

Taxon: <i>Clivia miniata</i> (Lindl.) Regel	Family: Amaryllidaceae
Common Name(s): bush lily clivia lily fire lily kaffir lily Natal lily	Synonym(s): Vallota miniata Lindl.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 2 Sep 2016
WRA Score: 6.0	Designation: L	Rating: Low Risk

Keywords: Perennial Herb, Naturalized, Toxic, Rhizomatous, Bird-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	n
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	y
406	Host for recognized pests and pathogens	y=1, n=0	n
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	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		
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	n
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	2
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire	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
	Van Wyk, B. 2000. A Photographic Guide to Wild Flowers of South Africa. Struik Publishers, Cape Town, South Africa	[No evidence of domestication] "Cultivars include forms with bright yellow, whitish. dark orange-red and bicoloured flowers."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2016. 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, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 31 Aug 2016]	"Native: Africa Southern Africa: South Africa - Eastern Cape, - KwaZulu-Natal, - Mpumalanga; Swaziland"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 31 Aug 2016]	

Qsn #	Question	Answer
203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Burke's Backyard. 2016. Clivia. http://www.burkesbackyard.com.au/fact-sheets/in-the-garden/flowering-plants-shrubs/clivia/#.V8jQJq009YE . [Accessed 1 Sep 2016]	"Best climate: Clivias come from South Africa and grow in most areas of Australia – from Tasmania to the Tropics. In colder areas such as the mountains and Tasmania clivias need protection from frost and extreme cold. In warmer climates plants will become bleached and stressed if grown in full sun and allowed to dry out. In very cold climates clivias can be grown in pots which are moved into shelter or a glasshouse during the winter."
	Dave's Garden. 2016. Bush Lily, Clivia Lily, St. John's Lily, Boslelie, Fire Lily - <i>Clivia miniata</i> . http://davesgarden.com/guides/pf/go/2201/ . [Accessed 1 Sep 2016]	"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
	Source(s)	Notes
	South African National Biodiversity Institute. 2001. PlantzAfrica.com. <i>Clivia miniata</i> . http://www.plantzafrika.com/plantcd/cliviaminiata.htm . [Accessed 31 Aug 2016]	"Clivia are endemic to southern Africa, meaning that they do not occur naturally anywhere else in the world! The wild bush lily grows in the forests of Kwazulu-Natal, Eastern Cape, Mpumalanga and Swaziland. The habitat may vary from subtropical coastal forest to ravines in high altitude forest."
	Kiepiel, I., & Johnson, S. D. (2014). Breeding systems in <i>Clivia</i> (Amaryllidaceae): late-acting self-incompatibility and its functional consequences. <i>Botanical Journal of the Linnean Society</i> , 175(1), 155-168	" <i>Clivia miniata</i> is found in the eastern part of southern Africa where plants occur naturally on sandstone and doleritic humic scree in a wide variety of conditions ranging from coastal to subtropical forest habitats (Duncan, 1999; Winter, 2000; van der Merwe et al., 2005)."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Van Wyk, B. 2000. <i>A Photographic Guide to Wild Flowers of South Africa</i> . Struik Publishers, Cape Town, South Africa	"An extremely popular garden or pot plant for shady situations; extensively cultivated worldwide."
	Imada, C.T., Staples, G.W. & Herbst, D.R. 2005. Annotated Checklist of Cultivated Plants of Hawai'i. http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/ . [Accessed 31 Aug 2016]	"Locations: Harold L. Lyon Arboretum Wahiawa Botanical Garden Waimea Arboretum & Botanical Garden"
	Wang, Q. M., Gao, F. Z., Gao, X., Zou, F. Y., Sui, X., Wang, M., ... & Wang, L. (2012). Regeneration of <i>Clivia miniata</i> and assessment of clonal fidelity of plantlets. <i>Plant Cell, Tissue and Organ Culture (PCTOC)</i> , 109(2), 191-200	"The most commonly cultivated species is <i>Clivia miniata</i> Regel (Ran and Simpson 2005) which is cultivated in many parts of the world, especially in Europe, the USA, Japan, China, Australia, New Zealand and Belgium."

301	Naturalized beyond native range	y
	Source(s)	Notes

Qsn #	Question	Answer
	ERMA New Zealand. 2002. Evaluation & Review Report. Application for approval to import for release <i>Clivia mirabilis</i> Rourke. Application Code: NOR06004	" <i>C. miniata</i> seem to have naturalised in New Zealand ... "Dr De Lange states that <i>C. miniata</i> is locally established in Auckland city where it usually occurs in shady habitats. Although most naturalisations appear close to garden plantings, a few observations of more remote plants he suggests may be the result of bird dispersed seeds."
	Allan Herbarium (2000) Ngā Tipu o Aotearoa - New Zealand Plant Names Database. Landcare Research, New Zealand. Available http://nzflora.landcareresearch.co.nz/ . [Accessed 31 Aug 2016]	"New Zealand (Political Region): Sometimes present, Exotic (Casual)"
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	Listed as naturalized [Confirmation needed]
	Wagner, W.L., Herbst, D.R. & Lorence, D.H. 2016. Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/ . [Accessed 31 Aug 2016]	No evidence to date

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

304	Environmental weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

305	Congeneric weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

401	Produces spines, thorns or burrs	n
	Source(s)	Notes

Qsn #	Question	Answer
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence] "S. Africa. Herb, evergreen, bulbous, leaves strap-shaped, orange flowers, inflorescence an umbel, membranous spathes, fleshy bright red fruit"

402	Allelopathic	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	Unknown

403	Parasitic	n
	Source(s)	Notes
	Kubitzki, K. (ed.). 1998. The Families and genera of vascular plants. Volume III. Flowering plants, Monocotyledons: Liliae (except Orchidaceae). Springer-Verlag, Berlin, Heidelberg, New York	"Rhizomatous herbs with firm, evergreen leaves." [Amaryllidaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	Rourke, J. P. (2002). <i>Clivia mirabilis</i> (Amaryllidaceae: Haemantheae) a new species from Northern Cape, South Africa. <i>Bothalia</i> , 32(1), 1-7	[Fruit palatable to birds. Palatability of foliage unknown] "Birds are probably the main seed dispersal vectors. <i>Clivia miniata</i> , <i>C. gardenii</i> and <i>C. caulescens</i> have all been observed by the author growing epiphytically in forest trees, five or more metres above ground level. It is probable that frugivorous birds deposited seeds in these positions, leading one to postulate that forest dwelling birds are responsible for the dispersal of large scarlet <i>Clivia</i> berries."
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Unknown. Toxicity may deter browsing or grazing] "All parts are poisonous. The plant contains small amounts of the alkaloid lycorine, the greatest concentration of the alkaloid is in the bulb. Large quantities must be ingested to cause symptoms of toxicity. Children and family pets can be poisoned. Rhizomes are reportedly extremely toxic,..."

405	Toxic to animals	y
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"All parts are poisonous. The plant contains small amounts of the alkaloid lycorine, the greatest concentration of the alkaloid is in the bulb. Large quantities must be ingested to cause symptoms of toxicity. Children and family pets can be poisoned. Rhizomes are reportedly extremely toxic,..."

406	Host for recognized pests and pathogens	n
	Source(s)	Notes

Qsn #	Question	Answer
	The Royal Horticultural Society. 2016. Clivia. https://www.rhs.org.uk/advice/profile?PID=655 . [Accessed 2 Sep 2016]	"Clivia are generally trouble-free, suffering few pests and diseases. However, conspicuous tufts of white, waxy wool appearing on the leaves indicates an infestation of mealybug, which may be troublesome. Slugs and snails can also cause damage to flowers and leaves."
	Missouri Botanical Garden. 2016. Clivia miniata. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b549 . [Accessed 2 Sep 2016]	"Problems: Pests to watch for are scale and mites. When placed outdoors, they are a favorite of snails which feed on the flowers."

407	Causes allergies or is otherwise toxic to humans	y
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"(All parts are poisonous. The plant contains small amounts of the alkaloid lycorine, the greatest concentration of the alkaloid is in the bulb. Large quantities must be ingested to cause symptoms of toxicity. Children and family pets can be poisoned. Rhizomes are reportedly extremely toxic, leaves and rhizomes help childbirth, and also for snakebites and fever complaints, pain relief, muscle and uterine stimulation, impotency and barrenness; leaves infusion used to induce labor and speed contractions, ingesting too much can overstimulate uterine contractions and cause complications.)"
	Van Wyk, B. 2000. A Photographic Guide to Wild Flowers of South Africa. Struik Publishers, Cape Town, South Africa	"Although rhizomes of all bush lilies contain alkaloids and are extremely toxic, plants of this species. as well as <i>C. nobilis</i> , are widely used in traditional medicine."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Van Wyk, B. 2000. A Photographic Guide to Wild Flowers of South Africa. Struik Publishers, Cape Town, South Africa	[Unlikely given habit & habitat] "Evergreen perennial herb, up to 1 m high, with creeping rhizomes; occurring in moist places in the shade of forest, often growing on rocks."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Van Wyk, B. 2000. A Photographic Guide to Wild Flowers of South Africa. Struik Publishers, Cape Town, South Africa	"Evergreen perennial herb, up to 1 m high, with creeping rhizomes; occurring in moist places in the shade of forest, often growing on rocks."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	
	Source(s)	Notes
	Clivia PE. 2016. Growing Clivias - Frequently asked questions. http://www.cliviape.co.za/clivia_faq.htm#faq8 . [Accessed 2 Sep 2016]	"Q. What type of soil is the best? A. In pots Clivias prefer a well drained, slightly acidic potting mix such as composted pine bark. If grown in the garden they grow in virtually any soil type with varying degree of success, provided that they are not over watered."

Qsn #	Question	Answer
	Dave's Garden. 2016. Bush Lily, Clivia Lily, St. John's Lily, Boslelie, Fire Lily - <i>Clivia miniata</i> . http://davesgarden.com/guides/pf/go/2201/ . [Accessed 2 Sep 2016]	"Soil pH requirements: 6.1 to 6.5 (mildly acidic) 6.6 to 7.5 (neutral) 7.6 to 7.8 (mildly alkaline)"
	South African National Biodiversity Institute. 2001. PlantzAfrica.com. <i>Clivia miniata</i> . http://www.plantzafrica.com/plantcd/cliviaminiata.htm . [Accessed 2 Sep 2016]	"The soil is well drained and humus rich. Occasionally they may be found growing in the fork of a tree."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Van Wyk, B. 2000. A Photographic Guide to Wild Flowers of South Africa. Struik Publishers, Cape Town, South Africa	"Evergreen perennial herb, up to 1 m high, with creeping rhizomes"

412	Forms dense thickets	n
	Source(s)	Notes
	South African National Biodiversity Institute. 2001. PlantzAfrica.com. <i>Clivia miniata</i> . http://www.plantzafrica.com/plantcd/cliviaminiata.htm . [Accessed 2 Sep 2016]	"The bush lily grows in dappled shade, often in large colonies."
	Swanevelder, Z. H., Forbes-Hardinge, A., Truter, J. T., & Van Wyk, A. E. (2006). Amaryllidaceae: a new variety of <i>Clivia robusta</i> . <i>Bothalia</i> , 36(1), 66-68	[No evidence for <i>C. miniata</i> . Related species grows in dense stands] "The habitat at the type locality is typical for <i>Clivia robusta</i> , in this case, a swamp-like area with forest covering \pm 2 ha. Most of the <i>C. robusta</i> population grows as dense stands in very heavy mud on a stream bank."

501	Aquatic	n
	Source(s)	Notes
	Van Wyk, B. 2000. A Photographic Guide to Wild Flowers of South Africa. Struik Publishers, Cape Town, South Africa	[Terrestrial] "Evergreen perennial herb ... occurring in moist places in the shade of forest, often growing on rocks."

502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 31 Aug 2016]	Family: Amaryllidaceae Subfamily: Amaryllidoideae Tribe: Haemantheae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 31 Aug 2016]	Family: Amaryllidaceae Subfamily: Amaryllidoideae Tribe: Haemantheae

Qsn #	Question	Answer
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Kubitzki, K. (ed.). 1998. The Families and genera of vascular plants. Volume III. Flowering plants, Monocotyledons: Liliales (except Orchidaceae). Springer-Verlag, Berlin, Heidelberg, New York	"Bulbs are lacking in Scadoxus, Clivia, and Cryptostephanus." ... "All members of the Amaryllidaceae are perennials; all but three genera (Clivia, Cryptostephanus, and Scadoxus, Fig. 31) form tunic ate bulbs." ... "Rhizomatous herbs with firm, evergreen leaves."
	Gordon, D. R., Mitterdorfer, B., Pheloung, P. C., Ansari, S., Buddenhagen, C., Chimera, C., ... & Williams, P. A. 2010). Guidance for addressing the Australian Weed Risk Assessment questions. Plant Protection Quarterly, 25(2): 56-74	"This question is specifically to deal with plants that have specialized organs and should not include plants merely with rhizomes"

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Kiepiel, I., & Johnson, S. D. (2014). Breeding systems in Clivia (Amaryllidaceae): late-acting self-incompatibility and its functional consequences. Botanical Journal of the Linnean Society, 175(1), 155-168	[No evidence] "Clivia miniata is found in the eastern part of southern Africa where plants occur naturally on sandstone and doleritic humic scree in a wide variety of conditions ranging from coastal to subtropical forest habitats (Duncan, 1999; Winter, 2000; van der Merwe et al., 2005). Flowering occurs in the Austral spring between August and November (Duncan, 1999; Swanevelder, 2003; van der Merwe et al., 2005)."

602	Produces viable seed	y
	Source(s)	Notes
	Wang, Q. M., Gao, F. Z., Gao, X., Zou, F. Y., Sui, X., Wang, M., ... & Wang, L. (2012). Regeneration of Clivia miniata and assessment of clonal fidelity of plantlets. Plant Cell, Tissue and Organ Culture (PCTOC), 109(2), 191-200	"C. miniata is generally propagated through seeds and ramets; however, the former is time-consuming and the latter is inefficient.
	South African National Biodiversity Institute. 2001. PlantzAfrica.com. Clivia miniata. http://www.plantzafrica.com/plantcd/cliviaminiata.htm . [Accessed 31 Aug 2016]	"Clivia miniata can be propagated by seed or by removing suckers. The fruits are bright orange when ripe (or golden in the case of the yellow flowered plants). The pulp should be removed from the seed when you are ready to sow . The seeds are large with a pearly sheen and should be sown fresh for best results. (Remember to wash your hands very well after cleaning the seed.) Sow the seed in deep trays in sifted seedling mix which has been sterilised. Simply press the seeds gently into the mix until they are almost flush with the surface. The medium should be kept moist but since the seeds take a long time to germinate (four to six weeks), keep an eye out for algal growths on the surface which will deprive the germinating seeds of oxygen. They may remain in the trays for up to two years before they are large enough to plant on."

603	Hybridizes naturally	y
	Source(s)	Notes

Qsn #	Question	Answer
	Spies, P., Grobler, J. P., & Spies, J. J. (2011). A review of phylogenetic relationships in the genus <i>Clivia</i> . <i>Philosophical Transactions in Genetics</i> , 1, 168-207	"Although natural hybridization can occur freely between <i>Clivia</i> species when growing sympatrically, only one natural hybrid, <i>C. xnimbicola</i> Z.H.Swanevelder et al. which is a cross between <i>C. caulescens</i> and <i>C. miniata</i> , is recognised (Swanevelder et al., 2006)."

604	Self-compatible or apomictic	n
	Source(s)	Notes
	Kiepiel, I., & Johnson, S. D. (2014). Shift from bird to butterfly pollination in <i>Clivia</i> (Amaryllidaceae). <i>American Journal of Botany</i> , 101(1), 190-200	"Although horticulturists sometimes succeed in producing <i>Clivia</i> seeds from hand-selfing (Swanevelder and Fisher, 2009), our studies indicate that <i>Clivia</i> species have a late-acting self-incompatibility system, and are therefore fully reliant on pollinator visits for seed production (I. Kiepiel, unpublished data). <i>Clivia</i> flowers are protogynous and remain open for up to three weeks if not pollinated."
	Kiepiel, I., & Johnson, S. D. (2014). Breeding systems in <i>Clivia</i> (Amaryllidaceae): late-acting self-incompatibility and its functional consequences. <i>Botanical Journal of the Linnean Society</i> , 175(1), 155-168	[Predominantly self-sterile, but able to produce small numbers of seeds through self-fertilization] "Seed-set results following controlled hand pollinations revealed that <i>Clivia miniata</i> and <i>C. gardenia</i> are largely self-sterile." ... "The results of this study indicate that <i>C. miniata</i> and <i>C. gardenii</i> are both effectively self-sterile and therefore reliant on vectors for seed production (Figs 3, 4). Both species are nevertheless capable of the production of small amounts of seed through self-fertilization"

605	Requires specialist pollinators	n
	Source(s)	Notes
	Spies, P., Grobler, J. P., & Spies, J. J. (2011). A review of phylogenetic relationships in the genus <i>Clivia</i> . <i>Philosophical Transactions in Genetics</i> , 1, 168-207	"The open <i>C. miniata</i> flowers might be moth or butterfly pollinated due to the yellow centre of many <i>C. miniata</i> taxa (Swanevelder & Fisher, 2009)."
	Kiepiel, I., & Johnson, S. D. (2014). Shift from bird to butterfly pollination in <i>Clivia</i> (Amaryllidaceae). <i>American Journal of Botany</i> , 101(1), 190-200	[Moth & butterfly pollinated] "Four of the species (<i>C. nobilis</i> Lindl., <i>C. gardenii</i> Hook., <i>C. caulescens</i> R. A. Dyer, and <i>C. mirabilis</i> Rourke) have tubularpendulous flowers that conform to the syndrome of birdpollination, while a fifth species <i>C. miniata</i> (Lindl.) Bosse has upright, trumpet-shaped flowers consistent with the syndrome of butterfly pollination (Manning, 2005)." ... "Floral morphology was most obviously modified during the shift from bird- to butterfly pollination in <i>Clivia</i> . The upright trumpet-shaped flowers of <i>C. miniata</i> provide a landing platform for butterflies and accommodate their wings while they feed on nectar (Fig. 2A-D)."

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	South African National Biodiversity Institute. 2001. <i>PlantzAfrica.com</i> . <i>Clivia miniata</i> . http://www.plantzafrika.com/plantcd/cliviaminiata.htm . [Accessed 31 Aug 2016]	" <i>Clivia miniata</i> can be propagated by seed or by removing suckers."
	Van Wyk, B. 2000. <i>A Photographic Guide to Wild Flowers of South Africa</i> . Struik Publishers, Cape Town, South Africa	"Evergreen perennial herb, up to 1 m high, with creeping rhizomes"

Qsn #	Question	Answer
607	Minimum generative time (years)	2
	Source(s)	Notes
	Wang, Q. M., Gao, F. Z., Gao, X., Zou, F. Y., Sui, X., Wang, M., ... & Wang, L. (2012). Regeneration of <i>Clivia miniata</i> and assessment of clonal fidelity of plantlets. <i>Plant Cell, Tissue and Organ Culture (PCTOC)</i> , 109(2), 191-200	" <i>C. miniata</i> is generally propagated through seeds and ramets; however, the former is time-consuming and the latter is inefficient. It takes 2.5–7 years for plants to mature from seeds (Finnie and van Staden 1999; Ran and Simpson 2005)."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Kubitzki, K. (ed.). 1998. The Families and genera of vascular plants. Volume III. Flowering plants, Monocotyledons: Liliales (except Orchidaceae). Springer-Verlag, Berlin, Heidelberg, New York	"Berry subglobose, red. Seeds turgid, ivory-colored." [No evidence. Fruit & seeds lack means of external attachment]

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"...a bulbous plant often grown as a ground cover in Hawaii and as a potted plant on the mainland."
	Van Wyk, B. 2000. A Photographic Guide to Wild Flowers of South Africa. Struik Publishers, Cape Town, South Africa	"An extremely popular garden or pot plant for shady situations; extensively cultivated worldwide."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Kubitzki, K. (ed.). 1998. The Families and genera of vascular plants. Volume III. Flowering plants, Monocotyledons: Liliales (except Orchidaceae). Springer-Verlag, Berlin, Heidelberg, New York	"Berry subglobose, red. Seeds turgid, ivory-colored." ... " <i>Clivia miniata</i> (Lindl.) Regel is a widely grown ornamental." [No evidence. Widely grown, & adapted for frugivory]

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Kubitzki, K. (ed.). 1998. The Families and genera of vascular plants. Volume III. Flowering plants, Monocotyledons: Liliales (except Orchidaceae). Springer-Verlag, Berlin, Heidelberg, New York	"Berry subglobose, red. Seeds turgid, ivory-colored."

705	Propagules water dispersed	n
	Source(s)	Notes
	Rourke, J. P. (2002). <i>Clivia mirabilis</i> (Amaryllidaceae: Haemantheae) a new species from Northern Cape, South Africa. <i>Bothalia</i> , 32(1), 1-7	"Birds are probably the main seed dispersal vectors."

706	Propagules bird dispersed	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Rourke, J. P. (2002). <i>Clivia mirabilis</i> (Amaryllidaceae: Haemantheae) a new species from Northern Cape, South Africa. <i>Bothalia</i> , 32(1), 1-7	"Birds are probably the main seed dispersal vectors. <i>Clivia miniata</i> , <i>C. gardenii</i> and <i>C. caulescens</i> have all been observed by the author growing epiphytically in forest trees, five or more metres above ground level. It is probable that frugivorous birds deposited seeds in these positions, leading one to postulate that forest dwelling birds are responsible for the dispersal of large scarlet <i>Clivia</i> berries."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Kubitzki, K. (ed.). 1998. <i>The Families and genera of vascular plants. Volume III. Flowering plants, Monocotyledons: Liliales (except Orchidaceae)</i> . Springer-Verlag, Berlin, Heidelberg, New York	"Berry subglobose, red. Seeds turgid, ivory-colored." [Unlikely. No means of external attachment]
	Rourke, J. P. (2002). <i>Clivia mirabilis</i> (Amaryllidaceae: Haemantheae) a new species from Northern Cape, South Africa. <i>Bothalia</i> , 32(1), 1-7	"Birds are probably the main seed dispersal vectors."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Rourke, J. P. (2002). <i>Clivia mirabilis</i> (Amaryllidaceae: Haemantheae) a new species from Northern Cape, South Africa. <i>Bothalia</i> , 32(1), 1-7	[Presumably Yes] "Birds are probably the main seed dispersal vectors. <i>Clivia miniata</i> , <i>C. gardenii</i> and <i>C. caulescens</i> have all been observed by the author growing epiphytically in forest trees, five or more metres above ground level. It is probable that frugivorous birds deposited seeds in these positions, leading one to postulate that forest dwelling birds are responsible for the dispersal of large scarlet <i>Clivia</i> berries."

801	Prolific seed production (>1000/m ²)	n
	Source(s)	Notes
	Kiepiel, I., & Johnson, S. D. (2014). Breeding systems in <i>Clivia</i> (Amaryllidaceae): late-acting self-incompatibility and its functional consequences. <i>Botanical Journal of the Linnean Society</i> , 175(1), 155-168	" <i>Clivia miniata</i> typically produces one to four seeds per fruit which take 9–12 months to mature (Swanevelder, 2003)."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	Unknown

Qsn #	Question	Answer
803	Well controlled by herbicides	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Kubiak, P. J. 2009. Fire responses of bushland plants after the January 1994 wildfires in northern Sydney. <i>Cunninghamia</i> , 11(1): 131-165	[Resprouts after fires] "Appendix 1. Observations on fire responses (after 100% leaf scorch) of vascular plants in the Lane Cove River (LCR) (observations mainly Jan 1994 – Oct 1999) and Narrabeen Lagoon (NL) (Mar – Oct 1994) catchments, following the fires of January 1994." [* <i>Clivia miniata</i> - R = majority of adult plants resprouted after the fires]

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	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	[Unknown] "...a bulbous plant often grown as a ground cover in Hawaii and as a potted plant on the mainland."

Summary of Risk Traits:

Summary of Risk Traits

High Risk / Undesirable Traits

- Able to grow in regions with subtropical climates
- Naturalized in New Zealand & possibly elsewhere
- All parts of the plant are poisonous to humans & animals if ingested
- Shade-tolerant
- Reproduces by seeds & vegetatively by rhizomes & suckers
- Seeds dispersed by birds & intentionally by people
- Resprouts after fire & possibly cutting

Low Risk Traits

- Despite naturalization, no negative impacts documented in introduced range
- Unarmed (no spines, thorns or burrs)
- Ornamental
- Predominantly self-incompatible

Second Screening Results for Herbs

(A) Reported as a weed of cultivated lands?> No
Outcome = Accept (Low Risk)