

<b>Taxon:</b> <i>Pilea microphylla</i>	<b>Family:</b> Urticaceae
<b>Common Name(s):</b> artillery plant gunpowder plant military fern	<b>Synonym(s):</b> Parietaria microphylla L.

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Assessor Approved	<b>End Date:</b> 22 Mar 2017
<b>WRA Score:</b> 18.0	<b>Designation:</b> H(HPWRA)	<b>Rating:</b> High Risk

**Keywords:** Annual Herb, Garden Weed, Horticultural Weed, Shade-Tolerant, Seed Contaminant

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)	y
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens	y=1, n=0	n
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	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	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	y
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed		
706	Propagules bird dispersed		
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m2)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)		
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)		

**Supporting Data:**

Qsn #	Question	Answer
101	Is the species highly domesticated?	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	"Cultivated forms are larger and more vigorous, with a medium green color; the weedy garden forms are smaller and tend to be yellow-green in bright sun." [Cultivated forms exist, but no evidence that plants are highly domesticated]

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2017. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2017. 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. 2017. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 20 Mar 2017]	"Native: Northern America : Mexico Southeastern U.S.A.: United States - Florida, - Georgia, - Louisiana, - South Carolina Southern America Brazil: Brazil Caribbean: Antigua and Barbuda; Bahamas; Barbados; Cayman Islands; Cuba; Dominica; Grenada; Guadeloupe; Hispaniola; Jamaica; Martinique; Montserrat; Netherlands Antilles - St. Eustatius; Puerto Rico; St. Kitts and Nevis; St. Lucia; St. Vincent and Grenadines; Virgin Islands (British); Virgin Islands (U.S.) Central America: Belize; Costa Rica; El Salvador; Guatemala; Honduras; Nicaragua; Panama Northern South America: French Guiana; Guyana; Suriname; Venezuela Southern South America: Argentina - Misiones; Paraguay Western South America: Bolivia; Colombia; Ecuador; Peru Naturalized: . natzd. elsewhere"

Qsn #	Question	Answer
202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 20 Mar 2017]	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i cultivated and naturalized in low elevation, mesic, disturbed sites at least on Kaua'i, O'ahu, Maui, and Hawai'i, but probably on all of the main islands."
	Gilman, E. F. (1999). <i>Pilea microphylla</i> . Artillery Plant. Fact Sheet FPS479. University of Florida IFAS Extension, Gainesville, FL. <a href="http://edis.ifas.ufl.edu">http://edis.ifas.ufl.edu</a> . [Accessed 21 Mar 2017]	"USDA hardiness zones: 10B through 11"
	Iremonger, S. (2002). A Guide to Plants in the Blue Mountains of Jamaica. University of the West Indies Press, Kingston, Jamaica	"var. <i>microphylla</i> ... Walls and pathside rocks in damp shaded places, 610 to 1,680 m (2,000 to 5,500 ft). Endemic." [Elevation range of this variety exceeds 1000 m, demonstrating environmental versatility in part of native range]

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 20 Mar 2017]	"Native: Northern America : Mexico Southeastern U.S.A.: United States - Florida, - Georgia, - Louisiana, - South Carolina Southern America Brazil: Brazil Caribbean: Antigua and Barbuda; Bahamas; Barbados; Cayman Islands; Cuba; Dominica; Grenada; Guadeloupe; Hispaniola; Jamaica; Martinique; Montserrat; Netherlands Antilles - St. Eustatius; Puerto Rico; St. Kitts and Nevis; St. Lucia; St. Vincent and Grenadines; Virgin Islands (British); Virgin Islands (U.S.) Central America: Belize; Costa Rica; El Salvador; Guatemala; Honduras; Nicaragua; Panama Northern South America: French Guiana; Guyana; Suriname; Venezuela Southern South America: Argentina - Misiones; Paraguay Western South America: Bolivia; Colombia; Ecuador; Peru Naturalized: . natzd. elsewhere"

205	Does the species have a history of repeated introductions outside its natural range?	y
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"on all of the main islands except Ni'ihau and Kaho'olawe"
	Friis, I. (1989). A Revision of <i>Pilea</i> (Urticaceae) in Africa. Kew Bulletin, 44(4), 557-600	"Scattered populations throughout Africa in coastal zones and some inland localities; elsewhere widespread in the tropics South America. Often a garden weed."

301	Naturalized beyond native range	y
	<b>Source(s)</b>	<b>Notes</b>
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i cultivated and naturalized in low elevation, mesic, disturbed sites at least on Kaua'i, O'ahu, Maui, and Hawai'i, but probably on all of the main islands. First collected on O'ahu in 1925 (F. Brown 1262, BISH)."
	Oppenheimer, H. L. & Bartlett, R. T. 2002. New plant records from the main Hawaiian Islands. Bishop Museum Occasional Papers. 69: 1-14	"Occurring on Kaua'i, O'ahu, Maui, and Hawai'i, but probably all of the main islands (Wagner et al., 1999: 1306), this taxon has also been documented from Midway Atoll: first from Sand Island by Wagner & Herbst (1995: 26), and later from Eastern Island by Shannon & Wagner (1996: 14). The following specimen is a new record for the island of Lāna'i. Material examined. LĀNA'I: Kō'ele, on rocks with <i>Youngia</i> , <i>Portulaca</i> , and <i>Calyptocarpus</i> , 518 m, 25 Oct 1999, Oppenheimer H109930."
	Oppenheimer, H.L. 2006. New Hawai'i Plant Records for 2004. Bishop Museum Occasional Papers 88: 10-15	" <i>Pilea microphylla</i> (L.) Liebm. New island record Known to be naturalized in Hawai'i on Midway Atoll, Kaua'i, O'ahu, Lāna'i, Maui, and Hawai'i (Wagner et al. 1999: 1306; Wagner & Herbst 1995: 26; Shannon & Wagner 1996: 14; Oppenheimer & Bartlett 2002: 12), artillery plant was recently collected on Moloka'i. Material examined. MOLOKA'I: west of Kaunakakai, nursery weed, 50 m, 2 Apr 2004, Oppenheimer H40407."

302	Garden/amenity/disturbance weed	y
	<b>Source(s)</b>	<b>Notes</b>
	Friis, I. (1989). A Revision of <i>Pilea</i> (Urticaceae) in Africa. Kew Bulletin, 44(4), 557-600	"Often a garden weed."
	Dave's Garden. 2017. Artillery Plant. <i>Pilea microphylla</i> . <a href="http://davesgarden.com/guides/pf/go/1697/">http://davesgarden.com/guides/pf/go/1697/</a> . [Accessed 21 Mar 2017]	"On Oct 6, 2014, williamca from Plant City, FL (Zone 9b) wrote: This is a highly invasive pest weed. If you ever get it and sooner or later it will arrive with some plant you buy it is impossible to get rid of in zone 9b. It loves hanging baskets, potted plants and will come up in the cracks in the pavers. I pluck it out of the orchid basket and pour hot water on it where I can. " ... "On Feb 23, 2014, brachychiton from Bribie Island, Australia wrote: This plant is highly invasive in subtropical Queensland. My friend has it in his plant nursery and it is the biggest pest problem that he has. Just a few specks of this plant on your hands when you're gardening are enough to start a plague in your garden." ... "On May 30, 2010, daleg from townsville, Australia wrote: This plant is a pest in tropical areas. Keep it well away from bonsai and orchids, especially if you use porous volcanic rock in your potting mix. The miniscule seeds get everywhere and even a 1 cm plant will set seed."

Qsn #	Question	Answer
	Reddy, C. S., & Raju, V. S. (2002). Additions to the weed flora of Andhra Pradesh, India. <i>Journal of Economic and Taxonomic Botany</i> , 26(1), 195-198	" <i>Pilea microphylla</i> ... Common potweed in gardens."

303	Agricultural/forestry/horticultural weed	y
	Source(s)	Notes
	Saha, D., Marble, C., Steed, S. & Boyd, N. (2016). <i>Biology and Management of Pilea microphylla (Artillery weed) in Ornamental Crop Production</i> . ENH1272. University of Florida IFAS Extension, Gainesville, FL. <a href="http://edis.ifas.ufl.edu">http://edis.ifas.ufl.edu</a> . [Accessed ]	"Artillery weed occurs primarily in moist, disturbed areas but can tolerate dry conditions once established. In landscapes, artillery weed is typically found growing in rock mulch beds, in cracks in driveways and hardscapes, and in planting beds. In nurseries, it can be problematic in containers, container drain holes, ground cloth (Figure 1), walkways, aisles, and in greenhouses."
	Flora of North America Editorial Committee, eds. 1997. <i>Flora of North America: Volume 3: Magnoliophyta: Magnoliidae and Hamamelidae</i> . Oxford University Press, Oxford, UK	"It is a greenhouse weed in various parts of the flora."
	Romani, G. N., Queiroz, J. R. G., Silva, M. T., Alves, P. L. C. A., & Pivetta, K. F. L. (2011). Chemical control of <i>Pilea microphylla</i> in <i>Euterpe oleraceae</i> nurseries with oxyfluorfen. In VII International Symposium on New Floricultural Crops 1000 (pp. 327-330)	[Weed in acai cultivation. Impacts not specified] "The açai palm is a Brazilian native species and economically important, grown for the hearts of palm and fruit extraction, as well as the seedling production for ornamental purposes. The weed control is one of the concerns observed in seedling production, which has the artillery plant ( <i>Pilea microphylla</i> ) with the major and widespread occurrence. Thus, the aim of this trial was to evaluate the selectivity and efficacy of oxyfluorfen in artillery plant control in açai ( <i>Euterpe oleracea</i> ) seedlings. The experimental design was completely randomized. The treatments were arranged in a 2 x 3 factorial scheme, using 2 types of herbicide application: broadcast spraying (sprayed over total area) and spot spraying (directed to the target) and 3 oxyfluorfen dosages (0, 72 and 144 g of active ingredient ha <sup>-1</sup> ) with four replications. Each experimental unit consisted by one açai palm pot infested by artillery plant. They ere visually evaluated for seedling toxicity and the weed control percentage, at 7, 15, 30, 45 and 60 days after application (DAA). There was 100% control of artillery plant from 15 to 60 DAA for the two tested dosages, regardless of application type. However, 100% control was observed at 7 days, using 1.5 L ha <sup>-1</sup> in the spot type. The effects of phytotoxicity from 30 to 60 days was moderate, regardless the application method or dosage."
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	Cited as an agricultural weed, but primarily a disturbance weed & weed of gardens

304	Environmental weed	n
	Source(s)	Notes
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	Disturbance, garden & possible agricultural weed

305	Congeneric weed	y
	Source(s)	Notes

Qsn #	Question	Answer
	Kiew, R., & Tan, J. P. C. (2016). Stop That Weed! UTAR Agriculture Science Journal 2(2): 53-60	"Pilea nummulariifolia (Urticaceae) called 'creeping Charlie' is used as a bedding plant at Fraser's Hill, Pahang. It forms a solid carpet aggressively smothering all the other plants both native and ornamental. Unfortunately, if not checked it spreads into the adjacent vegetation blanketing native plants. It is obviously a species to avoid planting in hill resorts."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Pilea nummulariifolia ... Weed of: Bananas, Orchards and Plantations"

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annual or short-lived perennial herbs; stems succulent, sometimes slightly woody at base, spreading or cespitose, 5-50 cm long. Leaves crowded throughout stem length, obovate, elliptic, oblanceolate, or oblong, 2-10 mm long, 1-4 mm wide, those of a pair very unequal in size, sometimes some branches with leaves of a pair equal or all leaves of plant equal, 1-nerved, upper surface with crowded elliptic cystoliths, lower surface finely reticulate, margins entire, petioles 1-4 mm long, always shorter than the blade, stipules ca. 1 mm long."

402	Allelopathic	n
	Source(s)	Notes
	WRA Specialist. 2017. Personal Communication	Unknown. No evidence found

403	Parasitic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annual or short-lived perennial herbs; stems succulent, sometimes slightly woody at base, spreading or cespitose, 5-50 cm long." [Urticaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Useful Tropical Plants Database. 2017. Pilea microphylla. <a href="http://tropical.theferns.info/viewtropical.php?id=Pilea+microphylla">http://tropical.theferns.info/viewtropical.php?id=Pilea+microphylla</a> . [Accessed 21 Mar 2017]	"Edible Uses None known" [Palatability unknown]

Qsn #	Question	Answer
405	<b>Toxic to animals</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Useful Tropical Plants Database. 2017. <i>Pilea microphylla</i> . <a href="http://tropical.theferns.info/viewtropical.php?id=Pilea+microphylla">http://tropical.theferns.info/viewtropical.php?id=Pilea+microphylla</a> . [Accessed 21 Mar 2017]	"Known Hazards - None known"
	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

406	Host for recognized pests and pathogens	n
	<b>Source(s)</b>	<b>Notes</b>
	Gilman, E. F. (1999). <i>Pilea microphylla</i> . Artillery Plant. Fact Sheet FPS479. University of Florida IFAS Extension, Gainesville, FL. <a href="http://edis.ifas.ufl.edu">http://edis.ifas.ufl.edu</a> . [Accessed 21 Mar 2017]	"Pest resistance: no serious pests are normally seen on the plant" ... "Artillery plant is occasionally bothered by chewing insects. Plants are subject to root rot in poorly drained soils."

407	Causes allergies or is otherwise toxic to humans	
	<b>Source(s)</b>	<b>Notes</b>
	Claus, E. (1948). A Study of the Anemophilous Plants of Puerto Rico. <i>Botanical Gazette</i> , 109(3), 249-258	[A minor allergen] "The artillery plant or gale of wind (madre selva, verdolaguilla), <i>Pilea microphylla</i> (L.) Liebrn., and the many species of <i>Urtica</i> (Tourn.) L. have been considered as lesser causes of hay fever in the United States (18) and also in Argentina (26)." ... "A summary list follows of the species of probable allergenicity in Puerto Rico. The significance of the numerical designations is: (1) of major importance in the pollen allergy of other countries; (2) of minor importance in the pollen allergy of other country" [(2) <i>Pilea microphylla</i> - minor importance]
	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. Medicinal uses] "Whole plant diuretic, anthelmintic, a paste applied on rheumatic joints and skin diseases, for gastric and intestinal troubles. Leaves paste applied to sores and bruises."

408	Creates a fire hazard in natural ecosystems	n
	<b>Source(s)</b>	<b>Notes</b>
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"A native of tropical America, artillery plant is ubiquitous in Hawaii's gardens, where it thrives in damp locations and also grows in sunny, drier situations." [No evidence]
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. 1999. <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence] "Annual or short-lived perennial herbs; stems succulent ... in Hawai'i cultivated and naturalized in low elevation, mesic, disturbed sites"

409	Is a shade tolerant plant at some stage of its life cycle	y
	<b>Source(s)</b>	<b>Notes</b>



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	"A native of tropical America, artillery plant is ubiquitous in Hawaii's gardens, where it thrives in damp locations and also grows in sunny, drier situations."
	Gilman, E. F. (1999). <i>Pilea microphylla</i> . Artillery Plant. Fact Sheet FPS479. University of Florida IFAS Extension, Gainesville, FL. <a href="http://edis.ifas.ufl.edu">http://edis.ifas.ufl.edu</a> . [Accessed 21 Mar 2017]	"Light requirement: plant grows in part shade/part sun; plant grows in the shade"
	Iremonger, S. (2002). A Guide to Plants in the Blue Mountains of Jamaica. University of the West Indies Press, Kingston, Jamaica	"var. <i>microphylla</i> ... Walls and pathside rocks in damp shaded places, 610 to 1,680 m (2,000 to 5,500 ft)."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Gilman, E. F. (1999). <i>Pilea microphylla</i> . Artillery Plant. Fact Sheet FPS479. University of Florida IFAS Extension, Gainesville, FL. <a href="http://edis.ifas.ufl.edu">http://edis.ifas.ufl.edu</a> . [Accessed 21 Mar 2017]	"Soil tolerances: extended flooding; alkaline; clay; sand; acidic; loam"
	Dehgan, B. (1998) Landscape Plants for Subtropical Climates. University Press of Florida, Gainesville, FL	"Tolerates a wide range of both light and soil types, but does best in shady moist locations."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annual or short-lived perennial herbs; stems succulent, sometimes slightly woody at base, spreading or caespitose, 5-50 cm long."

412	Forms dense thickets	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annual or short-lived perennial herbs; stems succulent, sometimes slightly woody at base, spreading or caespitose, 5-50 cm long." [No evidence. Habit more typically mat-forming or low growing]

501	Aquatic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Terrestrial] "in Hawai'i cultivated and naturalized in low elevation, mesic, disturbed sites"

Qsn #	Question	Answer
502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 20 Mar 2017]	Urticaceae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 20 Mar 2017]	Urticaceae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annual or short-lived perennial herbs; stems succulent, sometimes slightly woody at base, spreading or cespitose, 5-50 cm long."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. <a href="http://www.ars-grin.gov/npgs/index.html">http://www.ars-grin.gov/npgs/index.html</a> . [Accessed 21 Mar 2017]	No evidence. Widespread native & introduced range

602	Produces viable seed	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Achenes ellipsoid, compressed, 0.5-1 mm long, slightly longer than the largest calyx lobe."
	Whistler, A.W. 1995. Wayside Plants of the Islands: A Guide to the Lowland Flora of the Pacific Island. Isle Botanica, Honolulu, HI	"Fruit an ellipsoid achene 0.5-1 mm long, with a single seed that is ejected from the ripe fruit."

603	Hybridizes naturally	
	Source(s)	Notes
	WRA Specialist. 2017. Personal Communication	Unknown. No evidence found

604	Self-compatible or apomictic	
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Flora of North America Editorial Committee, eds. 1997. Flora of North America: Volume 3: Magnoliophyta: Magnoliidae and Hamamelidae. Oxford University Press, Oxford, UK	"Herbs weak, glabrous, monoecious."

605	Requires specialist pollinators	n
	<b>Source(s)</b>	<b>Notes</b>
	Datta. S.C. 1988. Systematic Botany. New Age International, New Delhi, India	"Artillery Plant or Gunpowder Plant [ <i>Pilea microphylla</i> (L.) Liebm.], seen on damp walls, scatters a volley of pollen-grains from the anthers when the plant is shaken." [Anemophilous]

606	Reproduction by vegetative fragmentation	y
	<b>Source(s)</b>	<b>Notes</b>
	Gilman, E. F. (1999). <i>Pilea microphylla</i> . Artillery Plant. Fact Sheet FPS479. University of Florida IFAS Extension, Gainesville, FL. <a href="http://edis.ifas.ufl.edu">http://edis.ifas.ufl.edu</a> . [Accessed 21 Mar 2017]	"Propagation is by cuttings which root easily."
	Henty, E. E., Pritchard, G. H. 1975. Weeds of New Guinea and their control. 2nd edition. Department of Forests, Division of Botany, Botany Bull. No. 7. Lae, Papua New Guinea	"Small pieces of stem are able to take root, if lying on the soil"

607	Minimum generative time (years)	1
	<b>Source(s)</b>	<b>Notes</b>
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annual or short-lived perennial herbs; stems succulent, sometimes slightly woody at base, spreading or cespitose, 5-50 cm long."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	<b>Source(s)</b>	<b>Notes</b>
	Leung, G. P., Hau, B. C., & Corlett, R. T. (2009). Exotic plant invasion in the highly degraded upland landscape of Hong Kong, China. <i>Biodiversity and Conservation</i> , 18(1), 191–202	"Table 3 Exotic plant species recorded in the surveyed streams" [ <i>Pilea microphylla</i> - Dispersal adaptations = N no obvious dispersal adaptations] [Possibly, if growing in disturbed habitats]

702	Propagules dispersed intentionally by people	y
	<b>Source(s)</b>	<b>Notes</b>
	Flora of North America Editorial Committee, eds. 1997. Flora of North America: Volume 3: Magnoliophyta: Magnoliidae and Hamamelidae. Oxford University Press, Oxford, UK	" <i>Pilea microphylla</i> has been collected once in Tennessee and once in Michigan, but it is unlikely that the species persists so far north. It is widely grown as a houseplant in the north and a border plant in the south. It is a greenhouse weed in various parts of the flora."

Qsn #	Question	Answer
703	Propagules likely to disperse as a produce contaminant	y
	Source(s)	Notes
	Galera, H., & Ratyńska, H. (1999). Greenhouse weeds in the Botanical Garden of PAS in Warsaw-Powsin. Acta Societatis Botanicorum Poloniae, 68(3), 227-236	"Systematic studies carried out in the greenhouses of the Botanical Garden in Warsaw-Powsin, Poland, from 1992-95 revealed that the flora of weeds was very species rich. A total of 243 taxa of vascular plants and 17 species of bryophytes were recorded and lists of these species are presented. Native plants (89 species), greenhouse-escapes (87 species) and permanently established aliens (48 species) co-dominated in the garden. In addition, 10 species of garden escapes, i.e. plants cultivated in the immediate neighbourhood of the greenhouses, were recorded indoors. Noteworthy were two species ( <i>Ruellia caroliniensis</i> and <i>Pilea microphylla</i> ) that had been brought accidentally to the glasshouses together with plant material - this group of plants is least numerous, but quite frequent in the study area."

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Achenes ellipsoid, compressed, 0.5-1 mm long, slightly longer than the largest calyx lobe."
	Leung, G. P., Hau, B. C., & Corlett, R. T. (2009). Exotic plant invasion in the highly degraded upland landscape of Hong Kong, China. Biodiversity and Conservation, 18(1), 191–202	"Table 3 Exotic plant species recorded in the surveyed streams" [Pilea microphylla - Dispersal adaptations = N no obvious dispersal adaptations]

705	Propagules water dispersed	
	Source(s)	Notes
	Leung, G. P., Hau, B. C., & Corlett, R. T. (2009). Exotic plant invasion in the highly degraded upland landscape of Hong Kong, China. Biodiversity and Conservation, 18(1), 191–202	"Table 3 Exotic plant species recorded in the surveyed streams" [Pilea microphylla - Dispersal adaptations = N no obvious dispersal adaptations] [No evidence, but small size may allow for some overland dispersal by water]

706	Propagules bird dispersed	
	Source(s)	Notes
	Sugden, A. M. (1982). Long-distance dispersal, isolation, and the cloud forest flora of the Serranía de Macuira, Guajira, Colombia. Biotropica, 14(3): 208-219	"APPENDIX. Notes on the propagules and their dispersal ... dispersed by birds externally ... <i>Pilea microphylla</i> . Achene small and dry. <i>Pilea microphylla</i> once arrived at Tweedside in imported sheep's wool (Ridley 1930)." [Dispersed externally by birds & potentially other animals]

Qsn #	Question	Answer
707	Propagules dispersed by other animals (externally)	y
	Source(s)	Notes
	Sugden, A. M. (1982). Long-distance dispersal, isolation, and the cloud forest flora of the Serranía de Macuira, Guajira, Colombia. <i>Biotropica</i> , 14(3): 208-219	"APPENDIX. Notes on the propagules and their dispersal ... dispersed by birds externally ... <i>Pilea microphylla</i> . Achene small and dry. <i>Pilea microphylla</i> once arrived at Tweedside in imported sheep's wool (Ridley 1930)." [Dispersed externally by birds & potentially other animals]

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Gawel, A. M., & Mangilao, G. (2010). PS 85-169: Endozoochory in introduced ungulates: dispersal of native and introduced plant species in tropical forests. In The 95th ESA Annual Meeting. <a href="https://eco.confex.com/eco/2010/techprogram/P26273.HTM">https://eco.confex.com/eco/2010/techprogram/P26273.HTM</a> . [Accessed ]	[Seeds germinated from deer pellets] "Populations of feral pigs ( <i>Sus scrofa</i> ) and Philippine deer ( <i>Cervus mariannus</i> ) have sustained populations in the Micronesian island of Guam for centuries and are believed to have severe impacts on native forests. Grazing and uprooting damage have been observed from both animals, but other impacts such as seed dispersal have not been investigated. Pigs and deer may act as dispersers of invasive species, as is suspected for feral pigs in Hawaii. To test whether deer or pigs could potentially act as dispersers, deer and pig scats were collected from forest areas in Guam. They were then planted and monitored in a nursery. Fifteen deer pellet groups and twelve pig scats were mixed with soil and watered daily. Any new sprouts were counted and identified. Results/Conclusions A high number of seedlings germinated from all of the pig scats collected, almost 100% of which belonged to two species of abundant, fast-growing fruit trees ( <i>Carica papaya</i> , an invasive, and <i>Morinda citrifolia</i> , a pan-tropical but likely native tree). Several pig scats had over 100 individual sprouts of <i>C. papaya</i> and over 30 individuals of <i>M. citrifolia</i> . Deer pellets were less productive, but several species did emerge in low numbers including <i>Leucaena leucocephala</i> , <i>Pilea microphylla</i> , and <i>Triphasia trifolia</i> , all invasive species. These results indicate that endozoochory in both species may be playing a role in the species composition and abundance of plants in Guam's forests, habitats that have lost most of their primary seed dispersers (extirpation of forest birds by invasive brown treesnake). However, the abundance of common invasive species in scats indicated endozoochorous dispersal by deer and pigs could be detrimental to Guam's forests."

801	Prolific seed production (>1000/m2)	n
	Source(s)	Notes
	Whistler, A.W. 1995. <i>Wayside Plants of the Islands: A Guide to the Lowland Flora of the Pacific Island</i> . Isle Botanica, Honolulu, HI	"Fruit an ellipsoid achene 0.5-1 mm long, with a single seed that is ejected fro the ripen fruit."
	Williams-Linera, G., Bonilla-Moheno, M., & López-Barrera, F. (2016). Tropical cloud forest recovery: the role of seed banks in pastures dominated by an exotic grass. <i>New Forests</i> , 47(3), 481-496	[No evidence from this study] "Table 3 Species and families identified in the soil seed banks of abandoned pasture (P), young secondary forest (SF) and old secondary forest (F) in the lower montane forest region, Veracruz, Mexico" [ <i>Pilea microphylla</i> - Seeds/m2 = 107]

Qsn #	Question	Answer
802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Cao, M., Tang, Y., Sheng, C., & Zhang, J. (2000). Viable seeds buried in the tropical forest soils of Xishuangbanna, SW China. <i>Seed Science Research</i> , 10(03), 255-264	[Possibly. Present in seed bank. Longevity unknown] "Of the 14 most abundant germinating species, nine were forbs, grasses or sedges (Table 4). Generally speaking, <i>Ageratum conyzoides</i> and <i>Pilea microphylla</i> dominated the germinated seedlings, particularly in Tof and Mdf. These two species, however, were rarely found in undergrowth of the forests."

803	Well controlled by herbicides	y
	Source(s)	Notes
	Saha, D., Marble, C., Steed, S. & Boyd, N. (2016). <i>Biology and Management of Pilea microphylla (Artillery weed) in Ornamental Crop Production</i> . ENH1272. University of Florida IFAS Extension, Gainesville, FL. <a href="http://edis.ifas.ufl.edu">http://edis.ifas.ufl.edu</a> . [Accessed 22 Mar 2017]	"Herbicides, including oxadiazon (Ronstar® FLO) (Conover and Stamps 1994), flumioxazin (SureGuard®), and glufosinate (Finale®), have provided excellent postemergence control in research trials. Oxadiazon and flumioxazin are both primarily used as preemergence herbicides but do provide some early postemergence control. In greenhouse trials, these two herbicides have provided greater than 95% control of mature artillery weed. Contact herbicides, including pelargonic acid (Scythe®) and diquat (Reward®), can provide temporary control but re-treatment is typically needed. Glyphosate (RoundUp® and many others), sulfosulfuron (Certainty®), and sulfentrazone (Dismiss®) typically only provide suppression or poor control. If artillery weed is growing in containers, directed applications can be made using a contact action herbicide such as pelargonic acid or diquat but care must be taken to ensure ornamental foliage is not contacted. If the ornamental growth habit does not allow for directed applications to be made, granular formulations of oxadiazon (Ronstar® G) and liquid formulations of dimethenamid-p (Tower®) can provide some suppression and are labeled for over-the-top use in many crops."

Qsn #	Question	Answer
	<p>Conover, C.A. &amp; Stamps, R.H. 1994. Controlling Artillery Plant (<i>Pilea microphylla</i>) with Herbicides. CFREC-Apopka Research Report RH-94-7. University of Florida/IFAS, Gainesville, FL.  <a href="http://mrec.ifas.ufl.edu/foilage/resrpts/rh_94_7.htm">http://mrec.ifas.ufl.edu/foilage/resrpts/rh_94_7.htm</a>. [Accessed 22 Mar 2017]</p>	<p>"Results In both experiments, best results were obtained from Ronstar® 50 WP (Tables 2 through 5). Artillery plants growing in full sun or 60% shade were almost dead two weeks after Ronstar was applied and no new growth had appeared eight weeks after plants were sprayed. Two weeks after spraying, artillery plant treated with Roundup exhibited significant phytotoxic symptoms. However, eight weeks after treatments were made, seed germination and plant regrowth had occurred in Roundup® sprayed containers and artillery plant was covering nearly 50% of the growing medium surface in containers under full sun or 60% shade. Other treatments tested, including the control, were not very phytotoxic and artillery plant covered over 60% of the growing medium surface in containers eight weeks after herbicides were applied. In experiment 1 (September 29 - November 24), four weeks after treatment there was a slight tendency for phytotoxicity and growth inhibition to be greater under 60% shade than full sun for some of the herbicides (data not shown). At eight weeks, however, even for Roundup® the effects were not great enough to benefit commercial growers. In experiment 2 (March 22 May 17), the tendency was reversed but again phytotoxic effects were not great enough to be of value commercially." ... "Of the six herbicides tested in the two experiments described above, Ronstar® WP 50 was by far the most effective in controlling artillery plant for up to eight weeks. For maximum benefit and safety when using agricultural chemicals, please follow label directions regarding use and disposal. "</p>

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	<p>Saha, D., Marble, C., Steed, S. &amp; Boyd, N. (2016). Biology and Management of <i>Pilea microphylla</i> (Artillery weed) in Ornamental Crop Production. ENH1272. University of Florida IFAS Extension, Gainesville, FL.  <a href="http://edis.ifas.ufl.edu">http://edis.ifas.ufl.edu</a>. [Accessed 22 Mar 2017]</p>	<p>[Able to regrow from stem or root fragments] "Hand weeding effectively controls artillery weed in small areas. Because small seedlings are not easily removed by hand and artillery weed can regrow from roots or stem fragments, hand weeding must be thorough. Large and densely infested areas may be too labor intensive for such thorough hand weeding. Applying organic mulch (pinestraw, pinebark, etc.) at a depth of at least 2 inches has been shown to provide control in research trials."</p>

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	<p>Wagner, W.L., Herbst, D.R.&amp; Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.</p>	<p>[Unknown, but apparently not limited in distribution] "in Hawai'i cultivated and naturalized in low elevation, mesic, disturbed sites at least on Kaua'i, O'ahu, Maui, and Hawai'i, but probably on all of the main islands."</p>

**Summary of Risk Traits:**

## High Risk / Undesirable Traits

- Adapted to tropical climates
- Widely naturalized, including main Hawaiian Islands
- Garden and disturbance weed
- Nursery & horticultural weed
- Other *Pilea* species have become weedy
- Pollen a minor allergen
- Shade tolerant
- Tolerates many soil types
- Reproduces by seeds & vegetatively by stem fragments
- Capable of reaching maturity in one growing season
- Seeds dispersed intentionally by people, externally on birds & other animals, as a soil contaminant, and internally by deer (& possibly other animals)
- Able to resprout from roots & stems if not entirely removed

## Low Risk Traits

- Generally reported as a nuisance weed of yards and nurseries. Does not appear to be a problem in natural areas
- Unarmed (no spines, thorns, or burrs)
- Ornamental
- Herbicides provide effective control