Taxon: Kalanchoe daigremontiana Raym.-Hamet & H. Perrier

Family: Crassulaceae

Common Name(s): alligator plant
devil's backbone
mother of millions
mother of thousands

Synonym(s): Bryophyllum daigremontianum

Assessor: Chuck Chimera

Status: Assessor Approved

End Date: 13 Jul 2017

WRA Score: 24.0

Designation: H(HPWRA)

Rating: High Risk

Keywords: Succulent, Allelopathic, Toxic, Vegetative Spread, Wind-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		
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
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	y=1, n=0	y
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	y
405	Toxic to animals	y=1, n=0	y
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	y

Qsn #	Question	Answer Option	Answer
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)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	y
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	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		
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)	y=1, n=-1	y
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)	y=-1, n=1	n

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Eggli, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York	[No evidence of domestication] "D: SW Madagascar; open woods, on sandstone or limestone; naturalized in some tropical countries (e.g. India)."

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]. http://www.ars-grin.gov/npgs/index.html. [Accessed 12 Jul 2017]	"Native: Africa Western Indian Ocean: Madagascar"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 12 Jul 2017]	

203	**Broad climate suitability (environmental versatility)**	**n**
	Source(s)	**Notes**
	Dave's Garden. 2017. Mother of Thousands, Mexican Hat Plant. Kalanchoe daigremontiana. http://davesgarden.com/guides/pf/go/594/. [Accessed 13 Jul 2017]	"Hardiness: USDA Zone 9b: to -3.8 °C (25 °F) 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)"

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Eggli, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York	"Madagascar; open woods, on sandstone or limestone; naturalized in some tropical countries (e.g. India)."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	Eggli, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York	"It is frequently cultivated in tropical gardens."
	Dave's Garden. 2017. Mother of Thousands, Mexican Hat Plant. Kalanchoe daigremontiana. http://davesgarden.com/guides/pf/go/594/. [Accessed 13 Jul 2017]	Cultivated in a number of states

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Staples,G.W., Imada, C.T., & Herbst, D.R. 2002. New Hawaiian plant records for 2000. Bishop Museum Occasional Papers 68: 3-18	"First reported as naturalized on Kauaʻi (Lorence et al., 1995), the following specimen represents the first documentation for B. daigremontianum as a naturalized species on Oʻahu. The species has been abundant at the locality for years, a popular walking trail used by hundreds of city residents on weekends; it is surprising that no one has collected it before. Material examined: Oʻ AHU: Koʻolau Poko Distr., Makapuʻu Point state wayside, 21° 18' N, 157° 39' W, naturalized in disturbed coastal dry mixed community, 7 Nov 1996, C. Annable & D. Atha 3119."
	Starr, F., Starr, K. & Loope, L.L. 2006. New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 87: 31-43	"Kalanchoe daigremontiana (mother of millions, devil's backbone) was previously reported as a new naturalized record from Kauaʻi (Lorence et al., 1995) where it was locally naturalized on cliffs in dry Leucaena secondary vegetation. This large succulent with showy flowers is now also known from Maui, where it is common in pastures around Puʻu Pimoe. Material examined. MAUI: East Maui, Kanaio, Puʻu Pimoe, growing in dry scrub and pastures in association with Prosopis pallida and Amaranthus spinosus, 1500 ft [457 m], 31 Mar 2004, Starr, Starr, & Wysong 040331-3."
	Eggli, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York	"Madagascar; open woods, on sandstone or limestone; naturalized in some tropical countries (e.g. India)."

Qsn #	Question	Answer
	Parker, J. L. & Parsons, B. 2010. New plant records from the Big Island for 2008. Bishop Museum Occasional Papers 107: 41–43	"Native to Madagascar and introduced to horticulture in the early twentieth century, this species has distinctive channeled, rather trowel-shaped leaf blades that are yellow-green with purple-brown markings and produce plantlets in between the marginal teeth (Staples & Herbst 2005). Previously recorded as naturalized on Kaua'i, Lāna'i, and Maui (Lorence et al. 1995; oppenheimer & Bartlett 2002; Staples et al. 2002; Starr et al. 2006), this voucher specimen was collected from a large, non-flowering population on a roadside in Hawaiian ocean View Estates. This species propagates vigorously from plantlets; in fact, a dried specimen's plantlets are still producing roots in our filing cabinet, over four months after collection. Material examined. HAWAI'I: Ka'ū Distr, Hawaiian ocean View Estates, Lehua Ln (2113302N, 208139E), significant population growing in disturbed, dry roadside, distinct markings on underside of leaf, plantlets budding from leaf margins, 7 Jul 2008, J. Parker & R. McGuire BIED2."
	Lorence, D.H., Flynn, T.W. & Wagner, W.L. 1995. Contributions to the flora of Hawai'i. III. New additions, range extensions, and rediscoveries of flowering plants. Bishop Museum Occasional Papers 41: 19-58	"This species is locally naturalized on Kauai where it occurs on cliffs in dry Leucaena secondary vegetation with other naturalized succulents. This native of Madagascar is cultivated in gardens, but this collection is a new naturalized record of this species in the archipelago. Kalanchoë daigremontiana is distinguished from other members of the genus naturalized in the Hawaiian Islands (K. fedtschenkoi, K. pinnata (Lam.) Pers., and K. tubiflora) by the following characters: herb with stem unbranched, erect, 25–40 cm tall; leaves opposite, petiole 3–4.5 cm long, lamina narrowly triangular-hastate, 15–20 x 3.5–6 cm, dark green above and with purple markings beneath, the base subcordate or auriculate, margin coarsely serrate with teeth 5–10 mm apart, serrations producing plantlets; flowers said to be rose-colored (Neal 1965: 377). A hybrid between K. daigregmontaniana [as Bryophyllum daigremontiana (Raymond-Hamet & H. Perrier) Berger] and K. tubiflora (Harv.) Raymond-Hamet, characterized by intermediate leaf morphology, is also cultivated in the archipelago (D. Lorence, pers. comm., 1994). Material examined. KAUAI: Waimea District, Hanapepe, along Awawa Road along Hanapepe River, below Hanapepe Heights, 20–30 m, 10 Dec 1993, D. Lorence & T. Flynn 7431 (PTBG)."
	Oppenheimer, H. L. & Bartlett, R. T. 2002. New plant records from the main Hawaiian Islands. Bishop Museum Occasional Papers. 69: 1-14	"This succulent species was first documented from Kaua'i by Lorence et al. (1995: 33) as Kalanchoë daigremontiana Raym.-Hamet & H. Perrier. On Läna'i, it has apparently escaped from a nearby residence, and grows on dry cliffs and roadcuts in the Kaumalapau Harbor area. Elsewhere in this year's Records (Staples et al., 2002: 9) the change in name is reported, as well as a new record for the island of O'ahu. Material examined. LÄNA'I: Kaumalapau, 24 m, on roadcut and cliffs, 24 Oct 1999, Oppenheimer H109919."

302	Garden/amenity/disturbance weed	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Dave's Garden. 2017. Mother of Thousands, Mexican Hat Plant. Kalanchoe daigremontiana. http://davesgarden.com/guides/pf/go/594/. [Accessed 13 Jul 2017]	[A number of growers refer to this plant's invasiveness in yards, gardens & landscapes] "On Apr 30, 2012, Mydnight from Bradenton, FL wrote: This is an awful little plant!! I just moved into a home where this ugly thing has been the resident plant in the yard and garden and it has not been a pleasant experience. I immediately ripped up every single one I could see in the garden, but every time I turn my head I spot more and more. Some of the new ones are so tiny they are hard to see (except for the fact that they are clustered together). It's been a bit over a week and I'm still seeing them and still ripping them up. The first day weeding, I filled an entire trash bin in about 5 minutes! And I just filled up another bin to the top when clearing out another area in the yard - this plant is truly an invasive nightmare! I thought it was two different types of weeds that I've been pulling up this whole time, but I found out that the same thing that produces the long scraggly stick with flowers is the same toothy-leaved menace in my yard! The small ones even grow in the cracks of my pavers. BEWARE! If you want this thing, keep it potted indoors unless you want your entire yard completely taken over."

303	Agricultural/forestry/horticultural weed	
	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	"This plant contains a cardiac glycoside that has caused experimental toxicity and death in chicks and mice. It has caused illness in pets, such as rabbits and mice." [Toxicity could possibly impact agricultural operations]

Qsn #	Question	Answer
304	**Environmental weed**	**y**
	Source(s)	**Notes**
	Herrera, I., Hernandez, M. J., Lampo, M., & Nassar, J. M. 2012. Plantlet recruitment is the key demographic transition in invasion by Kalanchoe daigremontiana. Population Ecology, 54(1): 225-237	"Biological invasions have a great impact on biodiversity and ecosystem functioning worldwide. Kalanchoe daigremontiana is a noxious invasive plant in arid zones. Besides being toxic for domestic animals and wildlife, this species inhibits the growth of native plants. Its rapid proliferation in Cerro Saroche National Park (Venezuela) is of great concern because this area hosts several species endemic to the scarce arid zones in the Caribbean."
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"K. daigremontiana is an aggressive invasive plant. Studies have demonstrated that K. daigremontiana produces root exudates that can inhibit the germination of seeds and the development of seedlings of nearby plants. These effects have been observed in areas where K. daigremontiana plants either had grown or are still growing. In addition, extracts from K. daigremontiana shoots are also effective in inducing allelopathic responses (Groner, 1975; McKenzie et al., 1987). This species also produces large numbers of seeds and plantlets which can grow forming dense monospecific thickets. K. daigremontiana can be toxic to domestic animals and wildlife (Mckenzie et al., 1987). It also has the potential to alter soil properties (Chacón et al., 2009), and inhibit the recruitment of native vegetation (Groner 1975; Herrera et al., 2011). In Australia, K. daigremontiana has hybridized with the species Kalanchoe delagoensis and the resulting hybrid is widespread in Queensland where it is consider a pest (Queensland Government, 2011)."

305	Congeneric weed	y
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"In Queensland, Australia, K. pinnata was ranked 47 of 200 invasive naturalized plants (Batianoff and Butler, 2002). In New South Wales, Australia, it is a declared noxious weed under that state's Noxious Weed Act (1993) in the shire of Maclean. The species is listed as W2 requiring that the weed must be fully and continuously suppressed and destroyed by land managers. K. pinnata is described as a moderate invader of the Pacific islands of Hawaii, French Polynesia and Palau (Meyer, 2000). In the Galapagos Islands, K. pinnata invades disturbed sites and native vegetation (Soria et al., 2002). K. pinnata is recognized as a threat to island ecosystems by the Pacific Island Ecosystems at Risk project (PIER, 2004). It continues to be made available as a garden ornamental in many countries and is therefore likely to spread further."

Qsn #	Question	Answer
401	**Produces spines, thorns or burrs**	**n**
	Source(s)	**Notes**
	Eggli, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York	[No evidence] "Biennials, entirely glabrous, 40 - 80 cm tall; stems simple, erect or decumbent, brownish; L dark green, pink-green to purplish-green with brown-red spots, petiolate, sometimes peltate, petiole amplexicaul, 1 - 5 cm, lamina ovate, oblong-ovate to longtriangular, often ± folded, 2 - 20 x 1 - 3.5 cm, tip acute, base ± rounded, margins regularly dentate, with numerous bulbils on the teeth;"

402	**Allelopathic**	**y**
	Source(s)	**Notes**
	Herrera, I., Hernandez, M. J., Lampo, M., & Nassar, J. M. 2012. Plantlet recruitment is the key demographic transition in invasion by Kalanchoe daigremontiana. Population Ecology, 54(1): 225-237	"Besides being toxic for domestic animals and wildlife, this species inhibits the growth of native plants."
	Groner, M. G. (1974). Intraspecific allelopathy in Kalanchoe daigremontiana. Botanical Gazette, 135(1), 73-79	"Established plants of Kalanchoe daigremontiana inhibit the growth rate of daughter plantlets that fall within the radius of their root systems. Plantlets which were detached from their parent leaves and planted in fresh substrate increased in stem length at about twice the rate of sister plantlets grown in substrate that had been used previously to grow K. daigremontiana Addition of water extracts of finely cut stems and leaves from older plants caused a retardation of growth similar to that observed in substrate containing Kalanchoe roots Nutrient levels were adequate in all of the above cases. Inhibition is apparently caused by one or more water-soluble, allelopathic substances which are secreted into the substrate through the roots of established plants, and which are present in extracts from stems and leaves of older plants."
	Groner, M. G. (1975). Allelopathic influence of Kalanchoe daigremontiana on other species of plants. Botanical Gazette, 136(2), 207-211	"Inhibition of seed germination and seedling development was observed in root media in which Kalanchoe daigremontiana either had grown or were still growing. Extracts from Kalanchoe shoots were also effective in inducing allelopathic responses. Examples of plants which were affected include Digitaria sanguinales, Panicum miliaceum, Setaria italica, Trifolium incarnatum, Lactuca sativa, Allium cepa, and Chrysanthemum hortum. Those unaffected included Zea mays, Triticum aestivum, and Avena sativa. Clones of Zygocactus truncatus and Nephrolepis exaltata elegantissima showed a reduced rate of growth when grown in the same pot with Kalanchoe."

403	**Parasitic**	**n**
	Source(s)	**Notes**
	Eggli, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York	"Biennials, entirely glabrous, 40 - 80 cm tall; stems simple, erect or decumbent, brownish" [Crassulaceae. No evidence]

404	**Unpalatable to grazing animals**	**y**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Herrera, I., Ferrer-Paris, J. R., Hernández-Rosas, J. I., & Nassar, J. M. (2016). Impact of two invasive succulents on native-seedling recruitment in Neotropical arid environments. Journal of Arid Environments, 132, 15-25	"The impact caused by K. daigremontiana and S. gigantea could be overestimated if herbivory pressure is high, because neither of them is consumed by local herbivores, which frequently feed on native species (Herrera, 2008). Thus, native plants damaged by herbivores could be at competitive disadvantage against invasive species. On the other hand, these unpalatable invasive species could facilitate indirectly the establishment of native species, acting as camouflage against herbivores."

405	Toxic to animals	y
	Source(s)	**Notes**
	Dave's Garden. 2017. Mother of Thousands, Mexican Hat Plant. Kalanchoe daigremontiana. http://davesgarden.com/guides/pf/go/594/. [Accessed 13 Jul 2017]	"Danger: All parts of plant are poisonous if ingested" ... "On Jan 11, 2005, Herbynoel from Brisbane, Australia wrote: ... It is also highly toxic to grazing animals, and is virtualy impossible to remove once found in a paddock (or meadow)."
	Fuller, T.C. & McClintock, E.M. 1986. Poisonous plants of California: Issue 53 of California natural history guides. University of California Press, Berkeley and Los Angeles, CA	"Entire plant contains an unknown toxin. Household pets have been poisoned by eating small amounts. Signs include convulsions, labored breathing, and paralysis; shown experimentally to be highly toxic to chicks. Plants should be kept away from small children."
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"This plant contains a cardiac glycoside that has caused experimental toxicity and death in chicks and mice. It has caused illness in pets, such as rabbits and mice."

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	Unknown

407	Causes allergies or is otherwise toxic to humans	y
	Source(s)	**Notes**
	Dave's Garden. 2017. Mother of Thousands, Mexican Hat Plant. Kalanchoe daigremontiana. http://davesgarden.com/guides/pf/go/594/. [Accessed 13 Jul 2017]	"Danger: All parts of plant are poisonous if ingested"
	Fuller, T.C. & McClintock, E.M. 1986. Poisonous plants of California: Issue 53 of California natural history guides. University of California Press, Berkeley and Los Angeles, CA	"Entire plant contains an unknown toxin. Household pets have been poisoned by eating small amounts. Signs include convulsions, labored breathing, and paralysis; shown experimentally to be highly toxic to chicks. Plants should be kept away from small children."

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

Qsn #	Question	Answer
	Herrera, I., & Nassar, J. M. (2009). Reproductive and recruitment traits as indicators of the invasive potential of Kalanchoe daigremontiana (Crassulaceae) and Stapelia gigantea (Apocynaceae) in a Neotropical arid zone. Journal of Arid Environments, 73(11), 978-986	[No evidence. Succulent] "Kalanchoe daigremontiana is an annual or biennial succulent herb, native to dry zones in Madagascar."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	The Royal Horticultural Society. 2017. Kalanchoe daigremontiana. Mexican hat plant. https://www.rhs.org.uk/plants/details?plantid=6236. [Accessed 13 Jul 2017]	"Full Sun"
	Learn 2 Grow. 2017. Kalanchoe daigremontiana. http://www.learn2grow.com/plants/kalanchoe-daigremontiana/. [Accessed 13 Jul 2017]	"Sun Exposure - Full Sun, Partial Sun"
	Dave's Garden. 2017. Mother of Thousands, Mexican Hat Plant. Kalanchoe daigremontiana. http://davesgarden.com/guides/pf/go/594/. [Accessed 13 Jul 2017]	"Sun Exposure: Sun to Partial Shade"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Royal Botanic Gardens Kew. (2017) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/. [Accessed 13 Jul 2017]	"Moisture Well-drained Soil Sand, Loam pH Acid, Alkaline, Neutral"
	Dave's Garden. 2017. Mother of Thousands, Mexican Hat Plant. Kalanchoe daigremontiana. http://davesgarden.com/guides/pf/go/594/. [Accessed 13 Jul 2017]	"Soil pH requirements: 6.1 to 6.5 (mildly acidic) 6.6 to 7.5 (neutral) 7.6 to 7.8 (mildly alkaline)"

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Eggli, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York	"Biennials, entirely glabrous, 40 - 80 cm tall; stems simple, erect or decumbent, brownish"

412	Forms dense thickets	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Herrera, I., Ferrer-Paris, J. R., Hernández-Rosas, J. I., & Nassar, J. M. (2016). Impact of two invasive succulents on native-seedling recruitment in Neotropical arid environments. Journal of Arid Environments, 132, 15-25	"While the formation of plantlet banks as a result of high recruitment of asexual plantlets do not contribute to the establishment success during the early phases of the invasion process of K. daigremontiana, these banks appear to drive the formation of dense monospecific patches once the species is established. This is an effective strategy for the exclusion of interspecific competitors through site occupancy, which has been previously described in long-lived woody invasive plants species (i.e., Knapp and Canham 2000; Marco and Pa´ez 2000; Greenberg et al. 2001; Marco et al. 2002; Lee et al. 2004; Webster et al. 2005; Sebert-Cuvillier et al. 2007; Vanhellemont et al. 2009) These dense monospecific patches have an important impact on the receptor ecosystems, as other species are completely excluded from large areas."

501	Aquatic	n
	Source(s)	**Notes**
	Eggli, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York	[Terrestrial succulent] "open woods, on sandstone or limestone" ... "Biennials, entirely glabrous, 40 - 80 cm tall; stems simple, erect or decumbent, brownish"

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 12 Jul 2017]	Family: Crassulaceae Subfamily: Sedoideae Tribe: Kalanchoeae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 12 Jul 2017]	Family: Crassulaceae Subfamily: Sedoideae Tribe: Kalanchoeae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	Eggli, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York	"Biennials, entirely glabrous, 40 - 80 cm tall; stems simple, erect or decumbent, brownish"

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

Qsn #	Question	Answer
	Eggli, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York	[No evidence] "D: SW Madagascar; open woods, on sandstone or limestone; naturalized in some tropical countries (e.g. India)."

602	Produces viable seed	y
	Source(s)	**Notes**
	Herrera, I., & Nassar, J. M. (2009). Reproductive and recruitment traits as indicators of the invasive potential of Kalanchoe daigremontiana (Crassulaceae) and Stapelia gigantea (Apocynaceae) in a Neotropical arid zone. Journal of Arid Environments, 73(11), 978-986	"K. daigremontiana is autogamous, produces >16,000 seeds per plant and also reproduces clonally. Despite low seed viability (17.9%) and germination rates (11.9%), seeds were present in the seed bank. Plantlets of asexual origin showed high survival (75–100%) compared to seedlings of sexual origin (10%)."

603	Hybridizes naturally	y
	Source(s)	**Notes**
	Lorence, D.H., Flynn, T.W. & Wagner, W.L. 1995. Contributions to the flora of Hawai'i. III. New additions, range extensions, and rediscoveries of flowering plants. Bishop Museum Occasional Papers 41: 19-58	"A hybrid between K. daigregmontaniana [as Bryophyllum daigremontiana (Raymond-Hamet & H. Perrier) Berger] and K. tubiflora (Harv.) Raymond-Hamet, characterized by intermediate leaf morphology, is also cultivated in the archipelago (D. Lorence, pers. comm., 1994)."
	Eggli, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York	"This species hybridizes easily with several others (K. rosei, K. delagoensis).'

604	Self-compatible or apomictic	y
	Source(s)	**Notes**
	Herrera, I., & Nassar, J. M. (2009). Reproductive and recruitment traits as indicators of the invasive potential of Kalanchoe daigremontiana (Crassulaceae) and Stapelia gigantea (Apocynaceae) in a Neotropical arid zone. Journal of Arid Environments, 73(11), 978-986	"K. daigremontiana is autogamous and does not require flower visitation to produce seeds." ... "K. daigremontiana is self-compatible and capable of autonomous self-pollination"

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Herrera, I., & Nassar, J. M. (2009). Reproductive and recruitment traits as indicators of the invasive potential of Kalanchoe daigremontiana (Crassulaceae) and Stapelia gigantea (Apocynaceae) in a Neotropical arid zone. Journal of Arid Environments, 73(11), 978-986	"Percentage of visits per inflorescence of K. daigremontiana was comparatively lower than values found for native species simultaneously in bloom (Fig. 3). Visits occurred between 1000 and 1100 h and were rare (0.3 ± 0.14 s.e. visits per day). Floral visitors included two wasps (Brachygastra lecheguama and Parachartegus colaboterus) and honeybees (Apis mellifera), and all contacted the reproductive parts of the flowers." ... "K. daigremontiana is autogamous and does not require flower visitation to produce seeds."

606	Reproduction by vegetative fragmentation	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Parker, J. L. & Parsons, B. 2010. New plant records from the Big Island for 2008. Bishop Museum Occasional Papers 107: 41–43	"This species propagates vigorously from plantlets; in fact, a dried specimen's plantlets are still producing roots in our filing cabinet, over four months after collection."
	Herrera, I., & Nassar, J. M. (2009). Reproductive and recruitment traits as indicators of the invasive potential of Kalanchoe daigremontiana (Crassulaceae) and Stapelia gigantea (Apocynaceae) in a Neotropical arid zone. Journal of Arid Environments, 73(11), 978-986	"This species reproduces both sexually and clonally. Asexually produced plantlets grow in the margins of leaves. Fruits are dry capsules with numerous minute seeds easily transported by wind."

607	Minimum generative time (years)	1
	Source(s)	**Notes**
	Herrera, I., & Nassar, J. M. (2009). Reproductive and recruitment traits as indicators of the invasive potential of Kalanchoe daigremontiana (Crassulaceae) and Stapelia gigantea (Apocynaceae) in a Neotropical arid zone. Journal of Arid Environments, 73(11), 978-986	[Annual] "Kalanchoe daigremontiana is an annual or biennial succulent herb, native to dry zones in Madagascar."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"K. daigremontiana spreads by seeds and vegetatively. Each plant is able to produce thousands of minute seeds (more than 1000 seeds per fruit) which are dispersed by wind. The species also reproduce asexually by plantlets produced in the margin of the leaves (Herrera and Nassar, 2009; Herrera et al., 2011)." [Possibly yes. Seeds lack means of attachment, but may be able to adhere to footwear & vehicles via soil]

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Eggli, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York	"It is frequently cultivated in tropical gardens."

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	[Possibly, if grown with other plants] "K. daigremontiana spreads by seeds and vegetatively. Each plant is able to produce thousands of minute seeds (more than 1000 seeds per fruit) which are dispersed by wind. The species also reproduce asexually by plantlets produced in the margin of the leaves (Herrera and Nassar, 2009; Herrera et al., 2011)."

704	Propagules adapted to wind dispersal	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"K. daigremontiana spreads by seeds and vegetatively. Each plant is able to produce thousands of minute seeds (more than 1000 seeds per fruit) which are dispersed by wind. The species also reproduce asexually by plantlets produced in the margin of the leaves (Herrera and Nassar, 2009; Herrera et al., 2011)."

705	Propagules water dispersed	
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	[Grows in arid areas, but rainfall may possibly disperse seeds and bulbils] "K. daigremontiana has been introduced as an ornamental mostly in dry and arid environments in tropical and subtropical regions. It produces large numbers of minute seeds which can be easily dispersed by wind. It has a high invasive potential and its likelihood of invading new habitats remains high, mainly in water-stressed environments."

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	[No evidence] "K. daigremontiana spreads by seeds and vegetatively. Each plant is able to produce thousands of minute seeds (more than 1000 seeds per fruit) which are dispersed by wind. The species also reproduce asexually by plantlets produced in the margin of the leaves (Herrera and Nassar, 2009; Herrera et al., 2011)."

707	Propagules dispersed by other animals (externally)	
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"K. daigremontiana spreads by seeds and vegetatively. Each plant is able to produce thousands of minute seeds (more than 1000 seeds per fruit) which are dispersed by wind. The species also reproduce asexually by plantlets produced in the margin of the leaves (Herrera and Nassar, 2009; Herrera et al., 2011)." [Possibly yes. Seeds lack means of attachment, but may be able to adhere to fur, hooves, etc. in mud or soil]

708	Propagules survive passage through the gut	n
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	[No evidence. Unlikely given toxicity] "K. daigremontiana spreads by seeds and vegetatively. Each plant is able to produce thousands of minute seeds (more than 1000 seeds per fruit) which are dispersed by wind. The species also reproduce asexually by plantlets produced in the margin of the leaves (Herrera and Nassar, 2009; Herrera et al., 2011)."

801	Prolific seed production (>1000/m2)	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Herrera, I., & Nassar, J. M. (2009). Reproductive and recruitment traits as indicators of the invasive potential of Kalanchoe daigremontiana (Crassulaceae) and Stapelia gigantea (Apocynaceae) in a Neotropical arid zone. Journal of Arid Environments, 73(11), 978-986	"K. daigremontiana produces on average 16,865 (±1407.96 s.e.) seeds per individual per year, but only 17.8% of 1 month old seeds were viable."

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Herrera, I., & Nassar, J. M. (2009). Reproductive and recruitment traits as indicators of the invasive potential of Kalanchoe daigremontiana (Crassulaceae) and Stapelia gigantea (Apocynaceae) in a Neotropical arid zone. Journal of Arid Environments, 73(11), 978-986	"K. daigremontiana is autogamous, produces >16,000 seeds per plant and also reproduces clonally. Despite low seed viability (17.9%) and germination rates (11.9%), seeds were present in the seed bank." [Longevity unspecified]
	Royal Botanic Gardens Kew. (2017) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/. [Accessed 13 Jul 2017]	"Storage Behaviour: Orthodox"

803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"Herbicides registered in Queensland for control of Kalanchoe spp. include 2,4-D: 70 ml/10 L water or 7L / 1000L per ha; and fluroxypyr: 600 ml /100 L water. Follow-up treatments are recommended until control is completed (Queensland Government, 2011)."
	Dave's Garden. 2017. Mother of Thousands, Mexican Hat Plant. Kalanchoe daigremontiana. http://davesgarden.com/guides/pf/go/594/. [Accessed 13 Jul 2017]	"On Jul 1, 2011, nel5397 from Groveland, FL wrote: this plant is highly invasive. the only thing that gets rid of it is a herbicide that contains 2,4D or a very prolonged freeze."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**
	Dave's Garden. 2017. Mother of Thousands, Mexican Hat Plant. Kalanchoe daigremontiana. http://davesgarden.com/guides/pf/go/594/. [Accessed 13 Jul 2017]	"On Feb 3, 2012, adam1983tt from Eagle Lake, FL wrote: ... Mowing over them only spreads them faster. If you find yourself overwhelmed with them, expect to be on your hands and knees pulling them up!"

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	**n**
	Source(s)	**Notes**
	Parker, J. L. & Parsons, B. 2010. New plant records from the Big Island for 2008. Bishop Museum Occasional Papers 107: 41–43	[No evidence. Naturalized on at least 5 Hawaiian Islands] "Previously recorded as naturalized on Kaua'i, Lāna'i, and Maui (Lorence et al. 1995; oppenheimer & Bartlett 2002; Staples et al. 2002; Starr et al. 2006), this voucher specimen was collected from a large, non-flowering population on a roadside in Hawaiian ocean View Estates."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Naturalized and invasive in regions with tropical climates
• Naturalized on Kauai, Oahu, Lanai, Maui, and Hawaii islands and elsewhere throughout the tropics
• Regarded as a garden and landscaping weed (but also valued as an ornamental)
• Environmental weed
• Other Kalanchoe species are invasive
• Allelopathic
• Unpalatable
• Toxic to animals and people
• Tolerates many soil types
• Able to form dense stands that exclude other vegetation
• Reproduces by seeds and vegetatively from plantlets
• Hybridizes with other Kalanchoe species
• Self-compatible
• Capable of reproducing in one year
• Seeds dispersed by wind
• Dispersed intentionally by people
• Prolific seed production
• Seeds may form a persistent seed bank (longevity unknown)
• Able to resprout after damage or mowing

Low Risk Traits
• Unarmed (no spines, thorns, or burrs)
• Ornamental value
• Herbicides may provide effective control