Taxon: Filicium decipiens (Wight & Arn.) Thwaites **Family:** Sapindaceae

Common Name(s): fern leaf
fern tree

Synonym(s): Jurighas decipiens (Wight & Arn.)
Pteridophyllum decipiens (Wight &
Rhus decipiens Wight & Arn.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 30 Jul 2019

WRA Score: 5.0 **Designation:** EVALUATE **Rating:** Evaluate

Keywords: Tropical Tree, Naturalized, Nuisance Tree, Street Tree, Bird-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	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		
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		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans		
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

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic		
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	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		
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)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
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**
	Davies, F. G. & Verdcourt, B. (1998). Flora of Tropical East Africa - Sapindaceae. A.A. Balkema, Rotterdam, Netherlands	No evidence of domestication

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

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

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**High**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 29 Jul 2019]	"Native Africa NORTHEAST TROPICAL AFRICA: Ethiopia EAST TROPICAL AFRICA: Kenya, Tanzania SOUTH TROPICAL AFRICA: Malawi, Mozambique, Zimbabwe Asia-Tropical INDIAN SUBCONTINENT: India, Sri Lanka"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 29 Jul 2019]	

Qsn #	Question	Answer
203	**Broad climate suitability (environmental versatility)**	**n**
	Source(s)	**Notes**
	Dave's Garden. (2019). Fern tree - Filicium decipiens. https://davesgarden.com/guides/pf/go/67773/. [Accessed 29 Jul 2019]	"Hardiness: USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F) USDA Zone 11: above 4.5 °C (40 °F)"
	Riffle, R.L. 1998. The Tropical Look - An Encyclopedia of Dramatic Landscape Plants. Timber Press, Portland, OR	"Zones 10 and 11; marginal in zone 10a"

Qsn #	Question	Answer
204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Lorence, D.H. (2019). Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/. [Accessed 29 Jul 2019]	"Filicium decipiens (Wight & Arn.) Thwaites Status: Naturalized Distribution: O/ M/ H"
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"India; natural; Sri Lanka: natural"
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 29 Jul 2019]	"Native Africa NORTHEAST TROPICAL AFRICA: Ethiopia EAST TROPICAL AFRICA: Kenya, Tanzania SOUTH TROPICAL AFRICA: Malawi, Mozambique, Zimbabwe Asia-Tropical INDIAN SUBCONTINENT: India, Sri Lanka"

Qsn #	Question	Answer
205	**Does the species have a history of repeated introductions outside its natural range?**	**y**
	Source(s)	**Notes**
	Adema, F., Leenhouts, P.W. & van Welzen, P.C. (1994). Flora Malesiana. Series I, Spermatophyta: Flowering plants. Volume 11, part 3. Sapindaceae. Rijksherbarium / Hortus Botanicus, Leiden, The Netherlands	"Distribution - Indigenous in S India and Sri Lanka. but now a pantropical ornamental. In Malesia locally cultivated as an ornamental (e.g. street tree) in Java and the Lesser Sunda Islands."
	Whistler, W.A. 2000. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	"probably native to southeastern Africa, but was long ago introduced to India, where it is widely cultivated. It is also grown elsewhere in the tropics as a shade or street tree."

Qsn #	Question	Answer
301	**Naturalized beyond native range**	**y**
	Source(s)	**Notes**
	Starr, F., Starr, K. & Loope, L.L. 2004. New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 79: 20-30	"A common tree that has escaped cultivation on Oʻahu, West Maui, and Hawaiʻi (Staples et al., 2002; Oppenheimer, 2003), F. decipiens is now also known from East Maui, where it is locally established in Kïhei. This collection represents a range extension to East Maui. Material examined: MAUI: East Maui, Kïhei, Kamaʻole, Lioholo Pl., seedling under trees and nearby, spreading from plantings, 140 ft [42 m], 17 Jun 2002, Starr & Starr 020617-2."

Qsn #	Question	Answer
	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	"Although fern tree is attractive and easy to grow, it has several drawbacks…the fruit is eaten by birds and, which disperse the seeds into vacant lots, hedgerows, and secondary forests. Fern tree is naturalized, at least on Oahu, and its continued use as a landscape ornamental should be discouraged."
	Lau, J-W. (2010). Botanical Survey of unmaintained areas surrounding McBryde Garden, National Tropical Botanical Garden, Kaua'i. Kaua'i Community College, Lihue, HI	"Distribution: Established in vacant lots, hedgerows, and secondary forests on O'ahu, and also naturalized on Maui and the island of Hawai'i, one immature twelve foot tall F. decipiens was detected in the unmanaged L. leucocephala forest behind the Ficus Area in Middle Valley." [Kauai]
	Oppenheimer, Hank L. 2003. New plant records from Maui and Hawai'i Counties. Bishop Museum Occasional Papers. 73: 3-30	"Filicium has also been observed to be sparingly naturalized along the lower portions of Iao Stream...Material examined: MAUI: West Maui, Lahaina Dist, Honoköwai Valley, 91 m, 24 Mar 2001, Oppenheimer H30134. HAWAI'I: S. Hilo Dist, Hilo, common in secondary, alien forest near Waiäkea Stream, 37 m, 31 Jul 2001, Oppenheimer H70139."
	Mascaro, J., Becklund, K. K., Hughes, R. F., & Schnitzer, S. A. (2008). Limited native plant regeneration in novel, exotic-dominated forests on Hawai'i. Forest Ecology and Management, 256(4), 593-606	"Novel forests also lacked some structural elements common to Hawaiian forests, notably understory tree ferns (Palmer, 2002). Some sites included a minor component of escaped agricultural species, such as Macadamia integrifolia (Macadamia nut), Musa X paradisiaca (banana), and Coffea arabica (coffee), as well as escaped ornamentals (e.g., Filicium decipiens [fern tree])."

302	Garden/amenity/disturbance weed	y
	Source(s)	**Notes**
	Staples, G.W., Herbst, D.R & Imada, C.T. 2000. Survey of invasive or potentially invasive cultivated plants in Hawai'i. Bishop Museum Occasional Papers 65: 1-35	"Among the best-known bird-dispersed plants, mostly woody perennials, are the octopus tree (Schefflera actinophylla), the two species of fiddlewood (Citharexylum caudatum, C. spinosum), Chinese banyan (Ficus microcarpa), fern tree (Filicium decipiens), miconia (Miconia calvescens), ivy gourd (Coccinia grandis), Fukien tea or Philippine tea (Carmona retusa), various members of the grape family (Cissus spp., Tetrastigma spp.), several species of asparagus (Asparagus spp.), two ardisias (Ardisia crenata, A. elliptica), at least three firethorns (Pyracantha spp.), and lantana (Lantana camara). It is no coincidence that some of Hawai'i's worst invasive plant species are included on this list."
	Motooka, P. (1999). Herbicides for Weed Control Workshop. Hawai'i Forestry News Volume 1, Issue 1 Summer 1999	"Basal bark application of a ready to use solution of Pathfinder II (trichlopyr), streaking the bottom 12 inches of trunk, caused defoliation of Psidium cattleianum (strawberry guava), Schinus terebinthifolius (Christmas berry), and Filicium decipiens (fern tree) after six weeks." [Inclusion of Filicium in these herbicide trials implies that it is being considered as a target for control and is an unwanted, or weedy plant, in certain circumstances]
	Kwan, C. (2019). Consulting arborist. Pers. Comm. 6 June	"Have you done a detailed evaluation of fern tree (Filicium decipiens)? I think it's invasive. I've worked on projects that have lots of fern tree weeds. It's not as bad as octopus tree or albizia, but I consider it moderately invasive."

Qsn #	Question	Answer
	Dave's Garden. (2019). Fern tree - Filicium decipiens. https://davesgarden.com/guides/pf/go/67773/. [Accessed 29 Jul 2019]	"On Jun 25, 2004, punaheledp from Kailua, HI (Zone 11) wrote:" … It grew wild in my yard. I moved it and have given in minimal care, and it has done very well. My only concern is that it seeded this year and I have seedlings sprouting up all around it. If I have to pull bunches of seedlings every year, I may reconsider my rating. Seeds seem to germinate easily. Here in Hawaii it is considered somewhat invasive."
	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	[Landscaping nuisance] "The purple fruit stains sidewalks and driveways, creating a maintenance problem."

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	
	Source(s)	**Notes**
	Staples, G.W., Herbst, D.R & Imada, C.T. 2000. Survey of invasive or potentially invasive cultivated plants in Hawai'i. Bishop Museum Occasional Papers 65: 1-35	"Among the best-known bird-dispersed plants, mostly woody perennials, are the octopus tree (Schefflera actinophylla), the two species of fiddlewood (Citharexylum caudatum, C. spinosum), Chinese banyan (Ficus microcarpa), fern tree (Filicium decipiens), miconia (Miconia calvescens), ivy gourd (Coccinia grandis), Fukien tea or Philippine tea (Carmona retusa), various members of the grape family (Cissus spp., Tetrastigma spp.), several species of asparagus (Asparagus spp.), two ardisias (Ardisia crenata, A. elliptica), at least three firethorns (Pyracantha spp.), and lantana (Lantana camara). It is no coincidence that some of Hawai'i's worst invasive plant species are included on this list."
	Motooka, P. (1999). Herbicides for Weed Control Workshop. Hawai'i Forestry News Volume 1, Issue 1 Summer 1999	"Basal bark application of a ready to use solution of Pathfinder II (trichlopyr), streaking the bottom 12 inches of trunk, caused defoliation of Psidium cattleianum (strawberry guava), Schinus terebinthifolius (Christmas berry), and Filicium decipiens (fern tree) after six weeks." [Inclusion of Filicium in these herbicide trials implies that it is being considered as a target for control and is an unwanted, or weedy plant, in certain circumstances]

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

Qsn #	Question	Answer
401	**Produces spines, thorns or burrs**	**n**
	Source(s)	**Notes**
	Woodson, R., Schery, R., & Croat, T. (1976). Flora of Panama. Part VI. Family 108. Sapindaceae. Annals of the Missouri Botanical Garden, 63(3), 419-540	"Small or medium-sized, polygamous trees; younger branches weakly sulcate with lepidote scales." [No evidence of spines, thorns or burrs]

402	Allelopathic	
	Source(s)	**Notes**
	De Costa, W. A. J. M., Hitinayake, H. M. J. B., & Dharmawardana, I. U. (2010). A physiological investigation into the invasive behaviour of some plant species in a mid-country forest reserve in Sri Lanka. Journal of the National Science Foundation of Sri Lanka, 29(1-2): 35-50	"The vegetation structure of Udawattakelle displays the typical canopy layers of a wet tropical rainforest. The most common tree species which form the canopy are Swietenia macrophylla (Mahogany), Michelia champaca (Gini-sapu) and Mesua ferrea (Na). The sub-canopy is formed by tree species such as Filicium decipiens (Pihimbiya) and Euphorbia longana (Mora). The forest floor has several plant species belonging to different growth- and plant forms including seedlings of trees and shrubs, herbaceous erect plants, vines and ferns. The forest contained areas of almost completely closed canopy cover as well as canopy gaps and open areas." [Co-exists with other species with no evidence of allelopathy reported. However, Bari & Kato-Noguchi, (2017) report allelopathic effects of plant extracts]
	Bari, I. N., & Kato-Noguchi, H. (2017). Phytotoxic Effect of Filicium decipiens Leaf Extract. American-Eurasian J. Agric. & Environ. Sci., 17(4): 288-292	[Extracts demonstrate allelopathic properties] "F. decipiens leaf extract had phytotoxic effect on barnyard grass, foxtail fescue, Italian ryegrass, timothy, alfalfa, garden cress, lettuce and rapeseed. The phytotoxic effect was on the seedling growth, both shoot and root growth. The seedling development inhibition of all test plants were concentration dependent and the sensitivity of each test plants vary to the extract of F. decipiens leaves. This result suggested that F. decipiens may possess phytotoxic substances. Accordingly, isolation and identification of the phytotoxic substances from F. decipiens are suggestedfor future studies."

403	Parasitic	n
	Source(s)	**Notes**
	Davies, F. G. & Verdcourt, B. (1998). Flora of Tropical East Africa - Sapindaceae. A.A. Balkema, Rotterdam, Netherlands	"Slender tree 4.5-20 (-30) m. tall; bark smooth, whitish." [Sapindaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	Unknown

405	Toxic to animals	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	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 of toxicity to animals

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	CABI. (2019). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Filicium decipiens … Wild host of: Ceratitis capitata (Mediterranean fruit fly)"
	Hodges, G. S., Hodges, A. C., & Unruh, C. M. (2008). A new exotic pest for Florida's natural areas: Crypticerya genistae (Hemiptera: Monophlebidae). Florida Entomologist, 91(2), 335-338	"We report for the first time the presence in Florida and the Continental United States of Crypticerya genistae (Hempel) (Hemiptera: Monophlebidae) (Figs. 1 and 2), an invasive scale insect native to Brazil. Crypticerya genistae was described by Hempel (1912) (as Icerya genistae) from specimens collected on Genista scoparia (L.) Lam., Lespedeza striata (Thunb.) Hook. & Arn., and Fragaria L. species from Brazil. There is very little information available on the biology of this insect. It is reported as a pest of vegetable crops including peppers, tomatoes, eggplants and peanuts (Barbados Ministry of Agriculture (http:// barbados.gov.bb)." [Host of pest in Florida, but unknown from Hawaii]

407	Causes allergies or is otherwise toxic to humans	
	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	"Some people appear to be allergic to fern trees in flower."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	**Notes**
	Dharani, N. (2019). Field Guide to Common Trees & Shrubs of East Africa. Third Edition. Struik Nature, Cape Town, South Africa	"…occurs in riverine forest and swampy sites in forests " [No evidence of and unlikely to create fire hazards in natural ecosystems]

Qsn #	Question	Answer
409	**Is a shade tolerant plant at some stage of its life cycle**	**y**
	Source(s)	**Notes**
	Matthew, K.M. (1995). An excursion flora of Central Tamilnadu, India. CRC Press, Boca Raton, FL	"in moist ravines/shady floor of sholas; copious regeneration."
	Dave's Garden. (2019). Fern tree - Filicium decipiens. https://davesgarden.com/guides/pf/go/67773/. [Accessed 29 Jul 2019]	"Sun Exposure: Full Sun Sun to Partial Shade"
	Mascaro, J., Becklund, K. K., Hughes, R. F., & Schnitzer, S. A. (2008). Limited native plant regeneration in novel, exotic-dominated forests on Hawaiʻi. Forest Ecology and Management, 256(4), 593-606	[Establishes in understory of novel forests] "Novel forests also lacked some structural elements common to Hawaiian forests, notably understory tree ferns (Palmer, 2002). Some sites included a minor component of escaped agricultural species, such as Macadamia integrifolia (Macadamia nut), Musa X paradisiaca (banana), and Coffea arabica (coffee), as well as escaped ornamentals (e.g., Filicium decipiens [fern tree])."

410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	**y**
	Source(s)	**Notes**
	Riffle, R.L. 1998. The Tropical Look - An Encyclopedia of Dramatic Landscape Plants. Timber Press, Portland, OR	"Average well-drained soil…not fussy about soil or watering…"
	Meade, G. & Hensley, D. L. (1998). Using Trees to Save Energy. Landscape L-5. College of Tropical Agriculture and Human Resources, University of Hawai'i, Honolulu, HI	"It grows well in any soil, likes full sun, and is not drought or salt tolerant."

411	**Climbing or smothering growth habit**	**n**
	Source(s)	**Notes**
	Davies, F. G. & Verdcourt, B. (1998). Flora of Tropical East Africa - Sapindaceae. A.A. Balkema, Rotterdam, Netherlands	"Slender tree 4.5-20 (-30) m. tall; bark smooth, whitish."

412	**Forms dense thickets**	**y**
	Source(s)	**Notes**
	Lovett, J.C. (1999). Tanzanian Forest Tree Plot Diversity and Elevation. Journal of Tropical Ecology 15(5): 689-694	"Anthropic disturbance for cultivation is associated with low species richness. Three low diversity plots from the Southern Udzungwa mountains at around 750- 1025 m elevation in the Kihansi Gorge are dominated by Filicium decipiens (Wight & Arn.) Thw. (Sapindaceae), a tree that occurs throughout eastern Africa and in Asia. The Filicium forest is adjacent to species rich forest at the same elevation (Lovett et al. 1997). The Filicium forest plots are significantly less diverse than the other plots (mean species per plot = 3 + 15, two-tailed t-test, $P < 0.0001$)." [Low species diversity, but no evidence of monotypic thickets forming]

Qsn #	Question	Answer
	Lovett, J. C., Hatton, J., Mwasumbi, L. B., & Gerstle, J. H. (1997). Assessment of the impact of the Lower Kihansi Hydropower Project on the forests of Kihansi Gorge, Tanzania. Biodiversity & Conservation, 6(7), 915-934	[Forms monospecific stands within native range] "On the basis of both qualitative and quantitative botanical surveys, forest in the Kihansi gorge below the dam site was found to be mostly typical species and endemic-rich Eastern Arc forest. An unusual forest type, dominated almost entirely by Filicium decipiens was also present." ... "The riverine forests also act as corridors or stepping stones for seasonal migration which further enhances their biodiversity values. In the moist forests, two further unusual communities are the almost monospeci®c stands of Filicium decipiens on the eastern edge of the gorge forests and the Olea capensis community in the upper part of the gorge."

501	Aquatic	n
	Source(s)	**Notes**
	Dharani, N. (2019). Field Guide to Common Trees & Shrubs of East Africa. Third Edition. Struik Nature, Cape Town, South Africa	[Terrestrial] "A well-shaped evergreen tree reaching a height of Sm, occasionally to 25m. Occurs in riverine forest and swampy sites in forests; also widely planted in the highland areas. Grows at altitudes of 100-1,500m."

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 29 Jul 2019]	Family: Sapindaceae Subfamily: Sapindoideae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 29 Jul 2019]	Family: Sapindaceae Subfamily: Sapindoideae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	Whistler, W.A. 2000. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	"Tree to 12 m high" [Not a geophyte]

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 30 Jul 2019]	[No evidence. Broad natural distribution and widely cultivated] "Native Africa NORTHEAST TROPICAL AFRICA: Ethiopia EAST TROPICAL AFRICA: Kenya, Tanzania SOUTH TROPICAL AFRICA: Malawi, Mozambique, Zimbabwe Asia-Tropical INDIAN SUBCONTINENT: India, Sri Lanka"

602	Produces viable seed	y
	Source(s)	**Notes**
	Randhawa, G.S. & Mukhopadhyay, A. (1986). Floriculture in India. Allied Publishers, New Delhi, India	"It is propagated from freshly harvested seeds."
	Whistler, W.A. 2000. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	"Propagate by seeds, the technique most used."

603	Hybridizes naturally	
	Source(s)	**Notes**
	Woodson, R., Schery, R., & Croat, T. (1976). Flora of Panama. Part VI. Family 108. Sapindaceae. Annals of the Missouri Botanical Garden, 63(3), 419-540	"The genus has three species in tropical Africa and Asia. A single species, F. decipiens (Wight & Arn.)" [Unknown. No evidence found]

604	Self-compatible or apomictic	
	Source(s)	**Notes**
	Kubitzki, K. (ed.). 2011. The Families and Genera of Vascular Plants. Vol. X. Flowering Plants. Eudicots: Sapindales, Cucurbitales, Myrtaceae. Springer, New York	"Falsely polygamous trees…Flowers actinomorphic, functionally unisexual…" [Self-compatibility unknown]

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Woodson, R., Schery, R., & Croat, T. (1976). Flora of Panama. Part VI. Family 108. Sapindaceae. Annals of the Missouri Botanical Garden, 63(3), 419-540	"Flowers with the sepals narrowly ovate, to 5 mm long, narrowly rounded at the apex, glabrate on the outer surface, villous along the margins and on the inner surface; petals ovate, 1.5 mm long, glabrous on the surfaces, ciliolate; disc plate shaped, woolly on the upper surface; stamens exserted, the filaments flattened, glabrous; staminate flowers with the stamens ca. 2.5 mm long, the anthers ovoid, ca. 0.5 mm long, the pistil ovoid, minute, glabrous; pistillate flowers not seen." [Flowers unspecialized]
	Zomlefer, W.B. 1994. Guide to Flowering Plant Families. The University of North Carolina Press, Chapel Hill & London	"Generally, the small flowers are aggregated into conspicuous inflorescences, and bees (as well as other insects and hummingbirds) visit for the copious nectar produced by the disc. However, a few species (e.g., in Acer and Dodonaea) are anemophilous." [Family description]

606	Reproduction by vegetative fragmentation	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Whistler, W.A. 2000. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	"Propagate by seeds, the technique most used." [No evidence of reproduction by vegetative fragmentation]

607	Minimum generative time (years)	>3
	Source(s)	**Notes**
	Benthall, A.P. (1946). The Trees of Calcutta and its Neighbourhood. Thacker Spink & Co., Calcutta	"It is occasionally planted in Calcutta, but is too slow-growing to be popular as a shade tree."
	Randhawa, G.S. & Mukhopadhyay, A. (1986). Floriculture in India. Allied Publishers, New Delhi, India	"The plant is slow growing"
	WRA Specialist. (2019). Personal Communication	Reaches reproductive maturity in 4+ years, R. Criley, CTAHR, UH Manoa, pers. comm.

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	**Notes**
	Woodson, R., Schery, R., & Croat, T. (1976). Flora of Panama. Part VI. Family 108. Sapindaceae. Annals of the Missouri Botanical Garden, 63(3), 419-540	"Fruit drupaceous, ovoid, 1-1.5 cm long, smooth, dark purple...seeds 1-2; embryo curved." [No evidence, and no means of external attachment]

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Whistler, W.A. 2000. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	"It is also grown elsewhere in the tropics as a shade or street tree."
	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	"Native to tropical Africa and perhaps southern India, fern tree is widely planted around Honolulu as a street tree, a purpose for which its nonaggressive root system and compact growth form suit it." [Ornamental & landscaping]
	Rauch, F.D. & Weissich, P.R. 2000. Plants for Tropical Landscapes: A Gardener's Guide. University of Hawaii Press, Honolulu, HI	"Plant it over a ground cover that will absorb the attractive but troublesome small black fruits. It makes an excellent tubbed specimen."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	**Notes**
	Woodson, R., Schery, R., & Croat, T. (1976). Flora of Panama. Part VI. Family 108. Sapindaceae. Annals of the Missouri Botanical Garden, 63(3), 419-540	"Fruit drupaceous, ovoid, 1-1.5 cm long, smooth, dark purple...seeds 1-2; embryo curved." [No evidence, and no means of external attachment]

704	Propagules adapted to wind dispersal	n
	Source(s)	**Notes**
	Whistler, W.A. 2000. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	"Fruit a shiny purple ovoid drupe." [No adaptations for wind dispersal]

Qsn #	Question	Answer
705	**Propagules water dispersed**	
	Source(s)	**Notes**
	Lovett, J.C., Ruffo, C.K. & Gereau, R.E. (1996). Field guide to the moist forest trees of Tanzania. The Society for Environmental Exploration and the University of Dar es Salaam, UK & Tanzania	"Filicium decipiens … Ecology: Riverine and lowland forest"
	Lovett, J.C. & Pócs, T. (1993). Assessment of the condition of the Catchment Forest Reserves, a botanical appraisal. Morogoro Region. Eastern Arc Mountains Conservation Endowment Fund, Morogoro, Tanzania	"In depressions and along streamlets on travertine banks swamp forest occurs with Pandanus cf. engleri and an undergrowth of Cremaspora triflora, Filicium decipiens, Justicia interrupta, Pavetta sp., and Psychotria schliebenii." [Suggests possible water dispersal]
	Dharani, N. (2019). Field Guide to Common Trees & Shrubs of East Africa. Third Edition. Struik Nature, Cape Town, South Africa	"Occurs in riverine forest and swampy sites in forests" … "Ripe fruit eaten by birds." [Unknown if water dispersed, but distribution along rivers suggests possibility of water dispersal]

706	**Propagules bird dispersed**	**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	"Although fern tree is attractive and easy to grow, it has several drawbacks…the fruit is eaten by birds and, which disperse the seeds into vacant lots, hedgerows, and secondary forests."
	Santhoshkumar, E., & Balasubramanian, P. 2011. Seed dispersal by the Indian Grey Hornbill Ocyceros birostris in Eastern Ghats, India. Ecotropica, 17(2): 71-77	"Among the avian frugivores in tropical forests, large birds have an important role in the seed dispersal. The Indian Grey Hornbill Ocyceros birostris, one of the few larger avian species in the Eastern Ghats was expected to play a key role in seed dispersal. We studied i. nest middens (i.e. the seeds deposited under the active nest), ii. seed germination trial of hornbill-dispersed seeds and iii. seedling abundance under nest trees, to assess its role in seed dispersal and forest regeneration. Of the 3303 seeds found in the nest middens, Premna tomentosa (38.6%), Drypetes roxburghii (19.5%) and Filicium decipiens (12.7%) formed the predominant species. Seeds found in the nest middens were intact indicating that the Indian Grey Hornbill is a legitimate seed disperser. Germination experiments on hornbill's diet species indicated that the seed germination efficiency of 15 out of 16 species is enhanced after defecation."
	Staples, G.W., Herbst, D.R & Imada, C.T. 2000. Survey of invasive or potentially invasive cultivated plants in Hawai'i. Bishop Museum Occasional Papers 65: 1-35	"Among the best-known bird-dispersed plants, mostly woody perennials, are the octopus tree (Schefflera actinophylla), the two species of fiddlewood (Citharexylum caudatum, C. spinosum), Chinese banyan (Ficus microcarpa), fern tree (Filicium decipiens), miconia (Miconia calvescens), ivy gourd (Coccinia grandis), Fukien tea or Philippine tea (Carmona retusa), various members of the grape family (Cissus spp., Tetrastigma spp.), several species of asparagus (Asparagus spp.), two ardisias (Ardisia crenata, A. elliptica), at least three firethorns (Pyracantha spp.), and lantana (Lantana camara)."
	Whistler, W.A. 2000. Tropical Ornamentals: A Guide. Timber Press, Portland, OR	"Fruit a shiny purple ovoid drupe." [Fleshy-fruits adapted for bird dispersal]
	Dharani, N. (2019). Field Guide to Common Trees & Shrubs of East Africa. Third Edition. Struik Nature, Cape Town, South Africa	"Fruit: Purple-black when ripe; small; round berries." … "Ripe fruit eaten by birds."

Qsn #	Question	Answer
707	**Propagules dispersed by other animals (externally)**	**n**
	Source(s)	**Notes**
	Dharani, N. (2019). Field Guide to Common Trees & Shrubs of East Africa. Third Edition. Struik Nature, Cape Town, South Africa	"Fruit: Purple-black when ripe; small; round berries." … "Ripe fruit eaten by birds." [No evidence of external dispersal. No means of external attachment]

708	**Propagules survive passage through the gut**	**y**
	Source(s)	**Notes**
	Santhoshkumar, E., & Balasubramanian, P. 2011. Seed dispersal by the Indian Grey Hornbill Ocyceros birostris in Eastern Ghats, India. Ecotropica, 17(2): 71-77	"Among the avian frugivores in tropical forests, large birds have an important role in the seed dispersal. The Indian Grey Hornbill Ocyceros birostris, one of the few larger avian species in the Eastern Ghats was expected to play a key role in seed dispersal. We studied i. nest middens (i.e. the seeds deposited under the active nest), ii. seed germination trial of hornbill-dispersed seeds and iii. seedling abundance under nest trees, to assess its role in seed dispersal and forest regeneration. Of the 3303 seeds found in the nest middens, Premna tomentosa (38.6%), Drypetes roxburghii (19.5%) and Filicium decipiens (12.7%) formed the predominant species. Seeds found in the nest middens were intact indicating that the Indian Grey Hornbill is a legitimate seed disperser. Germination experiments on hornbill's diet species indicated that the seed germination efficiency of 15 out of 16 species is enhanced after defecation."
	Mudappa, D., Kumar, A., & Chellam, R. (2010). Diet and fruit choice of the brown palm civet Paradoxurus jerdoni, a viverrid endemic to the Western Ghats rainforest, India. Tropical Conservation Science, 3(3), 282-300	"Appendix 1. The percent occurrence of seeds and other remains in scats (percentage of items, Fi) of the brown palm civet in the tropical rainforest of Kalakad-Mundanthurai Tiger Reserve, 1996–1999 (number of scats in parentheses)." [Includes viable F. decipiens seeds]
	Birkinshaw, C., Andrianjafy, M., & Rasolofonirina, J. J. (2009). Survival and growth of seedlings of 19 native tree and shrub species planted in degraded forest as part of a forest restoration project in Madagascar's highlands. Madagascar Conservation & Development, 4(2): 128-131	"TABLE 1. Percentage survival and mean percentage change in height of survivors for 19 native species on Madagascar's highlands, ten months after planting; with comments on each species." [Filicium decipiens - Comments (mainly based on personal observation) = Medium tree, lemur - dispersed]

801	**Prolific seed production (>1000/m2)**	
	Source(s)	**Notes**
	Woodson, R., Schery, R., & Croat, T. (1976). Flora of Panama. Part VI. Family 108. Sapindaceae. Annals of the Missouri Botanical Garden, 63(3), 419-540	"Fruit ovoid or ellipsoid, drupaceous, 1-2-loculate, the endocarp membranous; seeds 1-2" [Densities unknown, but unlikely. Few-seeded fruits]

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	**n**
	Source(s)	**Notes**
	Randhawa, G.S. & Mukhopadhyay, A. (1986). Floriculture in India. Allied Publishers, New Delhi, India	"It is propagate from freshly harvested seeds."
	Macmillan, H.F. (1999). Tropical planting and gardening with sepcial reference to Ceylon. Asian Educational Services, New Delhi, India	"Produces in March-April quantities of soft fleshy seed, which are of short vitality."

Qsn #	Question	Answer
	Baskin, C.C. & Baskin, J.M. 2014. Seeds Ecology, Biogeography, and Evolution of Dormancy and Germination. Second Edition. Academic Press, San Francisco, CA	"TABLE 9.1 Dormancy class or nondormancy (D/ND) in seeds of nonpioneer trees of evergreen rainforests." [Filicium decipiens = ND]

803	Well controlled by herbicides	
	Source(s)	**Notes**
	Motooka, P. (1999). Herbicides for Weed Control Workshop. Hawai'i Forestry News Volume 1, Issue 1 Summer 1999	"Basal bark application of a ready to use solution of Pathfinder II (trichlopyr), streaking the bottom 12 inches of trunk, caused defoliation of Psidium cattleianum (strawberry guava), Schinus terebinthifolius (Christmas berry), and Filicium decipiens (fern tree) after six weeks." [Efficacy of herbicide application in controlling Filicium decipiens not specified. Descriptions of defoliation indicate triclopyr may be effective]

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	Unknown. No information found

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	[Unknown. No natural enemies, pests or pathogens reported] "Native to tropical Africa and perhaps southern India, fern tree is widely planted around Honolulu as a street tree, a purpose for which its nonaggressive root system and compact growth form suit it."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Thrives in tropical climates
• Naturalized on Oahu, Maui and Hawaii (Hawaiian Islands)
• Regarded as weedy, and a landscape nuisance, in the Hawaiian Islands, with potential negative impacts to native ecosystems
• Some people may be allergic to flowering trees
• Moderately shade tolerant
• Tolerates many soil types
• Capable of forming monotypic stands in parts of native range
• Reproduces by seeds
• Seeds dispersed by birds, other frugivorous animal, possibly by water and intentionally by people

Low Risk Traits
• Despite naturalization and reports of weediness, also regarded as a desirable street tree in urban settings
• Unarmed (no spines, thorns, or burrs)
• Not reported to spread vegetatively
• Slow-growing, and reported to reach maturity in 4+ years
• Seeds are non-dormant, lose viability rapidly, and presumably will not form a persistent seed bank

Second Screening Results for Tree/tree-like shrubs

(A) Shade tolerant or known to form dense stands?> Yes. Moderately shade tolerant and reported to form monospecific stands in Africa
(B) Bird or clearly wind-dispersed?> Yes. Dispersed by birds
(C) Life cycle <4 years? No. Reaches maturity in 4+ years
Outcome = Evaluate further