Taxon: Brexia madagascarienisis **Family:** Celastraceae

Common Name(s): brexia **Synonym(s):** Brexia acanthifolia Noronha ex Tul.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 27 Jul 2018

WRA Score: 2.0 **Designation:** L **Rating:** Low Risk

Keywords: Tropical Tree, Naturalized, Spiny Leaves, Edible Fruit, Water-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	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	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)	n
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)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	n
401	Produces spines, thorns or burrs	y=1, n=0	y
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	n
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
409	Is a shade tolerant plant at some stage of its life cycle		
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)		

Qsn #	Question	Answer Option	Answer
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)		
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	y
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m2)		
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**
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	[No evidence of domestication in genus] "The following taxonomic framework recognizes 11 species of Brexia in Madagascar, 10 of which are endemic, and one of which (B. madagascariensis) also occurs in the Comoro Islands, and along the eastern coast of Africa in Mozambique, Tanzania, and Zanzibar (VERDCOURT 1968)."

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

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

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**High**
	Source(s)	**Notes**
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	"Brexia madagascariensis is a shrub to small tree in humid littoral forest on sand from W of Fort Dauphin at Cap Andavaka to just S of Vohemar at Ambaroana … This species also occurs in the Comoro Islands, and along the East African coast in Mozambique, Tanzania and Zanzibar (see VERDCOURT 1968; ROBSON 1978, who provide additional synonymy based principally upon cultivated material)."

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	

203	**Broad climate suitability (environmental versatility)**	**n**
	Source(s)	**Notes**
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	"Brexia madagascariensis is a shrub to small tree in humid littoral forest on sand"

Qsn #	Question	Answer
	Ruffo, C.K., Birnie, A. & Tengnäs, B. (2002). Edible Wild Plants of Tanzania. RELMA Technical Handbook Series 27. Regional Land Management Unit (RELMA), Swedish International Development Cooperation Agency (Sida), Nairobi, Kenya	"Coastal evergreen bushland on coral or coarse, rocky ground, edges of saline water, swamp forest, mangrove swamp, on eroded ridges near the sea, 0-100 m."
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"In its native range, brexia grows at low elevations in humid coastal forests, mangrove swamps, and brackish-water coastal forests, often on coral or limestone soils."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	"Brexia madagascariensis is a shrub to small tree in humid littoral forest on sand from W of Fort Dauphin at Cap Andavaka to just S of Vohemar at Ambaroana … This species also occurs in the Comoro Islands, and along the East African coast in Mozambique, Tanzania and Zanzibar (see VERDCOURT 1968; ROBSON 1978, who provide additional synonymy based principally upon cultivated material)."

205	Does the species have a history of repeated introductions outside its natural range?	n
	Source(s)	**Notes**
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"In Hawai'i, brexia is used as a specimen tree for a vertical effect and might be suitable as an untrimmed hedge if planted in two staggered, tightly spaced rows."
	Skolmen, R.G. 1980. Plantings on the forest reserves of Hawaii: 1910–1960. Institute of Pacific Islands Forestry, Pacific Southwest Forest & Range Experiment Station, US Forest Service, Honolulu, HI	A total of 19 trees were reported to have been planted in the Hawaiian Islands between the years of 1943-1956. Nine were planted in Kealia Forest Reserve, Kauai in 1943. Two were planted in Honolulu FR, Oahu in 1955. Six were planted on West Maui in 1956, and two were planted in South Kona, Hawaii in 1955.
	WRA Specialist. 2018. Personal Communication	Introduced & cultivated in the Hawaiian Islands, but limited evidence of introduction elsewhere

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Starr, F. & Starr, K. 2011. New plant records from midway Atoll, Maui and Kahoʻolawe. Bishop Museum Occasional Papers. 110: 23-35	"Brexia madagascariensis was previously known from east maui, where it was spreading from forestry planting in a wet lowland setting (Starr et al. 2003). the same is occurring on West Maui, where this tree with distinctly different juvenile and adult leaves is spreading from a forestry planting at ʻIao Valley state Park. the original planting consisted of six trees planted in 1956 (Skolmen, 1980). Material examined: MAUI: West Maui, ʻIao Valley state Park, in plantings by stream, few large planted trees with scattered saplings nearby, in association with Enterolobium cyclocarpum, Schefflera actinophylla, and Ficus pseudopalma, 1000 ft [304 m], 30 Apr 2010, Starr & Starr 100430-01."

Qsn #	Question	Answer
	Starr, F., Starr, K.& Loope, L.L. 2003. New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 74: 23-34	"Native to Madagascar and the Seychelles and cultivated in Hawaiʻi since the early 20th century but not known to be naturalized (St. John, 1973), B. madagascariensis is now known from Wahinepeʻe, East Maui where it is escaping well beyond plantings in wayside parks. A small, smooth tree with leaves that are evergreen, leathery, long, narrow, stipulate, with entire or sharp-toothed edges, borne on thick, cylindrical branches; greenish flowers which appear clustered at leaf axils, with five stamens attached to a lobed and fringed disk around a superior ovary; and five angled, one celled, hard fruit which contains numerous angular seeds (Neal, 1965). Material examined: MAUI: E. Maui, Wahinepeʻe, Häna Hwy, 600 ft [182 m], 15 Jul 2001, Starr & Martz 010715-1."
	Frohlich, D. & Lau, A. 2010. New plant records from Oʻahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"This plant, which in Hawaiʻi produces copious amounts of seed, is tolerant of a wide range of soil types and is resistant to disease (Staples & Herbst 2005), was previously found naturalized on Maui (Starr et al. 2003). Because of these characteristics, it was listed as one of the species in Hawaiʻi very likely to become invasive (Staples et al. 2000). It was found on oʻahu growing outside the boundaries of Lyon Arboretum and is occasionally found naturalizing within the garden. Material examined. OʻAHU: Lower Mānoa Valley just outside Lyon Arboretum (UTM 624371, 2359857), wet lowland secondary forest; found occasionally naturalizing in Lyon Arboretum, 16 Apr 2008, OISC/OED 2008041601."

302	Garden/amenity/disturbance weed	n
	Source(s)	**Notes**
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Brexia is usu-ally propagated from seed, which is produced abundantly in Hawai'i; the species should be carefully monitored for potential weediness. "
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

303	Agricultural/forestry/horticultural weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

304	Environmental weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

305	Congeneric weed	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	[To date, no evidence that any of the described species have become invasive outsider their native range] "A taxonomic revision of the genus Brexia Noronha ex Thouars (Celastraceae) in Madagascar is presented. Reevaluation of morphological characters allows the recognition of 11 species, three of which are described as new. Preliminary conservation assessments of each species are calculated according to IUCN Red List criteria."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

401	Produces spines, thorns or burrs	y
	Source(s)	**Notes**
	Neal, M.C. 1965. In Gardens of Hawaii. Bishop Museum Press, Honolulu, HI	"Brexia madagascariensis … Evergreen, leathery, long, narrow, stipulate (bracted) leaves with entire or sharp-toothed edges are borne on thick, cylindrical branches."
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Young trees have larger leaves with spiny margins, which become smaller and spineless as the tree matures"
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	[Juvenile leaves spinose] "Although not yet documented in all members of the genus, it is likely that the margins of leaves on juvenile and sucker shoots (“gourmands”) in most, if not all, species are regularly or at least sometimes spinose, as is most commonly encountered in B. madagascariensis."

402	Allelopathic	
	Source(s)	**Notes**
	WRA Specialist. 2018. Personal Communication	Unknown. No evidence found

403	Parasitic	n
	Source(s)	**Notes**
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	"Brexia madagascariensis is a shrub to small tree in humid littoral forest on sand from W of Fort Dauphin at Cap Andavaka to just S of Vohemar at Ambaroana" [Celastraceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	**Notes**
	Eppley, T. M. (2015). Ecological Flexibility of the Southern Bamboo Lemur (Hapalemur meridionalis) in Southeast Madagascar. PhD Dissertation. University of Hamburg, Hamburg, Germany	"Table 1. Top ten species consumed by H. meridionalis from Jan.–Dec. 2013" [Brexia madagascariensis - flowers consumed. Palatability of foliage unknown]
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Fruit edible, but palatability of foliage unknown] "The curious fruits are technically capsules that are initially tough and woody, but the fruit wall is reported to becomes pulpy and edible eventually."

Qsn #	Question	Answer
	Barresi, M. (2014). Habitat disturbance and perceived predation risk in Eulemur collaris: a comparative study in littoral forest fragments of South-eastern Madagascar. University of Pisa, Pisa, Italy	[Lemurs ear fruit. Palatability of foliage unknown] "Frugivorous animals have been shown to be important for seed dispersal and forest regeneration in Madagascar. Apollo, radio-collared sub-adult male of Eulemur collaris, feeding fruits of Voakarepoky (Brexia madagascariensis) in the littoral forest fragment of Mandena, south-east Madagascar."
	Ruffo, C.K., Birnie, A. & Tengnäs, B. (2002). Edible Wild Plants of Tanzania. RELMA Technical Handbook Series 27. Regional Land Management Unit (RELMA), Swedish International Development Cooperation Agency (Sida), Nairobi, Kenya	[Palatability of foliage unknown] "Fruit are edible. The pulp of ripe fruit is eaten raw."

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
	WRA Specialist. 2018. Personal Communication	No evidence. Fruit & flowers consumed by lemurs, & fruit consumed by people

406	Host for recognized pests and pathogens	n
	Source(s)	**Notes**
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Because the tree is naturally well formed, only a small amount of pruning is necessary, and no pests or diseases trouble brexia here."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	**Notes**
	Ruffo, C.K., Birnie, A. & Tengnäs, B. (2002). Edible Wild Plants of Tanzania. RELMA Technical Handbook Series 27. Regional Land Management Unit (RELMA), Swedish International Development Cooperation Agency (Sida), Nairobi, Kenya	[No evidence of toxicity. Edible & medicinal uses] "USES: Food: Fruit are edible. The pulp of ripe fruit is eaten raw. Medicinal: Roots are boiled and the liquid drunk to treat stomach-ache and yaws."
	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. Used medicinally] "Roots boiled and the liquid drunk to treat stomachache and yaws."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Ruffo, C.K., Birnie, A. & Tengnäs, B. (2002). Edible Wild Plants of Tanzania. RELMA Technical Handbook Series 27. Regional Land Management Unit (RELMA), Swedish International Development Cooperation Agency (Sida), Nairobi, Kenya	[No evidence from native range] "Coastal evergreen bushland on coral or coarse, rocky ground, edges of saline water, swamp forest, mangrove swamp, on eroded ridges near the sea, 0100 m."
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Would probably burn in a fire, but unlikely to contribute to fire risk in habitats where grown] "It is ideally suited for use in oceanfront gardens in Hawai'i as well as in a variety of inland situations."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Brexia requires only full sun and garden soil of average fertility…"
	Ruffo, C.K., Birnie, A. & Tengnäs, B. (2002). Edible Wild Plants of Tanzania. RELMA Technical Handbook Series 27. Regional Land Management Unit (RELMA), Swedish International Development Cooperation Agency (Sida), Nairobi, Kenya	[Coastal, presumably high light environments] "Coastal evergreen bushland on coral or coarse, rocky ground, edges of saline water, swamp forest, mangrove swamp, on eroded ridges near the sea, 0100 m."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	
	Source(s)	**Notes**
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	"Brexia madagascariensis is a shrub to small tree in humid littoral forest on sand …"
	Ruffo, C.K., Birnie, A. & Tengnäs, B. (2002). Edible Wild Plants of Tanzania. RELMA Technical Handbook Series 27. Regional Land Management Unit (RELMA), Swedish International Development Cooperation Agency (Sida), Nairobi, Kenya	"Coastal evergreen bushland on coral or coarse, rocky ground, edges of saline water, swamp forest, mangrove swamp, on eroded ridges near the sea, 0100 m."
	Conservatoire et Jardin botaniques & South African National Biodiversity Institute. (2012). African Plant Database - Brexia madagascariensis (Lam.) Ker Gawl. http://www.ville-ge.ch. [Accessed 27 Jul 2018]	"Coastal evergreen bushland on coral, on sandy (-loamy) soil or coarse rocky ground; edges of saline water swamp forest, mangrove swamps; fringing forest and eroded ridges near the sea. "
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"It thrives in porous, well-drained soils kept moderately moist, but it can also tolerate alkaline or saline soils and salt spray."

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	"Brexia madagascariensis is a shrub to small tree in humid littoral forest on sand from W of Fort Dauphin at Cap Andavaka to just S of Vohemar at Ambaroana"

412	Forms dense thickets	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Ruffo, C.K., Birnie, A. & Tengnäs, B. (2002). Edible Wild Plants of Tanzania. RELMA Technical Handbook Series 27. Regional Land Management Unit (RELMA), Swedish International Development Cooperation Agency (Sida), Nairobi, Kenya	[No evidence from native range] "ECOLOGY: Coastal evergreen bushland on coral or coarse, rocky ground, edges of saline water, swamp forest, mangrove swamp, on eroded ridges near the sea, 0100 m. DISTRIBUTION: Widespread along the coast, from Tanga southwards to Mtwara and on Zanzibar and Pemba Islands. Found in Mozambique, the Comoro Islands, Madagascar and South Africa."
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	[No evidence that dense stands are formed in native range] "Brexia madagascariensis is a shrub to small tree in humid littoral forest on sand … Within Madagascar, Brexia madagascariensis has an EO of c. 28000 km2, an AO of 3500 km2, and c. 25 subpopulations, 5 of which are encompassed within protected areas (Andohahela PN, Manombo RS, and Masoala PN)."
	Starr, F. & Starr, K. 2011. New plant records from midway Atoll, Maui and Kaho'olawe. Bishop Museum Occasional Papers. 110: 23-35	[No evidence to date, after 50+ years after introduction] "Brexia madagascariensis was previously known from east maui, where it was spreading from forestry planting in a wet lowland setting (starr et al. 2003). the same is occurring on West maui, where this tree with distinctly different juvenile and adult leaves is spreading from a forestry planting at 'iao Valley state Park. the original planting consisted of six trees planted in 1956 (skolmen, 1980)." … "West Maui, 'Iao Valley state Park, in plantings by stream, few large planted trees with scattered saplings nearby, in association with Enterolobium cyclocarpum, Schefflera actinophylla, and Ficus pseudopalma, 1000 ft [304 m], 30 Apr 2010, Starr & Starr 100430-01."

501	Aquatic	n
	Source(s)	**Notes**
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	[Terrestrial] "Brexia madagascariensis is a shrub to small tree in humid littoral forest on sand from W of Fort Dauphin at Cap Andavaka to just S of Vohemar at Ambaroana"

502	Grass	n
	Source(s)	**Notes**
	Kubitzki, K. (ed.). 2004. The Families and genera of vascular plants. Volume VI. Flowering plants, Dicotyledons: Celastrales, Oxalidales, Rosales, Cornales, Ericales. Springer-Verlag, Berlin, Heidelberg, New York	"Brexia has been assigned to Escalloniaceae (Hutchinson 1967), Brexiaceae (Verdcourt 1968), and Grossulariaceae (Cronquist 1981). However, phylogenetic analyses consistently support Brexia as a member of Celastraceae (e.g., Savolainen et al. 1997; Simmons et al. 2001b)."
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 26 Jul 2018]	Family: Celastraceae Subfamily: Celastroideae Altfamily: Brexiaceae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 26 Jul 2018]	Family: Celastraceae Subfamily: Celastroideae Altfamily: Brexiaceae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	"Brexia madagascariensis is a shrub to small tree in humid littoral forest on sand …"

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	[No evidence] "CONSERVATION STATUS.— Within Madagascar, Brexia madagascariensis has an EO of c. 28000 km2, an AO of 3500 km2, and c. 25 subpopulations, 5 of which are encompassed within protected areas (Andohahela PN, Manombo RS, and Masoala PN). It is thus assigned a preliminary status of Least Concern (LC)."

602	Produces viable seed	y
	Source(s)	**Notes**
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Brexia is usu-ally propagated from seed, which is produced abundantly in Hawai'i; the species should be carefully monitored for potential weediness."
	Ruffo, C.K., Birnie, A. & Tengnäs, B. (2002). Edible Wild Plants of Tanzania. RELMA Technical Handbook Series 27. Regional Land Management Unit (RELMA), Swedish International Development Cooperation Agency (Sida), Nairobi, Kenya	"Collected from the wild and not cultivated, but can be propagated using fresh seed."

603	Hybridizes naturally	
	Source(s)	**Notes**
	Schatz, G. E., & Lowry, P. P. (2004). A synoptic revision of Brexia (Celastraceae) in Madagascar. Adansonia, 26(1), 67-81	[Unknown. No hybrids reported in this publication] "A taxonomic revision of the genus Brexia Noronha ex Thouars (Celastraceae) in Madagascar is presented. Reevaluation of morphological characters allows the recognition of 11 species, three of which are described as new." … "Similarly, while some authors have considered Brexia to be monotypic (CAPURON in herb.; VERDCOURT 1968), others have recognized as many as nine (PERRIER DE LA BÂTHIE 1942), or even 10 (LEROY 1968) species."

604	Self-compatible or apomictic	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Kubitzki, K. (ed.). 2004. The Families and genera of vascular plants. Volume VI. Flowering plants, Dicotyledons: Celastrales, Oxalidales, Rosales, Cornales, Ericales. Springer-Verlag, Berlin, Heidelberg, New York	"Flowers bisexual, 5-merous; disk fleshy, lacerate, alternating with stamens; anthers longitudinally dehiscent, introrse; ovary . 5-7- locular; ovules axile, numerous."
	Ruffo, C.K., Birnie, A. & Tengnäs, B. (2002). Edible Wild Plants of Tanzania. RELMA Technical Handbook Series 27. Regional Land Management Unit (RELMA), Swedish International Development Cooperation Agency (Sida), Nairobi, Kenya	"FLOWERS: In rather loose branched clusters, beside leaves, sometimes on old wood, each flower to 2 cm diameter, the 5 spreading petals pale yellow or green-white, thick and fleshy, curling backwards, 4-5 stamens arise between the 5 lobes at the central disc with several stiff pointed filaments at the base."
	WRA Specialist. 2018. Personal Communication	Unknown. Trees produce seeds in the Hawaiian Islands & have naturalized on Oahu & Maui.

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Able to produce abundant seeds. Presumably not pollinator limited] "Brexia is usually propagated from seed, which is produced abundantly in Hawai'i;"
	Kubitzki, K. (ed.). 2004. The Families and genera of vascular plants. Volume VI. Flowering plants, Dicotyledons: Celastrales, Oxalidales, Rosales, Cornales, Ericales. Springer-Verlag, Berlin, Heidelberg, New York	[Family description] "Few taxa have been investigated to determine their specific pollinators. Nectariferous disks, present in most genera, attract bees, beetles, flies, wasps, and even ants (Knuth 1908; Ding Hou 1962; Brizicky 1964a; Sebsebe 1985)." [Genus description] "Flowers bisexual, 5-merous; disk fleshy, lacerate, alternating with stamens; anthers longitudinally dehiscent, introrse; ovary . 5-7- locular; ovules axile, numerous."
	Campera, M., Serra, V., Balestri, M., Barresi, M., Ravaolahy, M., Randriatafika, F., & Donati, G. (2014). Effects of habitat quality and seasonality on ranging patterns of collared brown lemur (Eulemur collaris) in littoral forest fragments. International Journal of Primatology, 35(5), 957-975	[Nectar used as food by collared brown lemurs] "For example, the ranging pattern of group MAN-C was heavily influenced by the availability of the flowers of Brexiamadagascariensis. This swamp tree produced a large flower crop where the lemurs spent long feeding sessions. Our feeding observations clearly showed that in July, August, and October, when the home range of groupMAN-C was at its minimum, Brexia was by far the preferred food item of this group (>33 % of feeding time)."
	Birkinshaw, C. (2002). Probable pollination of Brexia madagascariensis (Lam.) Ker Gaul. by Eulemur fulvus at Ambila-Lemaitso, Madagascar. Lemur News 7: 11	[Possibly lemur & bat-pollinated] "On the basis of the criteria given above it seems probable that E. fluvus pollinates B. madagascariensis. However, given the large number of lemur species that have been reported to exploit nectar, the extensive distribution of B. madagascariensis in Madagascar and the easy accessibility of its nectar, it seems likely that the flowers of this plant are also visited and pollinated by other lemur species. In addition, several characters of B. madagascariensis suggest that its flowers may also be exploited by fruit bats, which could likewise effect pollination, i.e.: the colour and shape of the flower, the presence of nectar in the early morning (suggesting nocturnal secretion), the position of the inflorescences outside the foliage where they would be easily accessible to a volant mammal, and its occurrence in littoral forest (a habitat particularly favoured by feeding fruit bats [van der Pijl, 1957)])."

606	Reproduction by vegetative fragmentation	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Brexia is usually propagated from seed, which is produced abundantly in Hawai'i; the species should be carefully monitored for potential weediness." [No evidence of vegetative spread]
	Ruffo, C.K., Birnie, A. & Tengnäs, B. (2002). Edible Wild Plants of Tanzania. RELMA Technical Handbook Series 27. Regional Land Management Unit (RELMA), Swedish International Development Cooperation Agency (Sida), Nairobi, Kenya	"Collected from the wild and not cultivated, but can be propagated using fresh seed."

607	Minimum generative time (years)	
	Source(s)	**Notes**
	Ruffo, C.K., Birnie, A. & Tengnäs, B. (2002). Edible Wild Plants of Tanzania. RELMA Technical Handbook Series 27. Regional Land Management Unit (RELMA), Swedish International Development Cooperation Agency (Sida), Nairobi, Kenya	"A much-branched, dense evergreen shrub or small tree, 2-3 m." [Time to maturity unknown]

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	**Notes**
	Wickens, G.E. (1979). The propagules of the terrestrial flora of the Aldabra Archipelago, Western Indian Ocean. Atoll Research Bulletin 29: 1-39	[No means of external attachment. Primarily water-dispersed] "Brexia madagascariensis (Lam.) Ker-Gawl. Drupe ovoid to cylindrical , 4-10 x 1.9-3 cm., (Fig. 1, 17a) sometimes tapering, prominently 5-ribbed, walls woody, cavity with large air spaces (Fig. 1, 17b); seeds many, irregularly compressed-ellipsoid, 4.5-7.5 x 3-3.5 mrn., keeled, minutely rugulose in ridges, brown or blackish. Native, strand; Aldabra. Fruits capable of floating in the sea for several months without the seeds losing their viability (Verdcourt, 1968)."

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"In Hawai'i, brexia is used as a specimen tree for a vertical effect and might be suitable as an untrimmed hedge if planted in two staggered, tightly spaced rows."

Qsn #	Question	Answer
703	**Propagules likely to disperse as a produce contaminant**	**n**
	Source(s)	**Notes**
	Wickens, G.E. (1979). The propagules of the terrestrial flora of the Aldabra Archipelago, Western Indian Ocean. Atoll Research Bulletin 29: 1-39	[No evidence. Unlikely given size of fruits & main dispersal vector] "Brexia madagascariensis (Lam.) Ker-Gawl. Drupe ovoid to cylindrical , 4-10 x 1.9-3 cm., (Fig. 1, 17a) sometimes tapering, prominently 5-ribbed, walls woody, cavity with large air spaces (Fig. 1, 17b); seeds many, irregularly compressed-ellipsoid, 4.5-7.5 x 3-3.5 mrn., keeled, minutely rugulose in ridges, brown or blackish. Native, strand; Aldabra. Fruits capable of floating in the sea for several months without the seeds losing their viability (Verdcourt, 1968)."

704	**Propagules adapted to wind dispersal**	**n**
	Source(s)	**Notes**
	Wickens, G.E. (1979). The propagules of the terrestrial flora of the Aldabra Archipelago, Western Indian Ocean. Atoll Research Bulletin 29: 1-39	"Brexia madagascariensis (Lam.) Ker-Gawl. Drupe ovoid to cylindrical , 4-10 x 1.9-3 cm., (Fig. 1, 17a) sometimes tapering, prominently 5-ribbed, walls woody, cavity with large air spaces (Fig. 1, 17b); seeds many, irregularly compressed-ellipsoid, 4.5-7.5 x 3-3.5 mrn., keeled, minutely rugulose in ridges, brown or blackish. Native, strand; Aldabra. Fruits capable of floating in the sea for several months without the seeds losing their viability (Verdcourt, 1968)."

705	**Propagules water dispersed**	**y**
	Source(s)	**Notes**
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"along the coasts, edges of saline water, swamp forest, mangrove swamps"
	Wickens, G.E. (1979). The propagules of the terrestrial flora of the Aldabra Archipelago, Western Indian Ocean. Atoll Research Bulletin 29: 1-39	[Fruits capable of floating] "Brexia madagascariensis (Lam.) Ker-Gawl. Drupe ovoid to cylindrical , 4-10 x 1.9-3 cm., (Fig. 1, 17a) sometimes tapering, prominently 5-ribbed, walls woody, cavity with large air spaces (Fig. 1, 17b); seeds many, irregularly compressed-ellipsoid, 4.5-7.5 x 3-3.5 mrn., keeled, minutely rugulose in ridges, brown or blackish. Native, strand; Aldabra. Fruits capable of floating in the sea for several months without the seeds losing their viability (Verdcourt, 1968)."

Qsn #	Question	Answer
706	**Propagules bird dispersed**	**n**
	Source(s)	**Notes**
	Wickens, G.E. (1979). The propagules of the terrestrial flora of the Aldabra Archipelago, Western Indian Ocean. Atoll Research Bulletin 29: 1-39	[Water, & possibly lemur-dispersed. No evidence of bird consumption or dispersal] "Brexia madagascariensis (Lam.) Ker-Gawl. Drupe ovoid to cylindrical , 4-10 x 1.9-3 cm., (Fig. 1, 17a) sometimes tapering, prominently 5-ribbed, walls woody, cavity with large air spaces (Fig. 1, 17b); seeds many, irregularly compressed-ellipsoid, 4.5-7.5 x 3-3.5 mrn., keeled, minutely rugulose in ridges, brown or blackish. Native, strand; Aldabra. Fruits capable of floating in the sea for several months without the seeds losing their viability (Verdcourt, 1968)."

707	**Propagules dispersed by other animals (externally)**	
	Source(s)	**Notes**
	Barresi, M. (2014). Habitat disturbance and perceived predation risk in Eulemur collaris: a comparative study in littoral forest fragments of South-eastern Madagascar. University of Pisa, Pisa, Italy	[Unknown if seeds are passed through gut, or spit out and discarded after pulp consumption, which would effectively disperse them externally] "Frugivorous animals have been shown to be important for seed dispersal and forest regeneration in Madagascar. Apollo, radio-collared sub-adult male of Eulemur collaris, feeding fruits of Voakarepoky (Brexia madagascariensis) in the littoral forest fragment of Mandena, south-east Madagascar."

708	**Propagules survive passage through the gut**	
	Source(s)	**Notes**
	Barresi, M. (2014). Habitat disturbance and perceived predation risk in Eulemur collaris: a comparative study in littoral forest fragments of South-eastern Madagascar. University of Pisa, Pisa, Italy	[Unknown if seeds are passed through gut, or spit out and discarded after pulp consumption] "Frugivorous animals have been shown to be important for seed dispersal and forest regeneration in Madagascar. Apollo, radio-collared sub-adult male of Eulemur collaris, feeding fruits of Voakarepoky (Brexia madagascariensis) in the littoral forest fragment of Mandena, south-east Madagascar."

801	**Prolific seed production (>1000/m2)**	
	Source(s)	**Notes**
	Wickens, G.E. (1979). The propagules of the terrestrial flora of the Aldabra Archipelago, Western Indian Ocean. Atoll Research Bulletin 29: 1-39	[Seed densities unknown] "Brexia madagascariensis (Lam.) Ker-Gawl. Drupe ovoid to cylindrical , 4-10 x 1.9-3 cm., (Fig. 1, 17a) sometimes tapering, prominently 5-ribbed, walls woody, cavity with large air spaces (Fig. 1, 17b); seeds many, irregularly compressed-ellipsoid, 4.5-7.5 x 3-3.5 mrn., keeled, minutely rugulose in ridges, brown or blackish."

Qsn #	Question	Answer
802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Royal Botanic Gardens Kew. (2018) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/. [Accessed 27 Jul 2018]	"Genus: Brexia Species Epithet: madagascariensis" … "Storage Behaviour: No data available for species or genus. Of 58 known taxa of family CELASTRACEAE, 93.10% Orthodox(p/?), 1.72% Recalcitrant (?), 3.45% Intermediate(?), 1.72% Uncertain"

803	**Well controlled by herbicides**	
	Source(s)	**Notes**
	WRA Specialist. 2018. Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	
	Source(s)	**Notes**
	WRA Specialist. 2018. Personal Communication	Unknown

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Probably no, but further evidence needed] "Because the tree is naturally well formed, only a small amount of pruning is necessary, and no pests or diseases trouble brexia here."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Thrives in tropical climates
• Naturalized on Oahu & Maui (Hawaiian Islands)
• Young trees have leaves with spiny margins (absent on older trees)
• Reproduces by seeds
• Seeds dispersed by water, possibly frugivorous mammals & intentionally by people
• Gaps in biological information (compatibility, seed production & longevity, regenerative ability) limit accuracy of risk prediction
• Able to coppice & resprout after cutting

Low Risk Traits
• No reports of negative impacts in Hawaiian Islands to date
• Non-toxic
• May be limited to full sun or high light environments
• Produces edible fruit
• Ornamental
• Not reported to spread vegetatively
• Cultivation away from water may limit dispersal ability

Second Screening Results for Tree/tree-like shrubs

(A) Shade tolerant or known to form dense stands?> Possibly shade intolerant (unverified). Not known to form dense stands.
(B) Bird or clear wind-dispersed?> Not dispersed by birds or wind.
Outcome = Accept (Low Risk)