

| | |
|--|---|
| Taxon: <i>Kalanchoe delagoensis</i> | Family: Crassulaceae |
| Common Name(s): chandelier plant | Synonym(s): <i>Bryophyllum delagoense</i> (Eckl. & <i>Bryophyllum tubiflorum</i> Harv. <i>Bryophyllum verticillatum</i> (Scott- <i>Kalanchoe tubiflora</i> (Harv.) Raym.- <i>Kalanchoe verticillata</i> Scott-Elliot |

| | | |
|--------------------------------|----------------------------------|-----------------------------|
| Assessor: Chuck Chimera | Status: Assessor Approved | End Date: 7 Aug 2015 |
| WRA Score: 19.0 | Designation: H(Hawai'i) | Rating: High Risk |

Keywords: Succulent, Agricultural Weed, Environmental Weed, Toxic, Plantlets-forming

| 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) | n |
| 303 | Agricultural/forestry/horticultural weed | n=0, y = 2*multiplier (see Appendix 2) | y |
| 304 | Environmental weed | n=0, y = 2*multiplier (see Appendix 2) | y |
| 305 | Congeneric weed | n=0, y = 1*multiplier (see Appendix 2) | 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 | y=1, n=-1 | n |
| 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 | y=1, n=0 | y |
| 410 | Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island) | | |
| 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 | | |
| 605 | Requires specialist pollinators | y=-1, n=0 | n |
| 606 | Reproduction by vegetative fragmentation | y=1, n=-1 | y |
| 607 | Minimum generative time (years) | | |
| 701 | Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas) | y=1, n=-1 | y |
| 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 | y |
| 705 | Propagules water dispersed | y=1, n=-1 | y |
| 706 | Propagules bird dispersed | y=1, n=-1 | n |
| 707 | Propagules dispersed by other animals (externally) | | |
| 708 | Propagules survive passage through the gut | y=1, n=-1 | n |
| 801 | Prolific seed production (>1000/m ²) | | |
| 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 | n |
| 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 |
| | Eggle, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York | No evidence |

| | | |
|-----|---|-------|
| 102 | Has the species become naturalized where grown? | |
| | Source(s) | Notes |
| | WRA Specialist. 2015. Personal Communication | NA |

| | | |
|-----|--|-------|
| 103 | Does the species have weedy races? | |
| | Source(s) | Notes |
| | WRA Specialist. 2015. 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, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 6 Aug 2015] | "Native: AFRICA Western Indian Ocean: Madagascar" |

| | | |
|-----|--|-------|
| 202 | Quality of climate match data | High |
| | Source(s) | Notes |
| | USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 6 Aug 2015] | |

| | | |
|-----|---|--|
| 203 | Broad climate suitability (environmental versatility) | n |
| | Source(s) | Notes |
| | Dave's Garden. 2015. Chandelier Plant, Mother of Thousands <i>Kalanchoe delagoensis</i> . http://davesgarden.com/guides/pf/go/595/ . [Accessed 6 Aug 2015] | "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)" |
| | 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 naturalized in low elevation, dry, disturbed sites" |

| Qsn # | Question | Answer |
|-------|---|--|
| 204 | Native or naturalized in regions with tropical or subtropical climates | y |
| | Source(s) | Notes |
| | Eggl, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York | "Madagascar; open wooded grasslands, rocky slopes, on sandy or rocky ground; cultivated and naturalized throughout the tropics." |

| | | |
|-----|--|---|
| 205 | Does the species have a history of repeated introductions outside its natural range? | y |
| | Source(s) | Notes |
| | Eggl, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York | "This is an easily growing and, due to the abundantly produced bulbils, rapidly propagated plant. It is frequently encountered naturalized in warm climate. [n most of the literature and almost throughout cultivation, this taxon is still found under the later synonym <i>K. tubiflora</i> ." |
| | Liogier, A.H. & Martorell, L.F. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Second Edition Revised. La Editorial, UPR, San Juan, Puerto Rico | "widely cultivated in the tropics." |

| | | |
|-----|---|--|
| 301 | Naturalized beyond native range | y |
| | Source(s) | Notes |
| | Walters, M., Figueiredo, E., Crouch, N.R., Winter, P.J.D., Smith, G.F., Zimmermann, H.G., & Mashope, B.K. (eds.). 2011. Naturalised and Invasive Succulents of Southern Africa, ABC Taxa Volume 11. BTC, Brussels | " <i>Bryophyllum delagoense</i> (Fig. 270, 271) is endemic to Madagascar, occurring mainly in the central and southern regions, where it is commonly found in open wooded grasslands, rocky slopes, and on sandy or rocky ground (Descoings, 2003). It is naturalised in many countries with warmer climates possibly including every country in southern Africa and also in southern Europe, Africa, Asia, Australia, New Zealand, southern USA and Hawaii, West Indies, northern South America and Macaronesia" ... "In South Africa, where it was introduced as a garden ornamental (Wells 1986) around 1765 (Witt et al., 2004; Witt & Nongogo, 2010), it is naturalised in all 9 provinces (Fig. 272)." |
| | Liogier, A.H. & Martorell, L.F. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Second Edition Revised. La Editorial, UPR, San Juan, Puerto Rico | "Cultivated and escaped, becoming a weed in dry regions, Puerto Rico" |
| | 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 naturalized in low elevation, dry, disturbed sites on Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i, cultivated and perhaps naturalized on some of the other main islands. Naturalized prior to 1930 (St. John, 1973a)." |

| | | |
|-----|--|--------------|
| 302 | Garden/amenity/disturbance weed | n |
| | Source(s) | Notes |

| Qsn # | Question | Answer |
|-------|--|--|
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc | [Environmental and agricultural weed] " <i>K. delagoensis</i> is an aggressive weed with a high invasive potential. It is present in pastures, grasslands, open woodlands and disturbed land in subtropical, tropical and warmer temperate regions. In Australia, it is a serious pest because it is highly poisonous to cattle (Mckenzie et al., 1987; Queensland Government, 2011). Batianoff et al. (2002) ranked it as the third most serious invasive naturalized plant in southeast Queensland." |

| 303 | Agricultural/forestry/horticultural weed | y |
|-----|---|---|
| | Source(s) | Notes |
| | BioNET-EAFRINE. 2011. <i>Bryophyllum delagoense</i> (Mother-of-millions). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Bryophyllum_delagoense_%28Mother-of-millions%29.htm . [Accessed 7 Aug 2015] | " <i>B. delagoense</i> very poisonous to livestock and humans and almost certainly also to wildlife. Cattle deaths resulting from ingestion of this species are quite common in Queensland, Australia. This species commonly invades rangelands and pastures, replacing grasses and legumes, and can significantly reduce the productivity of these areas." |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc | " <i>K. delagoensis</i> is very poisonous to livestock and humans. Cattle deaths from ingestion of this species are quite common in Queensland, Australia (Mckenzie et al., 1987; Queensland Government, 2011). When invading grasslands and rangelands it replaces grasses and legumes, and can significantly reduce productivity of these areas. In Queensland it flowers in the drier months of the year when feed is scarce, and hence can be consumed in lethal amounts by cattle. Poisoned cattle must be treated within 24 hours of consuming the plant. Treatment is expensive as it must be given by a veterinarian, or under their direction, because of the drugs and materials used (Queensland Government, 2011)." |

| Qsn # | Question | Answer |
|-------|--|--|
| 304 | Environmental weed | y |
| | Source(s) | Notes |
| | BioNET-EAFRINE. 2011. Bryophyllum delagoense (Mother-of-millions). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Bryophyllum_delagoense_%28Mother-of-millions%29.htm . [Accessed] | "Bryophyllum delagoense is considered to have a negative effect on biodiversity in Kenya's National Parks and minor environmental weed in private gardens. This species is well adapted to dry environments and able to survive droughts. It forms very expansive populations in grasslands and open woodlands in inland regions and spreads during flood events. ... B. delagoense has been listed a noxious weed in South Africa (prohibited plants that must be controlled. They serve no economic purpose and possess characteristics that are harmful to humans, animals or the environment) and in the Australian states of Queensland and New South Wales." |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc | "K. delagoensis is an aggressive weed in pastures, grasslands, and dry and arid forests. It produces high amounts of seeds and plantlets which can grow forming dense monospecific thickets displacing and inhibiting the recruitment of native vegetation (BioNet-EAFRINET, 2011; Queensland Government, 2011). In Kenya, it grows prolifically in parts of Nairobi National Park, and is considered to have a negative effect on biodiversity (BioNet-EAFRINET, 2011). It is poisonous to livestock and so almost certainly also poisonous to wildlife.:" |

| 305 | Congeneric weed | y |
|-----|---|---|
| | Source(s) | Notes |
| | Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK | [<i>Bryophyllum pinnatum</i> = <i>Kalanchoe pinnata</i>] "The plant is suckering from the base and spreads vegetatively by forming young plantlets on the leaf margins. It is a drought tolerant species that often forms dense stands and displaces native species. The plant spreads rapidly due to vegetative growth." |

| 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. | "Glabrous and glaucous perennial herbs; stems 5-10 dm long, unbranched, reproducing vegetatively by adventitious shoots from the base. Leaves simple, usually ternate, subcylindrical, 3-15 cm long, 0.3-0.6 cm wide, lower surface sulcate, often spotted with reddish brown, margins near apex with 3-9 conical teeth between which spoon-shaped bulbils are produced." |

| 402 | Allelopathic | |
|-----|--------------|-------|
| | Source(s) | Notes |
| | | |

| Qsn # | Question | Answer |
|-------|---|--|
| | Bär, W., Pfeifer, P., & Dettner, K. (1997). Intra- and interspecific allelochemical effects in three <i>Kalanchoe</i> -species (Crassulaceae). <i>Zeitschrift für Naturforschung C- Journal of Biosciences</i> , 52(7), 441-449 | "The intra- and interspecific acting allelochemicals of <i>Kalanchoe daigremontiana</i> , <i>K. tubiflora</i> and <i>K. pinnata</i> (Crassulaceae) were isolated and could be identified as p-hydroxybenzoic-, protocatechuic-, gallic-, p-coumaric- and caffeic acid. By measuring length of stems and primary roots of <i>Kalanchoe</i> -daughter plants the intra- and interspecific inhibitory activities of authentic compounds could be demonstrated." |
| | 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 | [May be allelopathic against itself] "Curiously, some <i>Bryophyllum</i> species (at least <i>B. daigremontianum</i> and <i>B. tubiflorum</i>) also release a toxic substance in the soil via their roots, preventing these plantlets from establishing themselves too close to the parent plant. This combination of viviparous plantlet production and allelopathy seems to be an effective means of dispersal." |

| 403 | Parasitic | n |
|-----|---|---|
| | Source(s) | Notes |
| | 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. | "Glabrous and glaucous perennial herbs" [Crassulaceae. No evidence] |

| 404 | Unpalatable to grazing animals | n |
|-----|--|---|
| | Source(s) | Notes |
| | Simmonds, H., Holst, P. & Bourke, C. 2000. The palatability, and potential toxicity of Australian weeds to goats. Rural Industries Research and Development Corporation, Barton, Australia | "Palatability: Seldom eaten" |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc | [Palatable, but toxic] "In Queensland it flowers in the drier months of the year when feed is scarce, and hence can be consumed in lethal amounts by cattle." |

| 405 | Toxic to animals | y |
|-----|--|---|
| | Source(s) | Notes |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc | "In Queensland it flowers in the drier months of the year when feed is scarce, and hence can be consumed in lethal amounts by cattle. Poisoned cattle must be treated within 24 hours of consuming the plant. Treatment is expensive as it must be given by a veterinarian, or under their direction, because of the drugs and materials used (Queensland Government, 2011)." |
| | Simmonds, H., Holst, P. & Bourke, C. 2000. The palatability, and potential toxicity of Australian weeds to goats. Rural Industries Research and Development Corporation, Barton, Australia | "Signs and symptoms; Depression, diarrhoea, slow irregular heart beat and eventually heart block. Health and production problems; Rapid death in many cases." ... "It is generally only a problem between late autumn and early spring when the plant is flowering. Ruminants, such as the goat, display more tolerance for this type of poisonous plant than do horses and donkeys." |

| Qsn # | Question | Answer |
|-------|--|---|
| | Walters, M., Figueiredo, E., Crouch, N.R., Winter, P.J.D., Smith, G.F., Zimmermann, H.G., & Mashope, B.K. (eds.). 2011. Naturalised and Invasive Succulents of Southern Africa, ABC Taxa Volume 11. BTC, Brussels | "The plant is poisonous to both humans and livestock (Henderson, 2001; Kellerman et al., 2005). In Australia Bryophyllum delagoense has been reported to cause stock losses and was found to effect myocardial degeneration (McKenzie & Dunster, 1986). Further investigation showed the cardiac glycosides (bufadienolides) responsible to be bryotoxins, also present in four other naturalised Bryophyllum species (McKenzie et al., 1987; Steyn & Van Heerden, 1998). Despite its reported toxicity to livestock, no stock losses by B. delagoense have been reported in South Africa." |
| | ASPCA. 2015. Chandelier Plant. https://www.aspc.org/pet-care/animal-poison-control/toxic-and-non-toxic-plants/chandelier-plant . [Accessed 7 Aug 2015] | "Toxicity: Toxic to Dogs, Toxic to Cats Toxic Principles: Bufodienolides Clinical Signs: Vomiting, diarrhea, abnormal heart rhythm (rare)." |

| 406 | Host for recognized pests and pathogens | |
|-----|--|--|
| | Source(s) | Notes |
| | Yamaoka, Y., Fujii, R., Iida, H., Kakishima, M., & Onda, T. (1997). Pathogenicity of Puccinia benkei causing rust of Kalanchoë against plants belonging to Kalanchoideae and Sedoideae, Crassulaceae. Annals of the Phytopathological Society of Japan, 63(1): 51-56 | "A total of 41 species of plants belonging to 3 genera of the family Crassulaceae, i.e. 21 species of Kalanchoë including 3 hybrids, 2 species of Orostachys and 18 species of Sedum, was inoculated with basidiospores of P. benkei to clarify the host range of the rust fungus. Telia were produced on leaves of 9 species of Kalanchoë, 4 species of Sedum and 1 species of Orostachys. Among them, K. daigremontiana, K. laxiflora, Kalanchoë sp., K. tubiflora, K. × hybrida, K. beauverdii, K. thyrsoiflora, K. longiflora, S. makinoi, S. cauciculum and O. japonicas [O. erubescens] were recognized as new host plants. Kalanchoë spp. recognized as host plants belonged to sections Laxiflora and Beauverdii in the subgenus Bryophyllum and sections Thyrsoiflora and Eukalanchoe in the subgenus Kalanchoë." |
| | Burr, T. J., & Otten, L. (1999). Crown gall of grape: biology and disease management. Annual Review of Phytopathology, 37(1): 53-80 | "Not until 1973 was it reported that strains of Agrobacterium that cause crown gall disease of grape form a specific group (later characterized as Agrobacterium vitis)." ... "Whereas A6 has a wide host range (WHR) that allows tumor induction on common test plants such as Nicotiana tabacum or Datura stramonium, Ag162 and Ag57 expressed a limited host range (LHR), inducing tumors on Vitis vinifera and only a few test plants such as Lycopersicon esculentum and Kalanchoe tubiflora." |

| 407 | Causes allergies or is otherwise toxic to humans | y |
|-----|---|---|
| | Source(s) | Notes |
| | Dave's Garden. 2015. Chandelier Plant, Mother of Thousands <i>Kalanchoe delagoensis</i> . http://davesgarden.com/guides/pf/go/595/ . [Accessed 7 Aug 2015] | "Danger: All parts of plant are poisonous if ingested" |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc | "K. delagoensis is very poisonous to livestock and humans." ... |

| 408 | Creates a fire hazard in natural ecosystems | n |
|-----|---|---|
|-----|---|---|

| Qsn # | Question | Answer |
|-------|---|--|
| | Source(s) | Notes |
| | Witt, A. B. R., & Nongogo, A. X. (2011). The impact of fire, and its potential role in limiting the distribution of <i>Bryophyllum delagoense</i> (Crassulaceae) in southern Africa. <i>Biological invasions</i> , 13(1): 125-133 | [Controlled by fire, but no evidence that this plant increases fire intensity or risk] "It is clear that <i>B. delagoense</i> and other succulents are sensitive to fire and that the absence or reduction Australia than South Africa because of the absence of widespread high intensity fires in Queensland and New South Wales." |
| | 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. | [Succulent habit] "Monocarpic, succulent perennial herbs or subshrubs" |

| | | |
|------------|---|---|
| 409 | Is a shade tolerant plant at some stage of its life cycle | y |
| | Source(s) | Notes |
| | 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 | "Chandelier plant thrives in shady to partly sunny conditions and can form a dense carpet beneath a dry zone forest cover." |

| | | |
|------------|---|--|
| 410 | Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island) | |
| | Source(s) | Notes |
| | BioNET-EAFRINE. 2011. <i>Bryophyllum delagoense</i> (Mother-of-millions). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Bryophyllum_delagoense_%28Mother-of-millions%29.htm . [Accessed 7 Aug 2015] | "It is commonly found growing in rocky sites or on poor soils. It prefers rocky outcrops in dry savannas and urban open spaces." |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc | "Soil drainage: free Soil reaction: neutral Soil texture: light, medium Special soil tolerances: infertile, shallow" |
| | Dave's Garden. 2015. Chandelier Plant, Mother of Thousands <i>Kalanchoe delagoensis</i> . http://davesgarden.com/guides/pf/go/595/ . [Accessed 7 Aug 2015] | "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 |
| | 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. | "Glabrous and glaucous perennial herbs; stems 5-10 dm long, unbranched, reproducing vegetatively by adventitious shoots from the base." |

| Qsn # | Question | Answer |
|-------|---|---|
| 412 | Forms dense thickets | 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 | "Chandelier plant thrives in shady to partly sunny conditions and can form a dense carpet beneath a dry zone forest cover." |
| | Eggl, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York | "Robust biennials or ± perennials, completely glabrous. 0.2 - 2 m tall, often growing in dense stands;" |

| 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] "Glabrous and glaucous perennial herbs ... in Hawai'i naturalized in low elevation, dry, disturbed sites..." |

| 502 | Grass | n |
|-----|--|--|
| | Source(s) | Notes |
| | USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 6 Aug 2015] | "Family: Crassulaceae subfamily: Sedoideae tribe: Kalanchoeae" |

| 503 | Nitrogen fixing woody plant | 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. | "Glabrous and glaucous perennial herbs" [Crassulaceae. No evidence] |

| 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. | [No bulbs, corms or tubers] "Glabrous and glaucous perennial herbs; stems 5-10 dm long, unbranched, reproducing vegetatively by adventitious shoots from the base." |

| 601 | Evidence of substantial reproductive failure in native habitat | n |
|-----|---|--|
| | Source(s) | Notes |
| | Eggl, U. (ed.). 2003. Illustrated Handbook of Succulent Plants: Crassulaceae. Springer-Verlag, Berlin - Heidelberg - New York | [No evidence] "Madagascar; open wooded grasslands, rocky slopes, on sandy or rocky ground; cultivated and naturalized throughout the tropics." |

| 602 | Produces viable seed | y |
|-----|----------------------|---|
|-----|----------------------|---|

| Qsn # | Question | Answer |
|-------|---|---|
| | Source(s) | Notes |
| | Walters, M., Figueiredo, E., Crouch, N.R., Winter, P.J.D., Smith, G.F., Zimmermann, H.G., & Mashope, B.K. (eds.). 2011. Naturalised and Invasive Succulents of Southern Africa, ABC Taxa Volume 11. BTC, Brussels | "Bryophyllum delagoense grows very easily and reproduces by means of seed, basal suckers and abundantly produced leaf bulbils (Fig. 273) thus facilitating its spread to new areas. Severed leaves and bulbils root very easily and it is often found spreading from sites where garden waste is dumped." |

| 603 | Hybridizes naturally | y |
|-----|---|---|
| | Source(s) | Notes |
| | Walters, M., Figueiredo, E., Crouch, N.R., Winter, P.J.D., Smith, G.F., Zimmermann, H.G., & Mashope, B.K. (eds.). 2011. Naturalised and Invasive Succulents of Southern Africa, ABC Taxa Volume 11. BTC, Brussels | "In Australia the hybrid between <i>Bryophyllum daigremontianum</i> and <i>B. delagoense</i> , known as <i>Bryophyllum xhoughtonii</i> (D.B.Ward) P.I.Forst., is widely naturalised in the Queensland and New South Wales regions (Moran, 2009; PlantNET, 2010)." |
| | Guerra-García, A., Golubov, J., & Mandujano, M. C. 2015. Invasion of <i>Kalanchoe</i> by clonal spread. <i>Biological Invasions</i> , 17(6), 1615-1622 | " <i>Kalanchoe delagoensis</i> , <i>K. daigremontiana</i> and their hybrid (Houghton's hybrid) are invasive in tropical regions." |

| 604 | Self-compatible or apomictic | |
|-----|--|---|
| | Source(s) | Notes |
| | Guerra-García, A., Golubov, J., & Mandujano, M. C. 2015. Invasion of <i>Kalanchoe</i> by clonal spread. <i>Biological Invasions</i> , 17(6), 1615-1622 | [Unknown for <i>K. delagoensis</i>] "Flowers are redish-purple, campanulate (Eggle 2003), produce copious amounts of nectar and at least <i>K. daigremontiana</i> is self-compatible (Herrera and Nassar 2009)." |

| 605 | Requires specialist pollinators | n |
|-----|--|---|
| | Source(s) | Notes |
| | Guerra-García, A., Golubov, J., & Mandujano, M. C. 2015. Invasion of <i>Kalanchoe</i> by clonal spread. <i>Biological Invasions</i> , 17(6), 1615-1622 | " <i>K. delagoensis</i> and <i>K. daigremontiana</i> are both reported as autogamous species which do not require specific pollinators (Eggle 2003)." |

| 606 | Reproduction by vegetative fragmentation | y |
|-----|---|--|
| | Source(s) | Notes |
| | Walters, M., Figueiredo, E., Crouch, N.R., Winter, P.J.D., Smith, G.F., Zimmermann, H.G., & Mashope, B.K. (eds.). 2011. Naturalised and Invasive Succulents of Southern Africa, ABC Taxa Volume 11. BTC, Brussels | " <i>Bryophyllum delagoense</i> grows very easily and reproduces by means of seed, basal suckers and abundantly produced leaf bulbils" |

| 607 | Minimum generative time (years) | |
|-----|--|---|
| | Source(s) | Notes |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc | [Unknown. Probably between <1 to <2 years] " <i>K. delagoensis</i> is a long-lived perennial. It reproduces by seed and by producing large numbers of tiny plantlets at the end of the fleshy leaves. Seeds can germinate for some years after production." |

| Qsn # | Question | Answer |
|-------|---|---|
| 701 | Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas) | y |
| | Source(s) | Notes |
| | Walters, M., Figueiredo, E., Crouch, N.R., Winter, P.J.D., Smith, G.F., Zimmermann, H.G., & Mashope, B.K. (eds.). 2011. Naturalised and Invasive Succulents of Southern Africa, ABC Taxa Volume 11. BTC, Brussels | "Bryophyllum delagoense grows very easily and reproduces by means of seed, basal suckers and abundantly produced leaf bulbils (Fig. 273) thus facilitating its spread to new areas. Severed leaves and bulbils root very easily and it is often found spreading from sites where garden waste is dumped." |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc | "Plants often establish on roadsides, along fence lines and around old rubbish dumps, and can spread from these areas, especially in flood (Queensland Government, 2011)" |
| | BioNET-EAFRINE. 2011. <i>Bryophyllum delagoense</i> (Mother-of-millions). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Bryophyllum_delagoense_%28Mother-of-millions%29.htm . [Accessed 7 Aug 2015] | "The tiny seeds are probably wind and water dispersed and its leaves and plantlets may also be dislodged and spread by animals, vehicles, machinery, soil and slashers." |

| | | |
|-----|--|---|
| 702 | Propagules dispersed intentionally by people | y |
| | Source(s) | Notes |
| | WRA Specialist. 2015. Personal Communication | Seeds and live plants available for purchase online |

| | | |
|-----|--|---|
| 703 | Propagules likely to disperse as a produce contaminant | n |
| | Source(s) | Notes |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc | " <i>K. delagoensis</i> reproduces sexually by seeds and asexually by plantlets that are produced at the tips of its leaves. Leaves and plant segments can also re-sprout or root and generate new plants. This species is commonly spread in garden waste. Seeds are minute and can be easily dispersed by wind and water. Leaves and plantlets may also be dislodged and spread by animals, vehicles, garden and/or agricultural machinery (BioNet-EAFRINET, 2011). Plants often establish on roadsides, along fence lines and around old rubbish dumps, and can spread from these areas, especially in flood (Queensland Government, 2011)." |

| | | |
|-----|--|---|
| 704 | Propagules adapted to wind dispersal | y |
| | Source(s) | Notes |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc | "Seeds are minute and can be easily dispersed by wind and water." |

| Qsn # | Question | Answer |
|-------|--|--|
| 705 | Propagules water dispersed | y |
| | Source(s) | Notes |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc | "Seeds are minute and can be easily dispersed by wind and water." ... "Plants often establish on roadsides, along fence lines and around old rubbish dumps, and can spread from these areas, especially in flood (Queensland Government, 2011)." |

| 706 | Propagules bird dispersed | n |
|-----|--|--|
| | Source(s) | Notes |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc | [No evidence] "K. delagoensis reproduces sexually by seeds and asexually by plantlets that are produced at the tips of its leaves. Leaves and plant segments can also re-sprout or root and generate new plants. This species is commonly spread in garden waste. Seeds are minute and can be easily dispersed by wind and water." |

| 707 | Propagules dispersed by other animals (externally) | |
|-----|---|--|
| | Source(s) | Notes |
| | BioNET-EAFRINE. 2011. <i>Bryophyllum delagoense</i> (Mother-of-millions). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Bryophyllum_delagoense_%28Mother-of-millions%29.htm . [Accessed 7 Aug 2015] | [Possibly, although seeds & bulbils lack means of external attachment] "its leaves and plantlets may also be dislodged and spread by animals, vehicles, machinery, soil and slashers." |

| 708 | Propagules survive passage through the gut | n |
|-----|--|---|
| | Source(s) | Notes |
| | Simmonds, H., Holst, P. & Bourke, C. 2000. The palatability, and potential toxicity of Australian weeds to goats. Rural Industries Research and Development Corporation, Barton, Australia | "Palatability: Seldom eaten" [Unlikely to be dispersed internally] |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc | [No evidence] "K. delagoensis reproduces sexually by seeds and asexually by plantlets that are produced at the tips of its leaves. Leaves and plant segments can also re-sprout or root and generate new plants. This species is commonly spread in garden waste. Seeds are minute and can be easily dispersed by wind and water. Leaves and plantlets may also be dislodged and spread by animals, vehicles, garden and/or agricultural machinery (BioNet-EAFRINET, 2011). Plants often establish on roadsides, along fence lines and around old rubbish dumps, and can spread from these areas, especially in flood (Queensland Government, 2011)." |

| Qsn # | Question | Answer |
|-------|--|--|
| 801 | Prolific seed production (>1000/m²) | |
| | Source(s) | Notes |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc | [Possibly yes, but no density estimates given] "It produces high amounts of seeds and plantlets which can grow forming dense monospecific thickets displacing and inhibiting the recruitment of native vegetation" |

| | | |
|-----|--|--|
| 802 | Evidence that a persistent propagule bank is formed (>1 yr) | |
| | Source(s) | Notes |
| | Royal Botanic Gardens Kew. 2008. Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/ . [Accessed 7 Aug 2015] | "Storage Behaviour: No data available for species. Of 31 known taxa of genus <i>Kalanchoe</i> , 100.00% Orthodox(p/?)" |
| | WRA Specialist. 2015. Personal Communication | Unknown |

| | | |
|-----|---|---|
| 803 | Well controlled by herbicides | y |
| | Source(s) | Notes |
| | BioNET-EAFRINE. 2011. <i>Bryophyllum delagoense</i> (Mother-of-millions). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Bryophyllum_delagoense_%28Mother-of-millions%29.htm . [Accessed 7 Aug 2015] | " <i>Bryophyllum delagoense</i> is susceptible to a variety of herbicides. Optimum time for treatment appears to be when plants flowering although they can be treated at any time. When using any herbicide always read the label first and follow all instructions and safety requirements. If in doubt consult an expert. " |
| | CABI, 2015. <i>Kalanchoe delagoensis</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc | "Chemical Control <i>K. delagoensis</i> is susceptible to a variety of herbicides. Optimum time for treatment may be when the plants are flowering (BioNet-EAFRINET, 2011). Herbicides registered for control in Queensland are: 2,4-D (70 ml/10 L water or 7L / 1000L per ha); picloram + triclopyr; fluroxypyr (600 ml /100 L water); and picloram + triclopyr + aminopyralid. Follow-up treatments are recommended until control is completed (Queensland Government, 2011)." |

| | | |
|-----|---|---|
| 804 | Tolerates, or benefits from, mutilation, cultivation, or fire | n |
| | Source(s) | Notes |
| | Walters, M., Figueiredo, E., Crouch, N.R., Winter, P.J.D., Smith, G.F., Zimmermann, H.G., & Mashope, B.K. (eds.). 2011. Naturalised and Invasive Succulents of Southern Africa, ABC Taxa Volume 11. BTC, Brussels | "For areas of small infestations simply pulling the plants up by hand will be sufficient, but care has to be taken not to dislodge the bulbs or leave any parts behind as it will simply resprout. It is best to burn unwanted material to prevent further spread. It is best to burn unwanted material to prevent further spread. In a recent study Witt and Nongogo (2010) found that high intensity and low intensity fires were respectively found to kill 89 and 45% of plants." |

| Qsn # | Question | Answer |
|-------|--|---|
| 805 | Effective natural enemies present locally (e.g. introduced biocontrol agents) | 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. | [Widespread] "in Hawai'i naturalized in low elevation, dry, disturbed sites on Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i, cultivated and perhaps naturalized on some of the other main islands." |

Summary of Risk Traits:

High Risk / Undesirable Traits

- Able to grow in tropical climates
- Widely naturalized, including Kauai, Oahu, Lanai, Maui, and Hawaii
- Agricultural weed (invades rangelands & pastures, replacing grasses & legumes, & reduces productivity)
- Environmental weed (forms dense monospecific thickets displacing & inhibiting recruitment of native vegetation)
- Other *Kalanchoe* species have become invasive
- Possibly allelopathic
- Toxic to animals & humans
- Tolerates shade
- Forms dense, monotypic ground cover
- Reproduces by seeds & vegetatively by plantlets
- Able to hybridize with other *Kalanchoe* species
- Seeds and/or vegetative parts spread by wind, water, garden waste & intentionally

Low Risk Traits

- Unarmed (no spines, thorns or burrs)
- Palatable, but toxic, to animals
- Ornamental
- Does not increase fire risk
- Fire may provide control
- Herbicides may provide effective control