K.. Wildland Shrubs of the United States & its Territories: Thamnic Descriptions General Technical Report IITF-WB-1. U.S.D.A. Forest Service Internation Institute of Tropical Forestry, http://www.fs.fed.us/global/iitf/wildland_shrubs.htm	"In Puerto Rico, it grows in subtropical dry forest along streams (750 to 1000 mm/year precipitation), in subtropical moist forest (1000 to 2000 mm/year precipitation), and in subtropical wet forests (2000 to 3000 mm/year precipitation). In Nicaragua, the species grows even in the cloud forests (Stevens and others 2001). In Puerto Rico, pan cimarrón is most common along streams, road cuts, and landslides."
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 range: Central and South America, West Indies."
205	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	No evidence
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 in disturbed sites, especially along roadsides, 550-920 m, in dry forest on Maui and mesic forest on Hawaii. "
301	2000. Grey-Wilson, C.. Poppies: a guide to the poppy family in the wild and in cultivation. Timber Press, Portland, OR	"This species has become naturalized in Java"
302	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 in disturbed sites, especially along roadsides, 550-920 m, in dry forest on Maui and mesic forest on Hawaii." [a disturbance weed with environmental impacts. See 3.04]
303	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	"Because bocconia is able to flourish in a broad range of environmental conditions and along a large elevational gradient within its home range it appears to have the potential to invade native and non-native habitats in dry and mesic environments in Hawai'i. Given its potential to reach tree-sized stature and its ability to form thick stands, bocconia is expected to be a serious competitor with native or other desirable species. In the Wood Valley area of Hawaii, bocconia quickly spread from one landscape planting near to occupy in excess of 3,500 acres of abandoned cane land. This recent population explosion coincides with the demise of active cane farming in the area that allowed bocconia to reach maturity and rapidly increase its range. Bocconia is now considered a major weed in small agricultural lots in the area. On Maui, bocconia has been observed at 5800' elevation. Art Medeiros (U.S. Geological Survey) considers bocconia to be one of the most threatening weeds in the Kanaio Natural Area Reserve"
303	2011. USDA NRCS. Hawaii State-listed Noxious Weeds. http://plants.usda.gov/java/noxious?rptType=State&statefips=15	Listed as a Hawaii State Noxious Weed

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	"Because <i>bocconia</i> is able to flourish in a broad range of environmental conditions and along a large elevational gradient within its home range it appears to have the potential to invade native and non-native habitats in dry and mesic environments in Hawai'i. Given its potential to reach tree-sized stature and its ability to form thick stands, <i>bocconia</i> is expected to be a serious competitor with native or other desirable species. In the Wood Valley area of Hawaii, <i>bocconia</i> quickly spread from one landscape planting near to occupy in excess of 3,500 acres of abandoned cane land. This recent population explosion coincides with the demise of active cane farming in the area that allowed <i>bocconia</i> to reach maturity and rapidly increase its range. <i>Bocconia</i> is now considered a major weed in small agricultural lots in the area. On Maui, <i>bocconia</i> has been observed at 5800' elevation. Art Medeiros (U.S. Geological Survey) considers <i>bocconia</i> to be one of the most threatening weeds in the Kanaio Natural Area Reserve"
304	2009. Duff, D.. Awareness helps control invasive species. West Hawaii Today. September 6: .	"One of the most invasive plant introductions on the Big Island reported by Page Else, public outreach specialist at the Big Island Invasive Species Committee, is the plume poppy, or tree poppy. This plant has seriously invaded the leeward native dry and mesic forests of East Maui. According to Page and the committee, this plant was introduced here as an ornamental planting in Wood Valley and has spread into more than 3,500 acres of abandoned cane land in the area. It has also begun spreading into other parts of West Hawaii."
305	2007. Randall, R.P.. Global Compendium of Weeds Index [Online Database]. http://www.hear.org/gcw/	No evidence or record of other invasive <i>Bocconia</i>
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.	"Branched shrubs; stems 2-6 m long, pith white. Leaves often somewhat congested toward the tips of the branches, oblong-obovate to oblong-lanceolate, 10-45 cm long, 4-20 cm wide, pinnately cleft ca. 1/2 to midrib, upper surface sparsely strigillose, lower surface glaucous and puberulent, especially along veins." [no spines, thorns, or burrs]
402	2011. WRA Specialist. Personal Communication.	Unknown
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.	"Branched shrubs" [no evidence]
404	2003. Starr, F./Starr, K./Loope, L.L.. <i>Bocconia frutescens</i> - Tree poppy Papaveraceae. http://www.hear.org/starr/hiplants/reports/pdf/bocconia_frutescens.pdf	"Cattle may occasionally push over or harass <i>B. frutescens</i> plants" [no evidence that plants are eaten]
404	2011. Big Island Invasive Species Committee (BIISC). Pest Alert - <i>Bocconia</i> . http://www.hawaiiinvasivespecies.org/iscs/biisc/pdfs/biiscbrochurebocconia.pdf	"Cattle seem to avoid it, probably because it makes a bitter yellowish sap."
405	2003. Starr, F./Starr, K./Loope, L.L.. <i>Bocconia frutescens</i> - Tree poppy Papaveraceae. http://www.hear.org/starr/hiplants/reports/pdf/bocconia_frutescens.pdf	"Cattle may occasionally push over or harass <i>B. frutescens</i> plants."
405	2010. San Marcos Growers. Products - <i>Bocconia frutescens</i> . http://www.smgrowers.com/products/plants/plantdisplay.asp?plant_id=2505	"All parts of this plant are poisonous and has been used for medicinal purposes such as a purgative."
405	2011. Big Island Invasive Species Committee (BIISC). Pest Alert - <i>Bocconia</i> . http://www.hawaiiinvasivespecies.org/iscs/biisc/pdfs/biiscbrochurebocconia.pdf	"Cattle seem to avoid it, probably because it makes a bitter yellowish sap."
405	2011. WRA Specialist. Personal Communication.	No direct evidence of animal poisoning found
406	2011. WRA Specialist. Personal Communication.	Unknown

407	2007. Calzada, F./Yépez-Mulia, L./Tapia-Contreras, A.. Effect of Mexican medicinal plant used to treat trichomoniasis on <i>Trichomonas vaginalis</i> trophozoites. <i>Journal of Ethnopharmacology</i> . 113(2): 248-251.	"Crude methanolic extracts from 22 Mexican medicinal plants were screened for antitrichomonal activity against <i>Trichomonas vaginalis</i> , which is the etiological agent of trichomoniasis. Among the plants tested <i>Carica papaya</i> and <i>Cocos nucifera</i> showed the best antitrichomonal activity with IC(50) values of 5.6 and 5.8 microg/ml, respectively. The extracts of <i>Bocconia frutescens</i> , <i>Geranium mexicanum</i> , and <i>Lygodium venustum</i> showed moderate activity with IC(50) values ranging from 30.9 to 60.9 microg/ml. All the other plant extracts were inactive (IC(50)>100 microg/ml). All extracts tested were less active than metronidazole (IC(50) 0.037 microg/ml), an antiprotozoal drug used as positive control. The results of the antiprotozoal screening support the popular uses of five of the plants tested for the treatment of some urogenital tract disorders in Mexican traditional medicine. However, seeds of <i>Carica papaya</i> and aerial parts of <i>Bocconia frutescens</i> should be used in herbal medicine with care to avoid toxicity."
407	2009. Francis, J.K.. Wildland Shrubs of the United States & its Territories: Thamnisc Descriptions General Technical Report IITF-WB-1. U.S.D.A. Forest Service International Institute of Tropical Forestry, http://www.fs.fed.us/global/iitf/wildland_shrubs.htm	"Benefits.—Pan cimarrón contributes to biodiversity, helps protect the soil, and furnishes food and cover for wildlife. The sap has been used as a dye (Little and others 1974). The orange wood is soft and brittle with a thick pith, and is of little use. Extracts of various tissues of pan cimarrón are employed in herbal medicine to control mange, lice, and intestinal worms, to treat ulcers of the eyes, to treat wounds, and to treat edema and jaundice (Pérez Arbelaez 1978). A dose of 15 drops of the sap causes a strong purgative effect (Guzmán 1975). The sap will cure warts and if injected under the skin acts as a local anesthetic although the injection itself causes considerable pain. The bark contains the alkaloids, bocconietrine, cocconichlorine, bocconioidine, and bocconixatine (Secretaría de Medio Ambiente y Recursos Naturales 2002). Pan cimarrón is being evaluated as a species for restoration of disturbed sites (Jardín Botánico de Bogotá José Mutis 2002)."
407	2010. San Marcos Growers. Products - <i>Bocconia frutescens</i> . http://www.smgrowers.com/products/plants/plantdisplay.asp?plant_id=2505	"All parts of this plant are poisonous and has been used for medicinal purposes such as a purgative." [no evidence of accidental poisonings or topical allergenicity]
407	2011. Pollen Library. Parrotweed (<i>Bocconia frutescens</i>). SDI Health LLC, http://www.pollenlibrary.com/Specie/Bocconia%20frutescens/	Allergenicity: No allergy has been reported for Parrotweed (<i>Bocconia Frutescens</i>) species.
408	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	No evidence of fire hazard listed among impacts
409	2008. Nishida, K.. Survey for Insect Enemies of <i>Bocconia frutescens</i> in Costa Rica. http://www.kenjinishida.net/bocconia/	"One troubling ecological trait of the species is its large seeds which may be a key trait in its ability to germinate and become established in dense shade."
409	2009. Francis, J.K.. Wildland Shrubs of the United States & its Territories: Thamnisc Descriptions General Technical Report IITF-WB-1. U.S.D.A. Forest Service International Institute of Tropical Forestry, http://www.fs.fed.us/global/iitf/wildland_shrubs.htm	"Pan cimarrón is intolerant of shade." [but readily establishes in shaded sites in Hawaiian Islands]
409	2010. San Marcos Growers. Products - <i>Bocconia frutescens</i> . http://www.smgrowers.com/products/plants/plantdisplay.asp?plant_id=2505	"Grows in full sun or moderate shade and can irrigated regularly or given little or no supplemental watering in coastal gardens."
410	2009. Francis, J.K.. Wildland Shrubs of the United States & its Territories: Thamnisc Descriptions General Technical Report IITF-WB-1. U.S.D.A. Forest Service International Institute of Tropical Forestry, http://www.fs.fed.us/global/iitf/wildland_shrubs.htm	"Pan cimarrón grows in a wide variety of soil types at middle elevations up to 2,150 m in Mexico (Secretaría de Medio Ambiente y Recursos Naturales 2002)."
411	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.	"Branched shrubs; stems 2-6 m long, pith white. Leaves often somewhat congested toward the tips of the branches, oblong obovate to oblong-lanceolate, 10-45 cm long, 4-20 cm wide, pinnately cleft ca. 1/2 to midrib, upper surface sparsely strigillose, lower surface glaucous and puberulent, especially along veins." [not climbing or smothering]

412	1985. Smith, C.W.. Impact of Alien Plants on Hawaii's Native Biota. http://www.hear.org/books/hte1985/pdfs/hte1985mith.pdf	"This evergreen shrub to small tree forms dense stands in dry habitats. It grows at elevations between 300-1,000 m in dry habitats "
412	2009. Francis, J.K.. Wildland Shrubs of the United States & its Territories: Thamnic Descriptions General Technical Report IITF-WB-1. U.S.D.A. Forest Service International Institute of Tropical Forestry, http://www.fs.fed.us/global/iitf/wildland_shrubs.htm	"It competes vigorously with herbs and brush after establishment. The shrub does not form continuous stands in Puerto Rico, but occurs as scattered individuals or small patches. However, as an invader in Hawaii, it does form large, dense stands in dry and mesic habitat"
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.	Terrestrial
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.	Papaveraceae [not a grass]
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.	Papaveraceae [not a nitrogen fixing woody plant]
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.	"Branched shrubs; stems 2-6 m long, pith white." [not a geophyte]
601	2008. Magnuson, B.L./Kimball, L.D.. A field guide to plants of Costa Rica. Oxford University Press US, New York, NY	No evidence of substantial reproductive failure in native habitat
602	2002. Motooka, P./Ching, L./Nagai, G.. Herbicidal Weed Control Methods for Pasture and Natural Areas of Hawaii. CTAHR free publication WC-8. CTAHR, University of Hawaii, Honolulu, HI	"Bocconia produces large numbers of seed with a red fleshy aril at the base that attracts birds, which disperse seed over long distances."
602	2011. Dave's Garden. PlantFiles: Plume Poppy, Tree Celandine, Parrotweed. http://davesgarden.com/guides/pf/go/31949/	"May be a noxious weed or invasive Self-sows freely; deadhead if you do not want volunteer seedlings next season...Propagation Methods: From softwood cuttings, From semi-hardwood cuttings, From seed; sow indoors before last frost, By simple layering, By air layering"
603	2011. WRA Specialist. Personal Communication.	Unknown if able to hybridize naturally
604	1993. Kubitzki, K. (ed.). The Families and genera of vascular plants. Volume II. Springer-Verlag, Berlin, Heidelberg, New York	"The incompatibility system of the family seems to be gametophytic although it has been reported to have dry stigmas which usually are associated with a sporophytic system..." [family description, but no direct evidence for Bocconia]
605	1982. Tanner, E.V.J.. Species diversity and reproductive mechanisms in Jamaican trees. Biological Journal of the Linnean Society. 18(3): 263-278.	Tanner (1982) observed honeybees visiting the male flowers of Bocconia in the tropical montane rain forests of Jamaica.
605	1995. Bush, M.B.. Neotropical Plant Reproductive Strategies and Fossil Pollen Representation. The American Naturalist. 145(4): 594-609.	"...insect-pollinated plants (e.g., Phytolacca, Heliocarpus, several Solanaceae, Eupatorium angulare, Urera, and Bocconia)..."
606	2000. Grey-Wilson, C.. Poppies: a guide to the poppy family in the wild and in cultivation. Timber Press, Portland, OR	"Plants can be propagated from seed sown in heat in the spring or from cuttings as described under Macleaya. "
607	2003. Starr, F./Starr, K./Loope, L.L.. Bocconia frutescens - Tree poppy Papavaraceae. http://www.hear.org/starr/hiplants/reports/pdf/bocconia_frutescens.pdf	"Plants will begin to set fruit when about 4-6 years old"
701	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.	"Capsules grayish at maturity, pulp pale yellow, ca. 12 mm long, stipe ca. 5 mm long. Seed 1, black, 6-7 mm long, the surface smooth and glossy, the lower 1/2-1/3 covered with a red, pulpy aril." [relatively large seeds with no means of external attachment]

701	2007. Benitez, D.M./Saulibio, D.. <i>Bocconia frutescens</i> distribution on the island of Hawaii. Technical Report 144. Pacific Cooperative Studies Unit, Honolulu, HI	"Implement decontamination protocols. Proper decontamination of heavy machinery used in Wood Valley should prevent the transport of seeds to new areas. Soil movement from infested areas should also be discouraged, by posting signs near the infested areas and notifying contractors and landowners of the threats posed by soil contaminated with <i>Bocconia</i> seeds." [potential to move soil with seeds exists]
702	1998. Riffle, R.L.. <i>The Tropical Look - An Encyclopedia of Dramatic Landscape Plants</i> . Timber Press, Portland, OR	Planted intentionally as an ornamental
703	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. <i>Manual of the flowering plants of Hawaii</i> . Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Capsules grayish at maturity, pulp pale yellow, ca. 12 mm long, stipe ca. 5 mm long. Seed 1, black, 6-7 mm long, the surface smooth and glossy, the lower 1/2-1/3 covered with a red, pulpy aril." [no evidence that fairly large seeds contaminate produce]
704	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. <i>Manual of the flowering plants of Hawaii</i> . Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Capsules grayish at maturity, pulp pale yellow, ca. 12 mm long, stipe ca. 5 mm long. Seed 1, black, 6-7 mm long, the surface smooth and glossy, the lower 1/2-1/3 covered with a red, pulpy aril." [bird-dispersed, no adaptations for wind dispersal]
705	2007. Benitez, D.M./Saulibio, D.. <i>Bocconia frutescens</i> distribution on the island of Hawaii. Technical Report 144. Pacific Cooperative Studies Unit, Honolulu, HI	" <i>Bocconia</i> is frequently encountered in gulches below Wood Valley, where seeds were presumably washed down during heavy rains in November 2000. It is in these gulches that <i>Bocconia</i> reaches its lowest distributional elevation (350 m) on Hawai'i. Although densities are low at these sites, <i>Bocconia</i> is adapted to bird dispersal, and these populations are the most likely threat to the plant communities within HAVO due to their proximity." [although not specifically adapted to water dispersal, can be washed down streams in heavy rains]
706	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. <i>Manual of the flowering plants of Hawaii</i> . Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Capsules grayish at maturity, pulp pale yellow, ca. 12 mm long, stipe ca. 5 mm long. Seed 1, black, 6-7 mm long, the surface smooth and glossy, the lower 1/2-1/3 covered with a red, pulpy aril."
706	2002. Motooka, P./Ching, L./Nagai, G.. <i>Herbicide Weed Control Methods for Pasture and Natural Areas of Hawaii</i> . CTAHR free publication WC-8. CTAHR, University of Hawaii, Honolulu, HI	" <i>Bocconia</i> produces large numbers of seed with a red fleshy aril at the base that attracts birds, which disperse seed over long distances."
706	2008. Magnuson, B.L./Kimball, L.D.. <i>A field guide to plants of Costa Rica</i> . Oxford University Press US, New York, NY	"Fruit dry, orange becoming grayish at maturity, splitting open to reveal 1 black seed partially covered by red flesh, attractive to birds, which disperse seeds; fruits present most of the year."
706	2008. Nishida, K.. <i>Survey for Insect Enemies of Bocconia frutescens in Costa Rica</i> . http://www.kenjinishida.net/bocconia/	"One troubling ecological trait of the species is its large seeds which may be a key trait in its ability to germinate and become established in dense shade. Seeds are prolifically dispersed by non-native passerines such as Japanese white eyes (<i>Zosterops japonica</i>) and Red billed leiothrix (<i>Leiothrix lutea</i>) for distances of apparently >1km. It is listed by the Hawai'i Department of Agriculture as a noxious species subject to legal restrictions for sale and distribution."
706	2010. Chimera, C.G./Drake, D.R.. <i>Patterns of seed dispersal and dispersal failure in a Hawaiian dry forest having only Introduced birds</i> . <i>Biotropica</i> . 42(4): 493–502.	"Dry forests are among the most endangered natural communities in the Hawaiian Islands. Most have been reduced to isolated trees and small forest fragments in which native tree species reproduce poorly. The replacement of native birds by introduced generalists may be contributing to dry forest decline through modification of seed dispersal patterns. To document seed dispersal by introduced birds, we conducted foraging observations on fleshy-fruited trees and measured seed rain under trees and in adjacent open areas for 1 year in a dry forest dominated by native trees. Although trees covered only 15.2 percent of the study area, 96.9 percent of the bird-dispersed seeds were deposited beneath them. The Japanese white-eye (<i>Zosterops japonicus</i>) was the principal dispersal agent. Among bird dispersed seeds, those of the invasive tree <i>Bocconia frutescens</i> accounted for 75 percent of all seeds collected beneath trees (14.8 seeds/m ² /yr) and the invasive shrub <i>Lantana camara</i> accounted for 17 percent. Although nearly 60 percent of the reserve's native woody species possess fleshy fruits, introduced birds rarely disperse their seeds. Native trees accounted for 08 percent of all bird-dispersed seeds and are consequently experiencing dispersal failure by falling directly under parent trees. Smaller seeded non-native plants, in contrast, may be benefiting from dispersal by introduced birds. Current dispersal patterns suggest that these readily disseminated non native plants may eventually replace the remaining native flora."
707	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. <i>Manual of the flowering plants of Hawaii</i> . Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Capsules grayish at maturity, pulp pale yellow, ca. 12 mm long, stipe ca. 5 mm long. Seed 1, black, 6-7 mm long, the surface smooth and glossy, the lower 1/2-1/3 covered with a red, pulpy aril." [no means of external attachment]

708	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.	"Capsules grayish at maturity, pulp pale yellow, ca. 12 mm long, stipe ca. 5 mm long. Seed 1, black, 6-7 mm long, the surface smooth and glossy, the lower 1/2-1/3 covered with a red, pulpy aril." [adapted for bird dispersal and presumably able to survive passage through the gut]
708	2002. Motooka, P./Ching, L./Nagai, G.. Herbicidal Weed Control Methods for Pasture and Natural Areas of Hawaii. CTAHR free publication WC-8. CTAHR, University of Hawaii, Honolulu, HI	"Bocconia produces large numbers of seed with a red fleshy aril at the base that attracts birds, which disperse seed over long distances."
801	2009. Francis, J.K.. Wildland Shrubs of the United States & its Territories: Thamnic Descriptions General Technical Report IITF-WB-1. U.S.D.A. Forest Service International Institute of Tropical Forestry, http://www.fs.fed.us/global/iitf/wildland_shrubs.htm	"Reproduction.—Pan cimarrón flowers and fruits throughout the year (Little and others 1974, Stevens and others 2001). The infrutescences may contain tens to hundreds of fruits. Fruits in the infrutescences mature a few at a time beginning at the top and proceeding downward. A collection of seeds from Puerto Rico weighed (air-dried) an average of 0.0146 + 0.0002 g/seed (author's observation). Germination begins in 25 to 55 days with 40 percent germinating. Germination is epigeal (Ricardi and others 1977)."
802	2007. Veldman1, J.W./Murray, K./Hull, A.L./Mauricio Garcia-C., J./Mungall, W.S./Rotman, G.B./Plosz, M.P./McNamara, L.K.. Chemical defense and the persistence of pioneer plant seeds in the soil of a tropical cloud forest. <i>Biotropica</i> . 39(1): 87–93.	"We also conducted detailed analyses of the identities and concentrations of defensive chemicals present in <i>Bocconia frutescens</i> (Papaveraceae), a species able to persist in the soil for decades or longer...This discrepancy is presumably due to the fact that <i>Bocconia</i> seeds can remain viable in the seedbank for exceptionally long periods of time. Our data suggest that <i>Bocconia</i> seeds achieve this longevity through chemical defense— <i>Bocconia</i> seed extract was highly toxic to brine shrimp (Fig. 2B), and also inhibited growth of a plant pathogen."
802	2009. Dalling, J.W./Brown, T.A.. Long - Term Persistence of Pioneer Species in Tropical Rain Forest Soil Seed Banks. <i>The American Naturalist</i> . 173(4): 531-535.	"Several species common in the seed bank, including <i>Trema micrantha</i> , were not observed in seed rain over 3 years, while a pioneer shrub, <i>Bocconia frutescens</i> , accumulated a seed bank equivalent to 85 years of seed rain. Estimates of seed persistence based on seed bank to seed rain ratios are sensitive to sampling methods and are unlikely to meet assumptions of spatial homogeneity and temporal equilibrium of seed rain and seed banks (Garwood 1989; Murray and Garcia 2002). Nonetheless, the combination of direct seed dating and inferred seed residence times in the soil strongly suggests that long-term seed persistence is common for tropical pioneer trees and shrubs."
803	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	"Good control with 2,4-D and fair control with triclopyr applied basal bark. Very little other work on bocconia management. Aerial spot spraying with the "spray ball" applicator would be an effective way to kill emerging trees in pastures and abandoned sugarcane land. Trials are needed to determine an effective herbicide and rate for this method"
804	2003. Starr, F./Starr, K./Loope, L.L.. <i>Bocconia frutescens</i> - Tree poppy Papavaraceae. http://www.hear.org/starr/hiplants/reports/pdf/bocconia_frutescens.pdf	"Physical control: Small <i>B. frutescens</i> seedlings can sometimes be pulled up by hand. However, once plants are larger than just a few inches, they tend to break off at the base when pulled and will re-sprout. Plants are harder to pull when firmly rooted in lava substrates."
805	2008. Nishida, K.. Survey for Insect Enemies of <i>Bocconia frutescens</i> in Costa Rica. http://www.kenjinishida.net/bocconia/	"Physical control: Small <i>B. frutescens</i> seedlings can sometimes be pulled up by hand. However, once plants are larger than just a few inches, they tend to break off at the base when pulled and will re-sprout. Plants are harder to pull when firmly rooted in lava substrates."
805	2011. Chimera, C.G./Drake, D.R.. Could poor seed dispersal contribute to predation by introduced rodents in a Hawaiian dry forest?. <i>Biological Invasions</i> . DOI 10.1007/s10530-010-9887-4: .	"For the invasive <i>Bocconia</i> tree, seed removal and predation are not preventing the spread of this species into native forest habitat..."