

Taxon: <i>Costus barbatus</i> Suess.	Family: Costaceae
Common Name(s): Hawaiian torch ginger red tower ginger red velvet ginger spiral ginger	Synonym(s):

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 29 Jun 2016
WRA Score: -3.0	Designation: L	Rating: Low Risk

Keywords: Perennial Herb, Ornamental, Edible Flowers, Rhizomatous, Bird-Pollinated

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	n
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		
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
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)	y=1, n=0	n
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		
602	Produces viable seed		
603	Hybridizes naturally		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	y
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	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed		
706	Propagules bird dispersed		
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut		
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		
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
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	[No evidence of domestication] "The species is a native of Costa Rica, Central America."

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
	Maas, P.J.M. 1972. Costoideae (Zingiberaceae). Flora Neotropica 8: 1-139	"Only known from Costa Rica; along rivers or in wet forest, one specimen from 1400 m, the others from unknown elevation."

202	Quality of climate match data	High
	Source(s)	Notes
	Maas, P.J.M. 1972. Costoideae (Zingiberaceae). Flora Neotropica 8: 1-139	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"It is found from 600 to 1,600 m altitude in its natural habitat in Costa Rica." [Elevation range approx. 1000 m, possibly demonstrating environmental versatility]
	MacCubbin, T. & Tasker, G. 2002. Florida Gardener's Guide. Cool Springs Press, Franklin, TN	"Zones 10B - 11"

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Maas, P.J.M. 1972. Costoideae (Zingiberaceae). Flora Neotropica 8: 1-139	"Only known from Costa Rica; along rivers or in wet forest, one specimen from 1400 m, the others from unknown elevation."

Qsn #	Question	Answer
205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"It is a common cultivated <i>Costus</i> species and a very popular ornamental and provides beautiful cut flower."
301	Naturalized beyond native range	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence
	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 29 Jun 2016]	No evidence [<i>Costus woodsonii</i> and <i>Cheilocostus speciosus</i> are the only members of the Costaceae currently recorded as naturalized in the Hawaiian Islands]
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	
	Source(s)	Notes
	Andrew, G. A. & John, L. 2010. National Invasive Species Strategy for Saint Lucia. http://www.ciasnet.org/ . [Accessed 29 Jun 2016]	" <i>Costus spicatus</i> ... Present; potential threat in lower montane rainforest"

Qsn #	Question	Answer
	CABI. 2014. <i>Cheilocostus speciosus</i> in: Invasive Species Compendium. www.cabi.org/isc	[<i>Costus speciosus</i> is a synonym of <i>Cheilocostus speciosus</i>] "Other Scientific Names: <i>Costus speciosus</i> (J.König) Sm." ... " <i>C. speciosus</i> is a perennial herb native to Malaysia. It is widely naturalized in the Pacific region, although it can be very invasive there. It is often found in disturbed areas, on roadsides and in the forest understory. In Pohnpei it is common in watersheds where the land has been disturbed by sakau growing (Englberger, 2009). Its seeds can be spread by birds and rodents, in soil and on machinery. <i>C. speciosus</i> can also spread via its stems and rhizomes (Englberger, 2009)."
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	<i>Costus cylindricus</i> , <i>Costus dubius</i> , <i>Costus guanaiensis</i> , <i>Costus pulverulentus</i> , <i>Costus sarmentosus</i> , <i>Costus scaber</i> , <i>Costus sericeus</i> , <i>Costus speciosus</i> , <i>Costus spicatus</i> , & <i>Costus woodsonii</i> included in the GCW as naturalized and/or weeds. Impacts are unspecified

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	[No evidence] "An erect, clumping herbaceous terrestrial with subterranean rhizome, growing to 1.5–2.5 m high. Ligule 10–30 mm, obtuse and lobed encircling the stem. Leaves spirally arranged with narrowly elliptic dark green lamina, 13–30 cm by 4.5–10 cm wide, simple, entire margin with a glabrous upper surface and slightly villose beneath"

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

403	Parasitic	n
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"An erect, clumping herbaceous terrestrial with subterranean rhizome, growing to 1.5–2.5 m high." [Costaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	[Flowers palatable to humans. Palatability of foliage to animals unknown] "Yellow flowers are edible (Carle 1995) and have a delightful sour lemony flavour. Flowers can be eaten straight off the plant and are excellent in a salad."

405	Toxic to animals	n
	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	No evidence

Qsn #	Question	Answer
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Randy's Tropical Plants. 2016. <i>Costus barbatus</i> . http://www.randys-tropicalplants.com/Costus-barbatus.html . [Accessed 29 Jun 2016]	"Pests: I have not found any pests to be a problem for this plant in Florida."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	[No evidence] "Yellow flowers are edible (Carle 1995) and have a delightful sour lemony flavour. Flowers can be eaten straight off the plant and are excellent in a salad."
	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
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	[An herbaceous plant that does not occur in fire prone habitats] "The plant grows well in full sun or partial shade in fertile, moist, well-drained, organic matter-rich soils. It blooms year round in the warm humid tropics. It tolerates cold temperatures but not frost. It is found from 600 to 1,600 m altitude in its natural habitat in Costa Rica." ... "An erect, clumping herbaceous terrestrial with subterranean rhizome, growing to 1.5–2.5 m high. Ligule 10–30 mm, obtuse and lobed encircling the stem."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Simpson, D. 2014. Some Magnetic Island Plants. http://www.somemagneticislandplants.com.au/ . [Accessed 29 Jun 2016]	" <i>Costus barbatus</i> will grow in a fairly wide range of light conditions provided that the soil is kept moist during active growth, but prefers partial shade and high humidity."
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"The plant grows well in full sun or partial shade"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Llamas, K.A. 2003. Tropical Flowering Plants. Timber Press, Portland, OR	"Fertile, organically rich, well-drained soil."
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"The plant grows well in full sun or partial shade in fertile, moist, well-drained, organic matter-rich soils."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"An erect, clumping herbaceous terrestrial with subterranean rhizome, growing to 1.5–2.5 m high."

412	Forms dense thickets	n
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	[Unknown. Other <i>Costus</i> species form thickets] "The species is a native of Costa Rica, Central America."

501	Aquatic	n
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	[Terrestrial] "It is found from 600 to 1,600 m altitude in its natural habitat in Costa Rica."

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 27 Jun 2016]	Costaceae

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 27 Jun 2016]	Costaceae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"An erect, clumping herbaceous terrestrial with subterranean rhizome, growing to 1.5–2.5 m high."

Qsn #	Question	Answer
	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. <i>Plant Protection Quarterly</i> , 25(2): 56-74	"This question relates to perennial plants with tubers, corms or bulbs. This question is specifically to deal with plants that have specialized organs and should not include plants merely with rhizomes/ stolons"

601	Evidence of substantial reproductive failure in native habitat	
	Source(s)	Notes
	Lim, T.K. 2013. <i>Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers.</i> Springer, Dordrecht	"The species is a native of Costa Rica, Central America."

602	Produces viable seed	
	Source(s)	Notes
	Lim, T.K. 2013. <i>Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers.</i> Springer, Dordrecht	[Unknown. No description of seeds provided] "The plant is readily propagated from division of the rhizomes or from stem cuttings."

603	Hybridizes naturally	
	Source(s)	Notes
	Maas, P.J.M. 1972. <i>Costoideae (Zingiberaceae). Flora Neotropica</i> 8: 1-139	[Unknown. Hybridization documented in genus] "Some specimens from Chiriqui, Panama', are intermediate between <i>C. lasius</i> and <i>C. scaber</i> . Woodson (1945) already remarked that some of the specimens cited below were putative hybrids. Their description is as follows:" ... " <i>C. scaber</i> Ruiz & Pavon x <i>C. lasius</i> Loesener" ... "At the present nothing certain can be said with certainty about differences in the floral structure of the four species, since well-preserved flowers were only available of <i>C. scaber</i> . Future collectors are urged to pay more attention to the flowers of these species and will collect spirit material in addition to dried specimens"

604	Self-compatible or apomictic	
	Source(s)	Notes
	Schemske, D. W. 1980. The evolutionary significance of extrafloral nectar production by <i>Costus woodsonii</i> (Zingiberaceae): an experimental analysis of ant protection. <i>The Journal of Ecology</i> , 6 (3): 959-967	[Unknown for <i>C. barbatus</i> . Selfing documented in genus] "This research utilized experimental field and greenhouse approaches to assess the fitness consequences of selfing and out- crossing in three neotropical herbs of the genus <i>Costus</i> (Zingiberaceae). All species are self-compatible, and require a treefall gap for germination and establishment. Self-pollination resulted in lower seed out- put in all species, and this difference was significant for <i>Costus allenii</i> and <i>C. laevis</i> ."

605	Requires specialist pollinators	y
	Source(s)	Notes

Qsn #	Question	Answer
	Temeles, E., Linhart, Y., Michael Masonjones, & Masonjones, H. (2002). The Role of Flower Width in Hummingbird Bill Length Flower Length Relationships. <i>Biotropica</i> , 34(1), 68-80	"APPENDIX 2. Lengths and widths (at orifice) in mm of some tubular flowers visited by two hummingbird species at Monteverde, Costa Rica" [Includes <i>Costus barbatus</i> , which is adapted for bird pollination]
	Feinsinger, P., Beach, J. H., Linhart, Y. B., Busby, W. H., & Murray, K. G. (1987). Disturbance, pollinator predictability, and pollination success among Costa Rican cloud forest plants. <i>Ecology</i> , 68(5), 1294-1305	"TABLE 1. Plant species visited by nectar-feeding birds on study plots in the Monteverde Cloud Forest Reserve and used in this analysis. Each observation lasted the first six daylight hours." [Includes <i>Costus barbatus</i> , presumably a bird-pollinated species]

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Lim, T.K. 2013. <i>Edible Medicinal And Non-Medicinal Plants</i> . Volume 7, Flowers. Springer, Dordrecht	"The plant is readily propagated from division of the rhizomes or from stem cuttings."

607	Minimum generative time (years)	
	Source(s)	Notes
	Lim, T.K. 2013. <i>Edible Medicinal And Non-Medicinal Plants</i> . Volume 7, Flowers. Springer, Dordrecht	"The plant is readily propagated from division of the rhizomes or from stem cuttings." [Unknown. Plant can probably reproduces vegetatively prior to first flowering]

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Maas, P.J.M. 1972. Costoideae (Zingiberaceae). <i>Flora Neotropica</i> 8: 1-139	[Unlikely. Fruits & seeds, if produced, lack means of external attachment] "Nothing is known about the seed-dispersal of the Costoideae; they might be myrmecochores." ... "Capsule unknown."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Lim, T.K. 2013. <i>Edible Medicinal And Non-Medicinal Plants</i> . Volume 7, Flowers. Springer, Dordrecht	"It is a common cultivated <i>Costus</i> species and a very popular ornamental and provides beautiful cut flower."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Maas, P.J.M. 1972. Costoideae (Zingiberaceae). <i>Flora Neotropica</i> 8: 1-139	[No evidence. Seeds may not be produced in cultivation] "Nothing is known about the seed-dispersal of the Costoideae; they might be myrmecochores." ... "Capsule unknown."

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes

Qsn #	Question	Answer
	Maas, P.J.M. 1972. Costoideae (Zingiberaceae). Flora Neotropica 8: 1-139	[Generic description. No adaptations for wind dispersal] "The fruit is a thin-walled capsule crowned by the persistent calyx. In many species of <i>Costus</i> the fruit is indehiscent and the seeds are released by the decaying of the fruit-wall which leaves a tri-lobate septal remnant." ... "Nothing is known about the seed-dispersal of the Costoideae; they might be myrmecochores."

705	Propagules water dispersed	
	Source(s)	Notes
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	"The plant is readily propagated from division of the rhizomes or from stem cuttings." [Unknown. Possible that rhizome fragments could be moved by water if growing in riparian areas]

706	Propagules bird dispersed	
	Source(s)	Notes
	Lefevre, K.L. 2008. The influence of human disturbance on avian frugivory and seed dispersal in a neotropical rainforest. PhD Dissertation. University of Toronto, Toronto	[Unknown if <i>C. barbatus</i> seeds are produced in cultivation. Related taxon is bird dispersed] "Appendix 2A. Fruiting plants of the lower montane rainforest of Tobago, West Indies (2003 and 2004 dry seasons)" ... " <i>Costus scaber</i> - Dispersal mode = bird"

707	Propagules dispersed by other animals (externally)	
	Source(s)	Notes
	Maas, P.J.M. 1972. Costoideae (Zingiberaceae). Flora Neotropica 8: 1-139	[Possibly, if seeds are produced in cultivation] "Nothing is known about the seed-dispersal of the Costoideae; they might be myrmecochores."

708	Propagules survive passage through the gut	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	Unknown. Seeds might not be produced in cultivation

801	Prolific seed production (>1000/m2)	n
	Source(s)	Notes
	Maas, P.J.M. 1972. Costoideae (Zingiberaceae). Flora Neotropica 8: 1-139	"Capsule unknown."
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 7, Flowers. Springer, Dordrecht	[No description of fruits or seeds. May be limited or absent in cultivation] "Flowers with short calyx tube 13–17 mm, corolla yellow, densely pubescent with tubular labellum 26 by 24 mm." ... "The plant is readily propagated from division of the rhizomes or from stem cuttings."

802	Evidence that a persistent propagule bank is formed (>1 yr)	

Qsn #	Question	Answer
	Source(s)	Notes
	Royal Botanic Gardens Kew. (2016) Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/ . [Accessed 29 Jun 2016]	"Storage Behaviour: No data available for species. Of 1 known taxa of genus <i>Costus</i> , 100.00% Orthodox"

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	
	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	[Possibly Yes. Other <i>Costus</i> species can tolerate damage to and spread from rhizomes & rhizome fragments] " <i>Costus woodsonii</i> " ... "Its rhizomes are robust and invasive, and once established they are difficult to remove[easily propagated by shoots that develop on the inflorescences."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Thrives in tropical climates
- Other *Costus* species have naturalized and may be invasive
- Shade tolerant
- Reproduces vegetatively by rhizomes
- Lack of ecological information minimizes accuracy of risk prediction

Low Risk Traits

- No evidence of naturalization or invasiveness outside native range
- Unarmed (no spines, thorns or burrs)
- Non-toxic
- Edible flowers
- Ornamental value
- Hummingbird-pollinated in native range (may limit seed set where hummingbirds are absent)
- Limited or lacking seed production may minimize longer distance dispersal