

Taxon: *Leucospermum cordifolium* (Knight) Fourc.

Family: Proteaceae

Common Name(s): red pincushion protea

Synonym(s): *Leucadendron cordifolium* Knight
Leucadendron nutans Kuntze
Leucospermum nutans R. Br.

Assessor: Chuck Chimera

Status: Assessor Approved

End Date: 4 Apr 2017

WRA Score: -5.0

Designation: L

Rating: Low Risk

Keywords: Shrub, Mediterranean Climate, Ornamental, Bird-Pollinated, Ant-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)	Intermediate
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	n
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		
302	Garden/amenity/disturbance weed		
303	Agricultural/forestry/horticultural weed		
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		
409	Is a shade tolerant plant at some stage of its life cycle		

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	n
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	y
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	3
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	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m ²)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
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
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 4 Apr 2017]	[No evidence of domestication] " <i>Leucospermum cordifolium</i> belongs to the protea family and is indigenous to South Africa. It grows in acid, nutrient poor soils in a fairly small area in the South Western Cape, from the Kogelberg to the Soetanyenberg near Bredasdorp. It is part of the Cape Floral Kingdom and occurs only in the winter rainfall area with its wet winters from May to September and hot, dry summers from December to the end of February. Other genera of the protea family, which produce striking and ornamental flowers, are <i>Leucadendron</i> and <i>Protea</i> ."

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

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2017. Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	Intermediate
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Mar 2017]	"Native: Africa; Southern Africa: South Africa - Cape Province" ["Table Mountain and the mountains of the south-western Cape have a Mediterranean climate, enjoying long warm and dry summers and a cool and wet but relatively short winter." http://thefynbosguy.com/capemountain-environment/cape-climate/]

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

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes

Qsn #	Question	Answer
	Dave's Garden. 2017. Pincushion Protea - <i>Leucospermum cordifolium</i> . http://davesgarden.com/guides/pf/go/97971/ . [Accessed 4 Apr 2017]	"Hardiness: USDA Zone 9a: to -6.6 °C (20 °F) USDA Zone 9b: to -3.8 °C (25 °F) USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 11: above 4.5 °C (40 °F)"
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 4 Apr 2017]	" <i>Leucospermum cordifolium</i> belongs to the protea family and is indigenous to South Africa. It grows in acid, nutrient poor soils in a fairly small area in the South Western Cape, from the Kogelberg to the Soetanyberg near Bredasdorp. It is part of the Cape Floral Kingdom and occurs only in the winter rainfall area with its wet winters from May to September and hot, dry summers from December to the end of February."

204	Native or naturalized in regions with tropical or subtropical climates	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 4 Apr 2017]	"Native: Africa Southern Africa: South Africa - Cape Province" [Mediterranean climate]

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 4 Apr 2017]	"Nurseries in Israel, California, Hawaii, Zimbabwe, Australia and New Zealand produce large amount of cut flowers of hybrids and cultivars of this South African plant. In South Africa it is a popular garden plant as well as a much-used cut flower."
	Dave's Garden. 2017. Pincushion Protea - <i>Leucospermum cordifolium</i> . http://davesgarden.com/guides/pf/go/97971/ . [Accessed 4 Apr 2017]	"Regional This plant has been said to grow in the following regions: Aliso Viejo, California Arroyo Grande, California Carlsbad, California (2 reports) Diamond Bar, California La Mesa, California Manhattan Beach, California Mission Viejo, California Oceanside, California Sacramento, California San Leandro, California Spring Valley, California Vista, California"
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	Cultivated in the Hawaiian Islands

301	Naturalized beyond native range	
-----	---------------------------------	--

Qsn #	Question	Answer
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Reported as naturalized and as a weed, but investigation of sources cited are inconclusive
302	Garden/amenity/disturbance weed	
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Cited as a weed. Confirmation needed [reference cited was inconclusive]
303	Agricultural/forestry/horticultural weed	
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
304	Environmental weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
305	Congeneric weed	
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Leucospermum conocarpodendron, Leucospermum gerrardii, & Leucospermum reflexum cited as naturalized and weeds. Unable to confirm with references cited.
401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	" <i>Leucospermum cordifolium</i> is a rounded spreading shrub up to 2 m in diameter and about 1,5 m high, with a single main stem and horizontally spreading stems, hard green leaves and 1 to 3 large inflorescences borne at the end on the stem."
402	Allelopathic	
	Source(s)	Notes
	WRA Specialist. 2017. Personal Communication	Unknown. No evidence found

Qsn #	Question	Answer
403	Parasitic	n
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	" <i>Leucospermum cordifolium</i> is a rounded spreading shrub up to 2 m in diameter and about 1,5 m high, with a single main stem and horizontally spreading stems, hard green leaves and 1 to 3 large inflorescences borne at the end on the stem." [Proteaceae. No evidence]]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	WRA Specialist. 2017. Personal Communication	Unknown

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

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 4 Apr 2017]	" <i>Leucospermum cordifolium</i> is an excellent garden plant, as a focal point or planted in groups, and provides good, long-stemmed cut flowers. The plants are relatively short lived and become leggy after about eight years. They are very sensitive to the fungal disease <i>Phytophthora cinnamomeum</i> ."

Qsn #	Question	Answer
	Knox-Davies, P. S., Van Wyk, P. S., & Marasas, W. F. O. (1985). Diseases of proteas and their control in the South-Western Cape. <i>ISHS Acta Horticulturae</i> 185: 189-200	"Most local protea diseases are caused by fungi belonging to the Loculoascomycotina and Deuteromycotina. There are no records of any rusts, smuts, powdery mildews, downy mildews, or bacterial or viral diseases. Many leaf specks, leaf blotches and leaf spots reduce the value of cut flowers. Important leaf spot diseases are those caused by <i>Mycosphaerella proteae</i> on <i>Protea neriifolia</i> and <i>Protea grandiceps</i> , by <i>Leptosphaeria protearum</i> on <i>Protea magnifica</i> and by <i>Batcheloromyces proteae</i> on certain <i>Protea cynaroides</i> ecotypes. Canker, die-back, anthracnose and blighting of shoots and twigs are especially common in older plantations. <i>Colletotrichum gloeosporioides</i> is important on <i>Protea compacta</i> and other species, whereas a <i>Drechslera</i> sp. causes blighting of certain <i>Leucospermum cordifolium</i> cultivars. The role of <i>Botryosphaeria</i> spp. is not clear, though they seem to be extremely successful opportunistic colonizers of protea shoots, flower parts and seeds. Scab is caused by an <i>Elsinoe</i> sp. Corky lesions develop on stems and leaves, particularly of <i>L. cordifolium</i> , and flowering is reduced. Control of above-ground fungal diseases is largely by applying sanitation measures, by avoiding susceptible species and cultivars, and by strategic use of fungicides. Witches' broom is an important disease of <i>P. cynaroides</i> , <i>P. neriifolia</i> and <i>P. compacta</i> X <i>P. neriifolia</i> hybrids. Control is by controlling the mite <i>Aceria proteae</i> and by strict sanitation. Damping-off and seedling blight occur sporadically. Some common pathogens are involved, but only <i>C. gloeosporioides</i> has been studied to any extent. It is controlled by thiram seed treatment. <i>Phytophthora cinnamomi</i> root rot is particularly severe on <i>Leucadendron argenteum</i> , <i>Leucospermum cordifolium</i> , <i>Leucadendron discolor</i> and <i>Leucadendron tinctum</i> . Losses are reduced by avoiding soils with a history of root rot and by planting tolerant species or cultivars. Cuttings sometimes die in mistbeds. A preplant treatment with captafol has given promising control. Postharvest diseases include rhizopus and botrytis decay of <i>L. cordifolium</i> blooms and blackening of <i>Protea</i> leaves. Use of disease-resistant cultivars is an important general disease control measure. But erosion of disease resistance in breeding programs means that shifts in importance of the different pathogens could occur. There is also the danger that indigenous pathogens will be disseminated on breeding material distributed to growers."
	Knox-Davies, P. S. (1975). Decline disease of silver trees and other indigenous species. <i>Veld & Flora</i> , 61(2), 20-21	" <i>Phytophthora cinnamomi</i> has a wide host range and a list of non-hosts would probably be shorter than a host list. However, not all hosts are killed as spectacularly as the silver tree: many simply appear unthrifty and undergo a slow decline." [Very susceptible - <i>Leucospermum cordifolium</i>]

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

408	Creates a fire hazard in natural ecosystems	

Qsn #	Question	Answer
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 4 Apr 2017]	[Seeds adapted to fire. Adult plants killed. Ecosystem is fire prone] "In their natural environment the seeds are collected by ants, stored in the soil, and germinate only after a fire has killed the mature plants and returned the nutrients back to the soil."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 4 Apr 2017]	"Seed can be sown in an open seedbed in full sun, or in a seed-tray placed in a sunny position."
	Dave's Garden. 2017. Pincushion Protea - <i>Leucospermum cordifolium</i> . http://davesgarden.com/guides/pf/go/97971/ . [Accessed 4 Apr 2017]	"Sun Exposure: Full Sun Sun to Partial Shade Light Shade"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	n
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	"It grows in acid, nutrient poor soils in a fairly small area in the South Western Cape, from the Kogelberg to the Soetanyberg near Bredasdorp."
	Dave's Garden. 2017. Pincushion Protea - <i>Leucospermum cordifolium</i> . http://davesgarden.com/guides/pf/go/97971/ . [Accessed 4 Apr 2017]	"Soil pH requirements: 5.6 to 6.0 (acidic) 6.1 to 6.5 (mildly acidic) 6.6 to 7.5 (neutral)"

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	" <i>Leucospermum cordifolium</i> is a rounded spreading shrub up to 2 m in diameter and about 1,5 m high, with a single main stem and horizontally spreading stems, hard green leaves and 1 to 3 large inflorescences borne at the end on the stem."

412	Forms dense thickets	n
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 4 Apr 2017]	[No evidence] " <i>Leucospermum cordifolium</i> belongs to the protea family and is indigenous to South Africa. It grows in acid, nutrient poor soils in a fairly small area in the South Western Cape, from the Kogelberg to the Soetanyberg near Bredasdorp."

501	Aquatic	n
-----	---------	---

Qsn #	Question	Answer
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 4 Apr 2017]	[Terrestrial shrub] " <i>Leucospermum cordifolium</i> belongs to the protea family and is indigenous to South Africa. It grows in acid, nutrient poor soils in a fairly small area in the South Western Cape, from the Kogelberg to the Soetanyenberg near Bredasdorp."

502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Mar 2017]	Family: Proteaceae

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

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	" <i>Leucospermum cordifolium</i> is a rounded spreading shrub up to 2 m in diameter and about 1,5 m high, with a single main stem and horizontally spreading stems, hard green leaves and 1 to 3 large inflorescences borne at the end on the stem."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Paterson-Jones, C. 2007. <i>Protea</i> . Struik Publishers, Cape Town, South Africa	" <i>Leucospermum cordifolium</i> is common on the Agulhas Plain, thriving on acidic soils derived from Table Mountain sandstone."

602	Produces viable seed	y
	Source(s)	Notes

Qsn #	Question	Answer
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	"Seed is sown at the end of February when the nights get cooler. For best results always use fresh seed. Soak <i>Leucospermum</i> seed in water to which hydrogen peroxide has been added, at the ratio of 1% of the total volume. This loosens the outer seedcoat and oxygenates the seed. The softened seedcoat is rubbed off. Dust the seed with a systemic fungicide. Sow on a well drained medium, firm down and cover with a layer of sand. Seed can be sown in an open seedbed in full sun, or in a seed-tray placed in a sunny position. Germination starts after three to four weeks. The seedlings will have to be pricked out in batches, as the seed germinates at different times. If the root is very long and has been removed without damaging the root-tip, the root-tip should be pinched off to promote root growth."

603	Hybridizes naturally	
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 4 Apr 2017]	[Artificial hybrids possible] "Nurseries in Israel, California, Hawaii, Zimbabwe, Australia and New Zealand produce large amount of cut flowers of hybrids and cultivars of this South African plant. "

604	Self-compatible or apomictic	
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 4 Apr 2017]	"The flowers are not self-pollinating and depend on the small Scarab beetles and the birds for pollination. The birds are accustomed to the visitors in the Gardens and provide great photo opportunities when feeding on the flowers." [Not self-pollinating, but self-compatibility unknown]

605	Requires specialist pollinators	y
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	"An added attraction during flowering time are the numerous birds found near the plants. In the early hours of the morning the abundant nectar flow attracts a variety of small insects, which in turn attract the Cape Sugar bird and three species of Sunbird. These insectivorous birds consume the small insects as well as the nectar, and in the process transfer pollen from one flower to the next. The flowers are not self-pollinating and depend on the small Scarab beetles and the birds for pollination. The birds are accustomed to the visitors in the Gardens and provide great photo opportunities when feeding on the flowers."

Qsn #	Question	Answer
606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Duncan, G., Brown, N. & Nurrish, L. 2013. Grow Proteas. Second Edition. South African National Biodiversity Institute, Cape Town, South Africa	"Propagation is from seed or cuttings." [No evidence of vegetative spread]

607	Minimum generative time (years)	3
	Source(s)	Notes
	Brits, G. J. (1986). Influence of fluctuating temperatures and H ₂ O ₂ treatment on germination of <i>Leucospermum cordifolium</i> and <i>Serruina florida</i> (Proteaceae) seeds. South African Journal of Botany, 52(4), 286-290	"Seeds' (achenes) of <i>Leucospermum cordifolium</i> (Salisb. ex Knight) Fourcade are dispersed annually at the end of the flowering season in mid-summer. They are released for many years after plants reach the flowering stage in their third or fourth year (Rourke 1972), apparently resulting in the accumulation of a seed reserve in the soil."
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	"Three years after sowing the plants will produce their first flowers."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	"Only a few large, hard, nut-like seeds are produced by each inflorescence. In their natural environment the seeds are collected by ants, stored in the soil, and germinate only after a fire has killed the mature plants and returned the nutrients back to the soil." [No evidence. No means of external attachment]

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	" <i>Leucospermum cordifolium</i> is an excellent garden plant, as a focal point or planted in groups, and provides good, long-stemmed cut flowers. The plants are relatively short lived and become leggy after about eight years."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	"Only a few large, hard, nut-like seeds are produced by each inflorescence. In their natural environment the seeds are collected by ants, stored in the soil, and germinate only after a fire has killed the mature plants and returned the nutrients back to the soil." [No evidence. Unlikely given seed size]

704	Propagules adapted to wind dispersal	n
-----	--------------------------------------	---

Qsn #	Question	Answer
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	"Only a few large, hard, nut-like seeds are produced by each inflorescence. In their natural environment the seeds are collected by ants, stored in the soil, and germinate only after a fire has killed the mature plants and returned the nutrients back to the soil."

705	Propagules water dispersed	n
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	"Only a few large, hard, nut-like seeds are produced by each inflorescence. In their natural environment the seeds are collected by ants, stored in the soil, and germinate only after a fire has killed the mature plants and returned the nutrients back to the soil."

706	Propagules bird dispersed	n
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	"Only a few large, hard, nut-like seeds are produced by each inflorescence. In their natural environment the seeds are collected by ants, stored in the soil, and germinate only after a fire has killed the mature plants and returned the nutrients back to the soil."

707	Propagules dispersed by other animals (externally)	y
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	"In their natural environment the seeds are collected by ants, stored in the soil, and germinate only after a fire has killed the mature plants and returned the nutrients back to the soil."
	Brits, G. J. (1987). Germination depth vs. temperature requirements in naturally dispersed seeds of <i>Leucospermum cordifolium</i> and <i>L. cuneiforme</i> (Proteaceae). <i>South African Journal of Botany</i> , 53(2), 119-124	"Myrmecochory appears to be the principal dispersal method for <i>Leucospermum cordifolium</i> and <i>L. cuneiforme</i> seeds. The mutual dependence of plant and ant is reflected in several morphological adaptations, notably the presence of elaiosomes on the seed (Slingsby & Bond 1985) and a flat, elise-like base of the hypocotyl in the seedling."

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	"Only a few large, hard, nut-like seeds are produced by each inflorescence. In their natural environment the seeds are collected by ants, stored in the soil, and germinate only after a fire has killed the mature plants and returned the nutrients back to the soil."

Qsn #	Question	Answer
801	Prolific seed production (>1000/m²)	n
	Source(s)	Notes
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 20 Mar 2017]	"The inflorescences consist of a large number of small flowers. It is the stiff protruding styles of the flowers which are the source of the common name "pincushion" for this genus. Only a few large, hard, nut-like seeds are produced by each inflorescence."

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	Brits, G. J. (1986). Influence of fluctuating temperatures and H ₂ O ₂ treatment on germination of <i>Leucospermum cordifolium</i> and <i>Serruina florida</i> (Proteaceae) seeds. South African Journal of Botany, 52(4), 286-290	"Seeds' (achenes) of <i>Leucospermum cordifolium</i> (Salisb. ex Knight) Fourcade are dispersed annually at the end of the flowering season in mid-summer. They are released for many years after plants reach the flowering stage in their third or fourth year (Rourke 1972), apparently resulting in the accumulation of a seed reserve in the soil. Seeds will apparently not germinate in undisturbed vegetation until it is destroyed by fire, after which dense, even-aged populations of seedlings emerge. This phenomenon has remained largely unexplained for <i>L. cordifolium</i> and other members of the Proteaceae with hard, nut-like seeds. The direct heat from fire apparently does not break dormancy in these seeds (unpublished results) unlike that in many members of the Leguminosae (Villiers 1972). Since seeds are insensitive to light (Horn 1962; Brown & Van Staden 1973), the improved illumination of burnt exposed soil would not influence germination."

803	Well controlled by herbicides	
	Source(s)	Notes
	WRA Specialist. 2017. 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
	Jamieson, H. 2000. <i>Leucospermum cordifolium</i> . PlantZAfrica. SANBI. https://www.plantzafrica.com/plantklm/leucospcordifol.htm . [Accessed 4 Apr 2017]	[Seeds adapted to fire. Adult plants killed] "In their natural environment the seeds are collected by ants, stored in the soil, and germinate only after a fire has killed the mature plants and returned the nutrients back to the soil."
	Duncan, G., Brown, N. & Nurrish, L. 2013. Grow Proteas. Second Edition. South African National Biodiversity Institute, Cape Town, South Africa	[Tolerates regular pruning] "The bushes flower prolifically and need regular pruning of flowering stems to stimulate new growth, prevent a 'leggy' appearance and lengthen the life of the plant."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. 2017. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Reported to be naturalized and/or a weed but evidence is inconclusive
- Reproduces by seeds
- May be able to hybridize with other *Leucospermum* species
- Reaches maturity in 3 years
- Seeds dispersed by ants & intentionally by people
- Seeds may form a persistent seed bank
- Tolerates pruning (but killed by fire)

Low Risk Traits

- Unarmed (no spines, thorns, or burrs)
- Non-toxic
- Ornamental
- Requires bird pollination (may limit seed set in cultivation)
- Not reported to spread vegetatively
- Relatively large, ant-dispersed seeds limit potential for long distance dispersal