Taxon: Epilobium billardierianum **Family:** Onagraceae

Common Name(s): Aboriginal willowherb
smooth willow herb
variable willow herb

Synonym(s): E. b. subsp. cinereum (A. Rich.) Raven
E. cinereum A. Rich.
E. junceum G. Forster ex Spreng. var.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 18 Nov 2015

WRA Score: 7.0 **Designation:** H(Hawai'i) **Rating:** High Risk

Keywords: Perennial Herb, Naturalized, Weedy, Palatable, Wind-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	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	y
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	n
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed		
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)	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	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)		
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		
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
702	Propagules dispersed intentionally by people	y=1, n=-1	n
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	y
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m2)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	n

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Harden, G.J. (ed.). (1990). Flora of New South Wales, Volume 4. UNSW Press, Kensington, NSW	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"**	**Intermediate**
	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.	[Native to temperate regions, but naturalized in mid- to higher elevation tropical areas] "Native to Australia, New Zealand, and Chatham Islands" ... "in Hawai'i naturalized in open sites in wet forest to disturbed grassland, especially on open lava, in pastures, and along roadsides, 800-3,200 m, on Maui, Hawai'i, and apparently very recently naturalized on Kaua'i in the Koke'e area and on Mount Ka'ala, O'ahu."

202	**Quality of climate match data**	**High**
	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.	

203	**Broad climate suitability (environmental versatility)**	**y**
	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.	[Elevation range exceeds 2000 m, demonstrating environmental versatility] "in Hawai'i naturalized in open sites in wet forest to disturbed grassland, especially on open lava, in pastures, and along roadsides, 800-3,200 m"

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

Qsn #	Question	Answer
	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.	"in Hawai'i naturalized in open sites in wet forest to disturbed grassland, especially on open lava, in pastures, and along roadsides, 800-3,200 m, on Maui, Hawai'i, and apparently very recently naturalized on Kaua'i in the Koke'e area and on Mount Ka'ala, O'ahu. First collected on Maui in 1909 (Faurie 847, BISH)"

205	Does the species have a history of repeated introductions outside its natural range?	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.	"on Maui, Hawai'i, and apparently very recently naturalized on Kaua'i in the Koke'e area and on Mount Ka'ala, O'ahu. First collected on Maui in 1909"
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence [only reported as naturalized in Hawaiian Islands]

301	Naturalized beyond native range	y
	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.	"in Hawai'i naturalized in open sites in wet forest to disturbed grassland, especially on open lava, in pastures, and along roadsides, 800-3,200 m, on Maui, Hawai'i, and apparently very recently naturalized on Kaua'i in the Koke'e area and on Mount Ka'ala, O'ahu. First collected on Maui in 1909 (Faurie 847, BISH)"

302	Garden/amenity/disturbance weed	
	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.	[Disturbance weed, identified as one of the weed threats to endangered plant habitat. See 3.04] "in Hawai'i naturalized in open sites in wet forest to disturbed grassland, especially on open lava, in pastures, and along roadsides, 800-3,200 m"
	New Zealand Plant Conservation Network. (2014). Flora Details - Epilobium billardiereanum. http://www.nzpcn.org.nz/. [Accessed 18 Nov 2015]	[Weedy native] "Inclined to be weedy and probably best left for restoration plantings into dune field rather than general cultivation."

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	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	U.S. Fish and Wildlife Service. 2010. Diplazium molokaiense (no common name). 5-Year Review Summary and Evaluation. U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, HI. http://www.fws.gov/. [Accessed]	[Identified by botanists as among the weed threats to the habitat of Diplazium molokaiense] "Threats to the rich natural ecosystem of East Honomanu include habitat degradation and destruction by feral pigs (Sus scrofa) (Factor A); catastrophic extinction through environmental events, especially flash floods (Factor E); and competition with invasive introduced plant species (Factor E), including Acacia melanoxylon (Australian blackwood) , Ageratina adenophora (sticky snakeroot), Anthoxanthum odoratum (sweet vernal grass), Cerastium fontanum subsp. triviale (common mouse chickweed), Epilobium ciliatum (willow herb), Epilobium billardierianum subsp. cinereum (willow herb), Holcus lanatus (common velvet grass), Hypochoeris radicata (hairy cat's ear), Juncus planifolius (bog rush), Lapsana communis (nipplewort), Prunella vulgaris (self heal), Rubus argutus (blackberry), and Youngia japonica (hawksbeard)."
	Romanowski, N. (2011). Wetland Weeds: Causes, Cures and Compromises. CSIRO Publishing, Collingwood, Australia	[No evidence] "Environmental effects: none recorded; sometimes a food source and refuge for a moth which also feeds on grapevines. Control and management: willowherbs are largely a perceived problem rather than a real one, partly because plants producing seed can look remarkably unattractive, and partly because they spread rapidly into disturbed or recently exposed habitats, including created wetlands."
	Medeiros, A.C., Loope, L.L. & Chimera, C.G. 1998. Flowering Plants and Gymnosperms of Haleakala National Park. Technical Report 120. Pacific Cooperative Studies Unit, Honolulu, HI	[Present but no impacts documented] "Kaupo Gap; Kalapawili; Kipahulu Valley; Manawainui; NE rift; West slope"

305	Congeneric weed	y
	Source(s)	**Notes**
	CABI, (2015). Epilobium ciliatum. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"E. ciliatum is a dicot perennial herb that is native to much of North America, southern South America and East Asia. It has been accidentally introduced into Europe, Australia and New Zealand. The distribution of this species is increasing as it rapidly spreads over Britain and many other European countries. It produces copious wind-borne seed and can, under favourable conditions, complete its life cycle from seed to seed in as little as nine to ten weeks. E. ciliatum has been described as an aggressive species and can become a noxious weed, particularly in agricultural areas. Even in its native range in North America it has proved to be a problem in agricultural land, in orchards and vineyards and in container plants in nurseries. Due to its rapid growth E. ciliatum can outcompete and displace native plant species. It is also possible for it to hybridize with native Epilobium species. Control of E. ciliatum is difficult to achieve due to herbicide resistance and tolerance."

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

Qsn #	Question	Answer
	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 evidence] "Many-branched perennial herbs 1.5-10 dm tall, often reddish-tinged, producing leafy stolons from base, strigillose, often densely so in inflorescence, mixed with glandular or nonglandular erect hairs. Leaves bluish green, usually opposite, sometimes alternate in upper !h, linear to ovate, 0.5-4 cm long, 0.1-1.8 cm wide, margins serrulate to serrate with 1-6(-8) teeth on each side, glabrous to densely strigillose, subsessile."

402	Allelopathic	
	Source(s)	**Notes**
	WRA Specialist. 2015. Personal Communication	Unknown. No evidence found

403	Parasitic	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.	"Many-branched perennial herbs 1.5-10 dm tall..." [No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Scowcroft, P.G. & Conrad, C.E. 1992. Alien and Native Plant Response to Release from Feral Sheep Browsing on Mauna Kea. Pp. 625-665 in Stone, C.P., Smith, C.W. & Tunison, J.T. (eds.). Alien Plant Invasions in Native Ecosystems of Hawai`i: Management and Research. University of Hawaii Cooperative National Park Resources Studies Unit, Honolulu, HI	"Several alien plant species are highly palatable: cocksfoot (Dactylis glomerata), velvet grass, Kentucky bluegrass, Epilobium billardierianum, and Sonchus oleraceus. However, susceptibility to damage by sheep for these and other alien plants is generally lower than for the native plants."

405	Toxic to animals	n
	Source(s)	**Notes**
	HerbiGuide. (2015). Willow Herb - Epilobium spp. http://www.herbiguide.com.au/Descriptions/hg_Willow_Herb.htm. [Accessed 17 Nov 2015]	"Toxicity: Not recorded as toxic."
	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**
	Benson, D., & McDougall, L. (1999). Ecology of Sydney plant species part 7a: Dicotyledon families Nyctaginaceae to Primulaceae. Cunninghamia 6(2): 402-509	"Interaction with other organisms: Foodplant for larvae of Grapevine Moth Phalaenoides glycinae (Common 1990)."

407	Causes allergies or is otherwise toxic to humans	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	HerbiGuide. (2015). Willow Herb - Epilobium spp. http://www.herbiguide.com.au/Descriptions/hg_Willow_Herb.htm. [Accessed 17 Nov 2015]	"Toxicity: Not recorded as toxic."
	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**	
	Source(s)	**Notes**
	Benson, D., & McDougall, L. (1999). Ecology of Sydney plant species part 7a: Dicotyledon families Nyctaginaceae to Primulaceae. Cunninghamia 6(2): 402-509	[Unknown, but no evidence of increased fire risk from this species] "Fire response: Resprouted after high intensity fire (1/94) at Lane Cove; secondary juvenile period less than 3 months (P. Kubiak pers. comm.)."
	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.	[Unlikely. May contribute to fuel load, but relative to grasses & trees, not likely to significantly increase fire risk] "in Hawai'i naturalized in open sites in wet forest to disturbed grassland, especially on open lava, in pastures, and along roadsides"

409	**Is a shade tolerant plant at some stage of its life cycle**	
	Source(s)	**Notes**
	New Zealand Plant Conservation Network. (2014). Flora Details - Epilobium billardiereanum. http://www.nzpcn.org.nz/. [Accessed 18 Nov 2015]	"Does best planted in full sun in a damp sandy soil."
	Hortipedia. (2015). Epilobium billardierianum subsp. cinereum. http://en.hortipedia.com/wiki/Epilobium_billardierianum_subsp._cinereum. [Accessed 18 Nov 2015]	"The perennials prefer a sunny to half-shady situation on moist soil."
	Yarra Ranges Shire Council. 2015. Epilobium billardierianum ssp. cinereum. http://fe.yarraranges.vic.gov.au. [Accessed 17 Nov 2015]	[Semi-shade] "Growing Conditions: Very extensive in moist soils in lowland areas but also on mountains in drier rocky sites. Full sun, semi shade."

Qsn #	Question	Answer
410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	
	Source(s)	**Notes**
	New Zealand Plant Conservation Network. (2014). Flora Details - Epilobium billardiereanum. http://www.nzpcn.org.nz/. [Accessed 18 Nov 2015]	"Does best planted in full sun in a damp sandy soil."
	Benson, D., & McDougall, L. (1999). Ecology of Sydney plant species part 7a: Dicotyledon families Nyctaginaceae to Primulaceae. Cunninghamia 6(2): 402-509	"Substrate: Clay soils on basalt, shale, Devonian sediments, granite, medium–high nutrients."
	HerbiGuide. (2015). Willow Herb - Epilobium spp. http://www.herbiguide.com.au/Descriptions/hg_Willow_Herb.htm. [Accessed 18 Nov 2015]	"The substrate should be sandy-loamy or gritty-loamy soil. "
	Yarra Ranges Shire Council. 2015. Epilobium billardierianum ssp. cinereum. http://fe.yarraranges.vic.gov.au. [Accessed 18 Nov 2015]	"Very extensive in moist soils in lowland areas but also on mountains in drier rocky sites"

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.	"Many-branched perennial herbs 1.5-10 dm tall..."

412	Forms dense thickets	n
	Source(s)	**Notes**
	Daehler, C. C. (2005). Upper-montane plant invasions in the Hawaiian Islands: patterns and opportunities. Perspectives in Plant Ecology, Evolution and Systematics, 7 (3): 203-216	[No evidence. This publication identifies taxa that form dense stands that disrupt recruitment. E. billardierianum is listed in the Appendix, but not identified as a disruptive species] "Appendix: Naturalized plants occurring above 2000m elevation in the Hawaiian Islands. ... D = disruptive in native communities, forming dense stands that appear to inhibit recruitment of natives"
	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 evidence] "naturalized in open sites in wet forest to disturbed grassland, especially on open lava, in pastures, and along roadsides, 800-3,200 m"
	Scowcroft, P.G. & Conrad, C.E. 1992. Alien and Native Plant Response to Release from Feral Sheep Browsing on Mauna Kea. Pp. 625-665 in Stone, C.P., Smith, C.W. & Tunison, J.T. (eds.). Alien Plant Invasions in Native Ecosystems of Hawai`i: Management and Research. University of Hawaii Cooperative National Park Resources Studies Unit, Honolulu, HI	Present. No evidence of dense stands

Qsn #	Question	Answer
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 herb] "Many-branched perennial herbs ... in Hawai'i naturalized in open sites in wet forest to disturbed grassland, especially on open lava, in pastures, and along roadsides..."

502	**Grass**	**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.	Onagraceae

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.	"Many-branched perennial herbs 1.5-10 dm tall..." [Onagraceae]

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Benson, D., & McDougall, L. (1999). Ecology of Sydney plant species part 7a: Dicotyledon families Nyctaginaceae to Primulaceae. Cunninghamia 6(2): 402-509	"Growth form: Erect stoloniferous perennial herb to 1 m high, with toothed leaves 6–18 mm wide."

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Benson, D., & McDougall, L. (1999). Ecology of Sydney plant species part 7a: Dicotyledon families Nyctaginaceae to Primulaceae. Cunninghamia 6(2): 402-509	[No evidence] "Distribution Sydney area: Widespread but mainly Tablelands." ... "Conservation: Probably adequately conserved"

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	New Zealand Plant Conservation Network. (2014). Flora Details - Epilobium billardiereanum. http://www.nzpcn.org.nz/. [Accessed 18 Nov 2015]	"Easily grown from rooted pieces and fresh seed."

Qsn #	Question	Answer
603	**Hybridizes naturally**	
	Source(s)	**Notes**
	Royal Botanic Gardens Victoria. 2015. VicFlora Flora of Victoria - Epilobium billardierianum subsp. cinereum. http://data.rbg.vic.gov.au/vicflora/. [Accessed 18 Nov 2015]	"Known to hybridize with E. billardierianum subsp. billardierianum where the two subspecies grow together." [Unknown if interspecific hybrids occur]

604	**Self-compatible or apomictic**	
	Source(s)	**Notes**
	WRA Specialist. 2015. Personal Communication	Unknown. Both self-fertility & self-sterility reported in genus

605	**Requires specialist pollinators**	
	Source(s)	**Notes**
	Museum Victoria. 2015. Plant Pollination Index Query. http://flyaqis.mov.vic.gov.au/cgi-bin/texhtml?form=bio_beej. [Accessed 18 Nov 2015]	Pollinated by Lasioglossum (Chilalictus) brazier (Halictidae) within its native range

606	**Reproduction by vegetative fragmentation**	**y**
	Source(s)	**Notes**
	McIntyre, S., Lavorel, S., & Tremont, R. M. 1995. Plant life-history attributes: their relationship to disturbance response in herbaceous vegetation. Journal of Ecology,83 (1): 31-44	"Appendix1: Life-form, dispersal unit morphology and vegetative reproduction in 365 herb and shrub taxa from temperate grassy vegetation" [Epilobium billardierianum - Vegetative spread: Yes]

607	**Minimum generative time (years)**	**1**
	Source(s)	**Notes**
	HerbiGuide. (2015). Willow Herb - Epilobium spp. http://www.herbiguide.com.au/Descriptions/hg_Willow_Herb.htm. [Accessed 18 Nov 2015]	"Life cycle: Perennial or annual herb. Seeds germinate from autumn to spring and usually only establish in bare moist soil. Plants grow over the cooler months and flower from spring to summer."

701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	
	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.	[Possibly. Distribution along roadsides suggests potential inadvertent movement] "Seeds brown, obovoid, 0.7-1.1 mm long, papillose, the coma white, 5-8 mm long, readily breaking off" ... "naturalized in open sites in wet forest to disturbed grassland, especially on open lava, in pastures, and along roadsides"

702	**Propagules dispersed intentionally by people**	**n**
	Source(s)	**Notes**

Qsn #	Question	Answer
	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.	[Possibly intentionally introduced in the past. No current evidence of intentional movement in the Hawaiian Islands] "in Hawai'i naturalized in open sites in wet forest to disturbed grassland, especially on open lava, in pastures, and along roadsides, 800-3,200 m, on Maui, Hawai'i, and apparently very recently naturalized on Kaua'i in the Koke'e area and on Mount Ka'ala, O'ahu. First collected on Maui in 1909 (Faurie 847, BISH"

703	Propagules likely to disperse as a produce contaminant	y
	Source(s)	**Notes**
	HerbiGuide. (2015). Willow Herb - Epilobium spp. http://www.herbiguide.com.au/Descriptions/hg_Willow_Herb.htm. [Accessed 17 Nov 2015]	"It is a common contaminant of nursery plants."

704	Propagules adapted to wind dispersal	y
	Source(s)	**Notes**
	Benson, D., & McDougall, L. (1999). Ecology of Sydney plant species part 7a: Dicotyledon families Nyctaginaceae to Primulaceae. Cunninghamia 6(2): 402-509	"Dispersal, establishment & growth: Diaspore adapted for wind-dispersal (McIntyre et al. 1995)."

705	Propagules water dispersed	
	Source(s)	**Notes**
	New Zealand Plant Conservation Network. (2014). Flora Details - Epilobium billardiereanum. http://www.nzpcn.org.nz/. [Accessed 18 Nov 2015]	[Distribution suggests water dispersal may be possible] "Coastal. Usually on sparsely vegetated damp sand flats, or sandy ground bordering slow flowing streams, lagoons, ponds and lake margins. Often found in association with oioi (Apodasmia similis), wiwi (Ficinia nodosa) and Juncus spp. On the Chatham Islands, E. billardierianum is occasionally found inland growing on sandy ground in seasonally damp ground or around permnanent water bodies."

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	Yarra Ranges Shire Council. 2015. Epilobium billardierianum ssp. cinereum. http://fe.yarraranges.vic.gov.au. [Accessed 17 Nov 2015]	"Bird Attracting: No"
	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.	"Capsules 3-7.5 cm long. Seeds brown, obovoid, 0.7-1.1 mm long, papillose, the coma white, 5-8 mm long, readily breaking off." [Unlikely. Not fleshy-fruited]

707	Propagules dispersed by other animals (externally)	n
	Source(s)	**Notes**
	Benson, D., & McDougall, L. (1999). Ecology of Sydney plant species part 7a: Dicotyledon families Nyctaginaceae to Primulaceae. Cunninghamia 6(2): 402-509	[No evidence] "Dispersal, establishment & growth: Diaspore adapted for wind-dispersal (McIntyre et al. 1995)."

Qsn #	Question	Answer
708	**Propagules survive passage through the gut**	
	Source(s)	**Notes**
	Scowcroft, P.G. & Conrad, C.E. 1992. Alien and Native Plant Response to Release from Feral Sheep Browsing on Mauna Kea. Pp. 625-665 in Stone, C.P., Smith, C.W. & Tunison, J.T. (eds.). Alien Plant Invasions in Native Ecosystems of Hawai`i: Management and Research. University of Hawaii Cooperative National Park Resources Studies Unit, Honolulu, HI	[Unknown. Consumed by animals. Unknown if seeds can survive intentional or inadvertent consumption] "Several alien plant species are highly palatable: cocksfoot (Dactylis glomerata), velvet grass, Kentucky bluegrass, Epilobium billardierianum, and Sonchus oleraceus. However, susceptibility to damage by sheep for these and other alien plants is generally lower than for the native plants."

801	**Prolific seed production (>1000/m2)**	**n**
	Source(s)	**Notes**
	Smith, B. M. A., Loneragan, W. A., Grant, C. D., & Koch, J. M. (2000). Effect of fire on the topsoil seed banks of rehabilitated bauxite mine sites in the jarrah forest of Western Australia. Ecological Management & Restoration, 1(1): 50-60	"Appendix I. Topsoil seed densities (per m2) for species showing densities of more than 10 seeds per m2 in either 5-year-old rehabilitation (1992), 8-year-old rehabilitation (1989) or jarrah forest soil" [Epilobium billardierianum measured at densities of 34.38 (1992), 42.19 (1989), and 107.81 (Jarrah forest) seeds per m2]

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Royal Botanic Gardens Kew. (2015) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/. [Accessed 18 Nov 2015]	"Storage Behaviour: Orthodox Storage Conditions: 95 % viability following drying to mc's in equilibrium with 15 % RH and freezing for 46 days at -20C at RBG Kew, WP"

803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	HerbiGuide. (2015). Willow Herb - Epilobium spp. http://www.herbiguide.com.au/Descriptions/hg_Willow_Herb.htm. [Accessed 18 Nov 2015]	"Tolerant to some common herbicides such as glyphosate." ... "Eradication strategies: Apply 4 L/ha amitrole250 plus 0.25% wetting agent to existing plants in late autumn to early spring, then 6-8 weeks later apply 3 L/ha amitrole plus 2 kg/ha diuron900 plus 0.25% wetting agent. Repeat annually. Control neighbouring infestations to prevent wind blown seed re infesting the site. For spot spraying use 10 ml amitrole250 plus 2 g diuron900 plus 2.5 mL wetting agent per litre of water."

Qsn #	Question	Answer
804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**
	Benson, D., & McDougall, L. (1999). Ecology of Sydney plant species part 7a: Dicotyledon families Nyctaginaceae to Primulaceae. Cunninghamia 6(2): 402-509	"Fire response: Resprouted after high intensity fire (1/94) at Lane Cove; secondary juvenile period less than 3 months (P. Kubiak pers. comm.)."
	Kubiak, P. J. 2009. Fire responses of bushland plants after the January 1994 wildfires in northern Sydney. Cunninghamia, 11(1): 131-165	[Epilobium billardierianum var. cinereum - R = majority of adult plants resprouted after the 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."

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.	[No evidence] "in Hawai'i naturalized in open sites in wet forest to disturbed grassland, especially on open lava, in pastures, and along roadsides, 800-3,200 m, on Maui, Hawai'i, and apparently very recently naturalized on Kaua'i in the Koke'e area and on Mount Ka'ala, O'ahu. First collected on Maui in 1909 (Faurie 847, BISH)"

Summary of Risk Traits:

High Risk / Undesirable Traits
• Elevation range exceeds 2000 m, demonstrating environmental versatility
• Temperate species that is naturalized in tropical climates
• Naturalized on Kauai, Oahu, Maui & Hawaii islands
• Environmental weed that threatens the endangered Hawaiian fern Diplazium molokaiense
• Other Epilobium species are invasive
• Reproduces by seeds & vegetatively
• Able to reach maturity in one growing season
• Seeds dispersed by wind & possibly due to human activities
• Able to resprout after fires

Low Risk Traits
• Unarmed (no spines, thorns or burrs)
• Palatable go grazing animals
• Non-toxic
• May not be able to establish in dense shade
• Certain herbicides may provide effective control