Taxon: Erigeron bonariensis **Family:** Asteraceae

Common Name(s): Argentine fleabane
bonar horseweed
flax-leaf fleabane
hairy fleabane
hairy horseweed
large horseweed
wavy-leaf fleabane

Synonym(s): Conyza bonariensis (L.) Cronquist
Erigeron crispus Pourr.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 4 Nov 2015

WRA Score: 17.0 **Designation:** H(Hawai'i) **Rating:** High Risk

Keywords: Annual Herb, Crop Weed, Self-Fertile, Wind-Dispersed, Seed Contaminant

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	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	y
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)	y
304	Environmental weed		
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

Qsn #	Question	Answer Option	Answer
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans		
408	Creates a fire hazard in natural ecosystems		
409	Is a shade tolerant plant at some stage of its life cycle		
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	y
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
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	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	y
702	Propagules dispersed intentionally by people	y=1, n=-1	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	y=1, n=-1	y
706	Propagules bird dispersed		
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	y
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	y=1, n=-1	n
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**
	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.	[Cosmopolitan weed. No evidence of domestication] "Perhaps native to South America but nearly cosmopolitan in distribution..."

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

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. 2015. Personal Communication	NA

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**High**
	Source(s)	**Notes**
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/. [Accessed 2 Nov 2015]	"Native: SOUTHERN AMERICA Northern South America: French Guiana; Guyana; Suriname Brazil: Brazil Western South America: Bolivia; Peru Southern South America: Argentina; Chile; Paraguay; Uruguay"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/. [Accessed 2 Nov 2015]	

Qsn #	Question	Answer
203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Although occurring mainly in warm temperate climates, it has wide adaptation to hotter climates and can be found in many sub-tropical regions, and even tropical zones especially at higher altitudes. In Europe, it is found mainly in the Mediterranean region, though has recently been recorded further north. There is little evidence for preference regarding soil type. In Bhutan, it occurs at a wide range of altitudes, whereas C. floribunda is found mainly in lowlands, below 2000 m and C. canadensis tends to be restricted to higher altitudes, over 2000 m (Parker, 1992). C. bonariensis has been recorded at altitudes up to 3900 m in Bolivia (Missouri Botanical Garden, 2004)."

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/. [Accessed 2 Nov 2015]	"Naturalized: AFRICA Macaronesia: Cape Verde; Portugal - Azores, Madeira Islands; Spain - Canary Islands Northern Africa: Algeria; Egypt; Libya; Morocco; Tunisia Northeast Tropical Africa: Eritrea; Ethiopia East Tropical Africa: Kenya; Tanzania; Uganda West-Central Tropical Africa: Rwanda; Sao Tome and Principe West Tropical Africa: Ghana Southern Africa: Botswana; Lesotho; Namibia; South Africa; Swaziland ASIA-TEMPERATE Arabian Peninsula: Oman; Yemen Western Asia: Afghanistan; Cyprus; Egypt - Sinai; Iran; Iraq; Israel; Jordan; Lebanon; Syria; Turkey Caucasus: Azerbaijan; Georgia China: China Eastern Asia: Japan - Honshu; Korea, South; Taiwan ASIA-TROPICAL Indian Subcontinent: Bhutan; India; Nepal; Pakistan; Sri Lanka Malesia: Malaysia AUSTRALASIA Australia: Australia New Zealand: New Zealand EUROPE Northern Europe: United Kingdom Middle Europe: Belgium; Germany; Netherlands; Switzerland Southeastern Europe: Albania; Bulgaria; Croatia; Greece [incl. Crete]; Italy [incl. Sardinia, Sicily]; Macedonia; Montenegro; Slovenia Southwestern Europe: France [incl. Corsica]; Portugal; Spain [incl. Baleares] NORTHERN AMERICA Northwestern U.S.A.: United States - Oregon Southeastern U.S.A.: United States - Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Virginia South-Central U.S.A.: United States - New Mexico, Texas Southwestern U.S.A.: United States - Arizona, California, Utah Mexico PACIFIC North-Central Pacific: U.S. Outlying Islands - Midway Islands; United States - Hawaii Northwestern Pacific: Marshall Islands; Northern Mariana Islands; U.S. Outlying Islands - Wake Island South-Central Pacific: French Polynesia; Pitcairn Southwestern Pacific: New Caledonia; Niue SOUTHERN AMERICA Caribbean: Antigua and Barbuda; Bahamas; Barbados; Cuba; Dominica; Grenada; Guadeloupe; Hispaniola; Jamaica; Martinique; Montserrat; Netherlands Antilles; Puerto Rico; St. Kitts and Nevis; St. Lucia; St. Vincent and Grenadines; Virgin Islands (British); Virgin Islands (U.S.) Mesoamerica: Belize; Costa Rica; Guatemala; Honduras; Nicaragua; Panama Northern South America: Venezuela Western South America: Ecuador - Galapagos Islands"

Qsn #	Question	Answer
205	**Does the species have a history of repeated introductions outside its natural 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.	"Perhaps native to South America but nearly cosmopolitan in distribution"
301	**Naturalized beyond native range**	**y**
	Source(s)	**Notes**
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"C. bonariensis was first described from Argentina and is probably native to the more temperate parts of South America (Michael, 1977), but it is now widely spread through most warmer regions of Europe, Africa, Asia, the Caribbean and Central America. The situation in North America is somewhat confused, with USDA-NRCS (2004) noting a continuous distribution across the southern USA from California to Florida, north to Oregon, North Carolina and Virginia but not Hawaii or Puerto Rico; whereas USDA-ARS (2004) records presence only California in mainland USA, and Hawaii and Puerto Rico also. This may be explained by the use of C. floribunda as a synonym by USDA-NRCS (2004), thus these additional USA states records may belong to this species and not C. bonariensis in the sense used in this datasheet. Missouri Botanical Garden (2004) do note, however, presence in Lousiana, Mississippi and Florida in addition to California, indicating that the situation is not clear and requires resolution."
	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 a common weed in various urban and nonurban areas, generally in relatively dry habitats, sometimes in disturbed mesic to wet forest, on Kure Atoll, Midway Atoll, Laysan, French Frigate Shoals, and all of the main islands. Naturalized prior to 1871 (Hillebrand, 1888)"
302	**Garden/amenity/disturbance weed**	
	Source(s)	**Notes**
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Found in dry and in moderately moist regions. A weed in cultivated areas and waste places."
	DiTomaso, J. 2007. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	"Hairy fleabane typically inhabits dry places and is mostly an urban and agricultural weed or highly disturbed and often compacted soils (i.e ., roadsides) in southern California."
	WRA Specialist. 2015. Personal Communication	A disturbance weed with negative agricultural impacts
303	**Agricultural/forestry/horticultural weed**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"C. bonariensis is a mainly annual herbaceous weed overwinters as a rosette, and spreads by producing high numbers of wind-dispersed seeds. It prefers undisturbed sites and is a particular problem in low-tillage systems such as orchards and plantations but also in some agricultural crops. It may be controlled by tillage at a suitable growth stage, but otherwise, it has developed resistance to many herbicides in a large number of countries. It has been introduced internationally as a seed contaminant and there is a risk of further similar introduction to countries where it is not yet established. It could become a problem invasive in protected areas, though may be controlled naturally by succession." ... "C. bonariensis, though only recorded as a major weed in two countries, Argentina and Brazil (Holm et al., 1979), is frequently noted as a dominant weed, especially in orchards (for example, in olives in Spain and in apple in Pakistan) and pastures. Nevertheless, no single species competition studies have been conducted, and any crop loss data are inevitably confounded by the presence of other weed species. The widespread development of resistance to herbicides means, however, that it is tending to increase in importance. Economic impacts may also arise from the effects of C. bonariensis as a host for crop pests, as is common with other Conyzo species. C. bonariensis has been noted as an important host for various ant species, reported to be serious crop pests in China (Xie and Yao, 1989)."

304	Environmental weed	
	Source(s)	**Notes**
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Potentially] "That C. bonariensis is principally a weed in undisturbed land, poses the risk that it may become invasive in protected areas."

305	Congeneric weed	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	CABI, 2015. Erigeron karvinskianus. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Erigeron karvinskianus is a widely grown herbaceous ornamental, belonging to the Asteraceae (or Compositae; commonly known as the daisy family) that was described based on a type from Mexico. It is native to Mexico, Honduras, El Salvador and Guatemala but occurs widely as a weed in subtropical and temperate regions of the world. It is now known from North, South, and Central America, the West Indies, Southern and Western Europe, Africa, the Indian Ocean Islands, India and oceanic regions of Asia, Australia, New Zealand and the Pacific islands (Nesom and Pruski, 2011). It can grow in almost any open habitat, and reproduces and spreads rapidly to form dense mats, smothering native plants. It produces huge amounts of anemochorous seeds that travel long distances, and tolerates a broad range of environmental conditions. There is no information on its natural enemies. It is considered as one of the major invasive plants in Hawaii and Réunion, according to the IUCN SSC Invasive Species Specialist Group (Global Invasive Species Database, 2008). It is also considered as a High Risk weed by the Pacific Island Ecosystems at Risk assessment with a score of 11 (PIER, 2012). It is listed as one of the 300 major invasive plants in tropical islands of the Indian and Pacific Oceans, Australia, New Zealand and South Africa (Meyer et al., 2006). It is treated as invasive, with laws against its introduction, in several countries, for example Portugal, New Zealand (where it is listed as one of the 120 major invasive plants) and New Caledonia. However it is still very easily available in dedicated shops, in the mail-order trade and on the Internet, and commonly found in cultivation in its whole current range and elsewhere."

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence] "Plants 1-10(-15) dm tall, often branched near base or unbranched, densely pubescent. Leaves numerous, usually grayish green, lower ones up to 15 cm long and 2 cm wide, becoming progressively smaller upward, usually 3-6 cm long and 0.5-1 cm wide, coarsely serrate."

402	Allelopathic	
	Source(s)	**Notes**
	Liu, M. J., Xu, G. F., & Jiang, H. (2008). Bioassay of Allelopathy in Invasive Plant Conyza bonariensis [J]. Journal of Henan Agricultural Sciences, 6, 024.	[Extracts demonstrate allelopathic properties] "The aqueous solution from the above-ground part of Conyza bonariensis(L.)Crong was used to treat the seeds of four crops,then the seed germination rate,root length,seedling height and simple vigour index were determined.The results showed that the allelopathic effects of C.bonariensis existed.Higher concentration of aqueous solution had significant inhibiting effect on the seed vigour,root length and seedling height,while low concentration of aqueous solution could stimulate the infancy development of Triticum aestivum L.,Phaseolus munge L.,and Raphanus sativus L.The aqueous solution of C.bonariensis contains phenol chemicals."

Qsn #	Question	Answer
	Hefen, L. (2008). Study on Allelopathy of Conyza bonariensis on Several Weeds [J]. Journal of Henan Institute of Science and Technology (Natural Sciences Edition), 1: 006	[Extracts demonstrate allelopathic properties] "Through measuring seedling height, root length and seedling weight, the effects of the water extraction of the stem and leave of Conyza bonariensis on seed germination and seedling growth of Hibiscus trioum L., Pharbitis hederacea L., Digitaria sanguinalis L.and Poa annua L. were studied in the experiment. The results showed that the concentration of 0.05g/mL displayed the promoting effect on the seedling height of Hibiscus trionum L. and the root length of Poa annua L., but the effects was not distinct. For Hibiscus trioum L. and Digitaria sanguinalis L., the seed germination and seedling growth were inhibited by the water extraction of four different concentration and the inhibiting effects became greater with the increasing of the concentration. The concentration of 0.05g/mL and 0.10g/mL display the best greatest effect on Digitaria sanguinalis L., and the inhibiting effect on Pharbitis hederacea L. was the weakest. The concentration of 0.20g/mL and 0.40g/mL display the best greatest inhibiting effect on Poa annua L., while the inhibiting effect on Pharbitis hederacea L. was the weakest."

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.	"Plants 1-10(-15) dm tall, often branched near base or unbranched, densely pubescent." [Asteraceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Abo Omar, J. M., & Omar, M. (2012). Partial replacement of barley grain and soybean meal by fleabane (Conyza bonariensis) in diets of growing Awassi lambs. Animal, 6 (07): 1103-1107	"Fleabane (FB, Conyza bonariensis) is a perennial native summer plant of the family Asteraceae, considered in all agrosystems as a weed. This weed is part of the local rangelands and had been grazed by ruminants since ages. It plays an important role in supplying CP to grazing ruminants and contributes a significant proportion of herbage fed to ruminants. Often, it is plucked or cut and either fed as fresh or conserved fodder."
	Noor, M. J., Ahmad, M., Zafar, M., Sarfraz, M., Yusoff, I., Alias, Y., & Ashraf, M. A. 2014. Floristic and ethnoecological diversity in various habitats of a semi-arid area in the Chakwal district (Pakistan), with special emphasis on medicinal plants. Plant Ecology, DOI 10.1007/s11258-014-0384-1	"Table 1 Ethnobotanical data of the plant species of Chakwal" [Conyza bonariensis - Local uses = Fodder for cattle]
	Singh, V., Gaur, R. D., & Bohra, B. (2008). A survey of fodder plants in mid-altitude Himalayan rangelands of Uttarakhand, India. Journal of Mountain Science, 5(3): 265 -278	"Table 1 Fodder species in the rangeland ecosystems of Uttarakhand Himalaya" [Includes Erigeron bonariensis]

405	Toxic to animals	n
	Source(s)	**Notes**
	Bryson, C.T.& DeFelice, M.S. 2009. Weeds of the South. University of Georgia Press, Athens, GA	"Toxic Properties. None reported."

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

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Economic impacts may also arise from the effects of C. bonariensis as a host for crop pests, as is common with other Conyzo species."
	Shrestha, A., Hembree, K. & Wright, S. (2008). Biology and management of Horseweed and Hairy Fleabane in California. Publication 8314, University of California Division of Agriculture and Natural Resources, Oakland, CA	"Horseweed is also known to be a host plant for the glassy-winged sharp shooter (Wistrom and Purcell 2005)."

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	**Notes**
	Invasoras. 2015. Conyza bonariensis (hairy fleabane). http://invasoras.pt. [Accessed 3 Nov 2015]	"Due to the high production of pollen, it is considered an allergenic plant."
	Sertoli, A., Fabbri, P., Campolmi, P., & Panconesi, E. (1978). Allergic contact dermatitis to Salvia officinalis, Inula viscosa and Conyza bonariensis. Contact Dermatitis, 4(5): 314-315	Possible dermatitis to susceptible individuals

408	Creates a fire hazard in natural ecosystems	
	Source(s)	**Notes**
	Northern Land Manager. 2005. Fire responses of Conyza bonariensis, http://www.landmanager.org.au/fire-responses-conyza-bonariensis. [Accessed 3 Nov 2015]	"Adult fire response: Seeder (>70% mortality when subject to 100% leaf scorch)"
	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.	"generally in relatively dry habitats, sometimes in disturbed mesic to wet forest" [May contribute to fuel load in fire prone areas]
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	No evidence

Qsn #	Question	Answer
409	**Is a shade tolerant plant at some stage of its life cycle**	
	Source(s)	**Notes**
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Seeds need a temperature of 10-25°C, and require light for germination (Zinzolker et al., 1985)."
	Dave's Garden. 2015. Asthmaweed, Flaxleaf Fleabane, Horseweed - Conyza bonariensis. http://davesgarden.com/guides/pf/go/135113/. [Accessed 3 Nov 2015]	"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)**	**y**
	Source(s)	**Notes**
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"There is little evidence for preference regarding soil type." "Soil drainage free impeded Soil reaction acid neutral Soil texture heavy light medium Special soil tolerances infertile saline shallow sodic"
	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.	[Distribution apparently not limited by soil types] "...generally in relatively dry habitats, sometimes in disturbed mesic to wet forest, on Kure Atoll, Midway Atoll, Laysan, French Frigate Shoals, and all of the main islands."

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.	"Plants 1-10(-15) dm tall, often branched near base or unbranched, densely pubescent."

412	**Forms dense thickets**	**y**
	Source(s)	**Notes**
	Shrestha, A., Hembree, K. & Wright, S. (2008). Biology and management of Horseweed and Hairy Fleabane in California. Publication 8314, University of California Division of Agriculture and Natural Resources, Oakland, CA	"These weeds can form dense stands that interfere with the distribution of water, particularly in low volume sprinkler and drip irrigation systems. These weeds also seem to be an aesthetic nuisance both in agroecosystems and natural or man-made landscapes."

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] "in Hawai'i a common weed in various urban and nonurban areas, generally in relatively dry habitats, sometimes in disturbed mesic to wet forest..."

502	**Grass**	**n**

Qsn #	Question	Answer
	Source(s)	**Notes**
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/. [Accessed 2 Nov 2015]	"Family: Asteraceae (alt. Compositae)"

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.	"Plants 1-10(-15) dm tall, often branched near base or unbranched, densely pubescent." [Asteraceae]

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	DiTomaso, J. 2007. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	"Taprooted, with fibrous lateral roots."

601	Evidence of substantial reproductive failure in native habitat	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] "nearly cosmopolitan in distribution"

602	Produces viable seed	y
	Source(s)	**Notes**
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Propagation: By seed. Many thousands of seeds are dispersed by the wind."

603	Hybridizes naturally	y
	Source(s)	**Notes**
	Stace, C. , van der Meijden, R. (ed.) & de Kort, I. (ed.). 2015. Interactive Flora of NW Europe - Conyza bonariensis. http://wbd.etibioinformatics.nl/bis/flora.php?menuentry=soorten&id=4025. [Accessed 3 Nov 2015]	"Hybrids - Conyza canadensis x Conyza bonariensis was identified as a single sterile intermediate plant found in Middlesex in 1993"
	Invasoras. 2015. Conyza bonariensis (hairy fleabane). http://invasoras.pt. [Accessed 3 Nov 2015]	"The several Conyza species in Portugal are very similar and hard to distinguish. Additionally, the Conyza species hybridize very rapidly among themselves, originating hybrids with intermediate characteristics, causing further difficulty in the identification."

Qsn #	Question	Answer
604	**Self-compatible or apomictic**	**y**
	Source(s)	**Notes**
	Okada, M., & Jasieniuk, M. (2014). Inheritance of glyphosate resistance in hairy fleabane (Conyza bonariensis) from California. Weed Science, 62(2): 258-266	"Because hairy fleabane is a predominantly self-pollinating species (Okada and Jasieniuk, unpublished data), there was a high probability that parental plants would be homozygous for resistance and susceptibility."

605	**Requires specialist pollinators**	**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.	"Heads usually numerous; involucre 4-6 mm high, densely pubescent; ray florets 50-200 or more per head, pistillate, rays ca. 0.5 mm long; pappus yellowish brown to reddish, in a single series, usually shorter than or equalling the inner florets." [No evidence from floral morphology]
	Boff, S., Araujo, A. C., & Pott, A. (2013). Bees (Hymenoptera: Apoidea) and flowers in natural forest patches of southern Pantanal. Biota Neotropica, 13(4): 46-56	[Visited & presumably pollinated by honeybees] "Other abundant ruderal plants recorded were: Borreria eryngioides Cham. & Schltdl., Conyza bonariensis (L.) Cronquist, Sphagneticola brachycarpa, and mainly Richardia grandiflora; but these species were primarily visited by honeybees."

606	**Reproduction by vegetative fragmentation**	**n**
	Source(s)	**Notes**
	DiTomaso, J. 2007. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	"Reproduce by seed." [No evidence of vegetative spread]

607	**Minimum generative time (years)**	**1**
	Source(s)	**Notes**
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"C. bonariensis is mainly an annual plant, germinating in autumn and persisting as a rosette of leaves over winter before shooting and flowering in the following spring. However, it may often behave as a biennial in temperate climates. It rarely, if ever, persists for a second season after flowering (unlike C. sumatrensis)."
	DiTomaso, J. 2007. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	"Plants exist as rosettes until flower stems develop at maturity. Seeds can germinate year-round under favorable conditions. Spring-germinating plants are annual. Late-summer and fall-germinating plants are usually biennial."

701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	**y**
	Source(s)	**Notes**
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Mowing along roadsides, especially during seed production, is likely to increase spread. Also, late tillage or other practices at such inappropriate times will also facilitate seed dispersal."

702	**Propagules dispersed intentionally by people**	**n**

Qsn #	Question	Answer
	Source(s)	**Notes**
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Seed of several Conyza species now widely present as weeds outside of their native ranges were probably introduced to most of their introduced ranges accidentally as contaminants in cotton, cereals or forage grains/seed."

703	Propagules likely to disperse as a produce contaminant	y
	Source(s)	**Notes**
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Seed of several Conyza species now widely present as weeds outside of their native ranges were probably introduced to most of their introduced ranges accidentally as contaminants in cotton, cereals or forage grains/seed. The first appearance of C. bonariensis around textile mills in Europe and elsewhere where exotic lead Sida (2003) to conclude that it may have been widely introduced from the New World as a contaminant of cotton. Also a weed in nurseries, Conyza spp. may be spread as seed present in the soil in pots or other planting containers that accompany nursery stock, either as ornamentals or for establishing plantations."

704	Propagules adapted to wind dispersal	y
	Source(s)	**Notes**
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"C. bonariensis is principally a wind-dispersed species, facilitated by light seed accompanied by a pappus which aids flight (e.g. Andersen, 1992)."
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Fruit 1/16 inch long, narrow, oblong, pale, tipped with stiff hairs and silky hairs which are 118 to 3/16 inch long" ... "Propagation: By seed. Many thousands of seeds are dispersed by the wind."

705	Propagules water dispersed	y
	Source(s)	**Notes**
	DiTomaso, J. 2007. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	"Achenes disperse with wind, soil movement, water, and human activities."

Qsn #	Question	Answer
706	**Propagules bird dispersed**	
	Source(s)	**Notes**
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Many thousands of seeds are dispersed by the wind."
	Heleno, R. H., Ross, G., Everard, A. M. Y., Memmott, J., & Ramos, J. A. (2011). The role of avian 'seed predators' as seed dispersers. Ibis, 153(1), 199-203	"Table 1. List of all seed–seed disperser interactions quantified in terms of the number of droppings with whole seeds." [1 seed of Conyza bonariensis was collected in the droppings of a Canary]
	Heleno, R. H. (2008). The impact of alien plants on native biota in the Azores: a food web approach. PhD Dissertation. University of Bristol, Bristol, UK	[Birds that act as seed predators may rarely disperse intact seeds] "Moreover, all seed predators were the sole disperser of at least one species: canary was the only disperser of Conyza bonariensis and Holcus lanatus..."

707	**Propagules dispersed by other animals (externally)**	**n**
	Source(s)	**Notes**
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[No significant evidence] "Natural Dispersal (Non-Biotic) C. bonariensis is principally a wind-dispersed species, facilitated by light seed accompanied by a pappus which aids flight (e.g. Andersen, 1992). Vector Transmission. No information is available on the possibility of spread by animals, but if it occurs, it is likely to be only of minor significance in comparison to wind-dispersal."

708	**Propagules survive passage through the gut**	
	Source(s)	**Notes**
	Heleno, R. H. (2008). The impact of alien plants on native biota in the Azores: a food web approach. PhD Dissertation. University of Bristol, Bristol, UK	[Seeds may rarely survive gut passage of bird seed predators] "Moreover, all seed predators were the sole disperser of at least one species: canary was the only disperser of Conyza bonariensis and Holcus lanatus..."
	Middleton, B. A., & Mason, D. H. (1992). Seed herbivory by nilgai, feral cattle, and wild boar in the Keoladeo National Park, India. Biotropica, 24(4): 538-543	[Viable seeds may be present in pig dung] "TABLE 3. Mean seed germination density (seeds m -2) in wild boar dung..." ... "Species with totals of less than 10 seeds m -2 per year include: Cassia tora, Coronopis didymus Sm., Cotula hemisphaerica, Cyperus difformis, Cyperus nutans Vahl, Erigeron bonariensis, Gnaphalium indicum Linn., Ipomoea aquatica, Melochia corchorifolia, Nicotiania plumbaginifolia, Nothosaerva brachiata Wt., Panicum paludosum, Paspalidium punctatum, Polygonum plebeium, Solanum nigrum, Sporobolus helvolus, and unknown composite, grass, herb, and mustard"

Qsn #	Question	Answer
801	**Prolific seed production (>1000/m2)**	**y**
	Source(s)	**Notes**
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Propagation: By seed. Many thousands of seeds are dispersed by the wind."
	CABI, 2015. Conyza bonariensis. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Seed production can be as great as 226,000 seeds per plant in the USA (Kempen and Graf, 1981), and seed dispersal by wind is made highly efficient by the pappus."

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	**y**
	Source(s)	**Notes**
	Wu, H., Walker, S., Rollin, M. J., Tan, D. K. Y., Robinson, G., & Werth, J. (2007). Germination, persistence, and emergence of flaxleaf fleabane (Conyza bonariensis [L.] Cronquist). Weed Biology and Management, 7(3): 192-199	[Some seeds remain viable after 3 years] "Flaxleaf fleabane (Conyza bonariensis [L.] Cronquist) is a difficult-to-control weed in dryland minimum tillage farming systems in the northern grains region of Australia. Experiments under field and controlled environments were conducted to study the seed germination, emergence, and persistence of C. bonariensis. The base, optimum, and maximum temperatures for seedling germination were estimated at 4.2, 20, and 35°C, respectively, with light stimulating germination. The soil types and burial depths had significant effects on seed persistence and emergence. The persistence pattern showed an initial rapid drop, followed by a slow but steady decline over time. After 3 years of burial, there were ª 7.5%, 9.7%, and 1.3% viable seeds at 10, 5, and 0–2 cm soil depths, respectively. Conyza bonariensis predominantly emerged from the soil surface or from the burial depth of 0.5 cm. Very few seeds emerged from a depth of 1 cm and none emerged from □ 2 cm. The emergence was greater in lighter soils." ... "The present research showed that, although the buried seeds of C. bonariensis sharply lost viability in the first year, they persisted well in the soil in the following years. After 3 years of burial, there was still ª 6% viable seeds in the soil. Although 6% viability is a relatively small fraction, it should not be underestimated due to the massive seed production of the weed in this region. Weed management plans would need to be extended to > 3 years in order to get this weed under control."

803	**Well controlled by herbicides**	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Shrestha, A., Hembree, K. & Wright, S. (2008). Biology and management of Horseweed and Hairy Fleabane in California. Publication 8314, University of California Division of Agriculture and Natural Resources, Oakland, CA	[Unknown if herbicide resistance has been documented in the Hawaiian Islands] "Glyphosate-resistant horseweed was first discovered in Delaware in 2000 (VanGessel 2001). Since then it has spread to 16 states in the United States and has also been reported from Brazil, China, Spain, and the Czech Republic (Heap 2008). Rapid seed dispersal, the expansive use of glyphosate, and the lack of tillage are major factors contributing to the quick invasion of glyphosate-resistant horseweed in the eastern United States (Dauer et al. 2007). In other parts of the United States, glyphosate-resistant horseweed has been reported where glyphosate resistant crops have been used in conjunction with no-till production systems (Dauer et al. 2007; Koger et al. 2004; Nandula et al. 2006). In California, glyphosate-resistant horseweed has been reported in orchards, vineyards, roadsides, and canal banks (Shrestha et al. 2007). Worldwide, including several regions of the United States, horseweed has developed resistance to several different herbicides, such as glyphosate, paraquat, and atrazine (Weaver et al. 2004; Heap 2008). Similarly, glyphosate-resistant hairy fleabane has recently been reported from Spain (Urbano et al. 2007) and South Africa (as reported in Heap 2008). Confirmed cases of glyphosate-resistant horseweed (Shrestha et al. 2007) and hairy fleabane (Shrestha et al. 2008) were reported in California in 2005 and 2007, respectively. In California, it was observed that the foliage of horseweed or hairy fleabane would initially show symptoms of injury to glyphosate, but the plants would recover in a few weeks and survive (fig. 8). Even within the same population, portions of the population were controlled while others would survive the glyphosate application (fig. 9). Such observations are characteristic signs of herbicide resistance. Relying on a single herbicide or combination of herbicides year after year increases the likelihood of selection for resistant populations. Rotating other effective products or using tank mixes of products where possible helps prevent or delay herbicide resistance. For detailed information on herbicide resistance management, refer to the Prather et al. 2000."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**n**
	Source(s)	**Notes**
	Shrestha, A., Hembree, K. & Wright, S. (2008). Biology and management of Horseweed and Hairy Fleabane in California. Publication 8314, University of California Division of Agriculture and Natural Resources, Oakland, CA	"It was found that even minimum tillage (discing) of the soil in spring or fall effectively controlled horseweed (Brown and Whitwell 1988). This explains why these weeds are observed more in undisturbed situations, such as orchard and vineyard berms, field margins, roadsides, and irrigation or ditch banks in California. In Australia, these species are considered the most difficult weeds to control in no-till systems (Somervaille and McLennan 2003 as cited in Wu et al. 2007)."
	DiTomaso, J. 2007. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	"Manual removal or cultivation before seed develops can control both species."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Shrestha, A., Hembree, K. & Wright, S. (2008). Biology and management of Horseweed and Hairy Fleabane in California. Publication 8314, University of California Division of Agriculture and Natural Resources, Oakland, CA	[Unknown for Hawaiian Islands] "Very little information is available on biological control of these two weed species. Since both weeds grow on lesser-disturbed and managed natural ecosystems, their seeds can easily blow into agroecosystems. Therefore, it is important to find methods that prevent the continuous influx of new seeds from the natural ecosystems. The bacterium Pseudomonas syringae pv. tagetis has been reported to affect these weeds (Charudattan 2001), but this has not yet been developed as a large scale biocontrol agent. Similarly, certain stem borers and leaf-eating caterpillars have been observed to damage these plants, but very little information is available on the success of these insects in controlling these weeds."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Broad climate suitability
• Thrives in tropical climates
• Widely naturalized
• Crop weed (esp. no-till crops)
• Other Erigeron & Conyza species are invasive
• May possess allelopathic properties
• May be an allergen to susceptible individuals
• Tolerates a wide range of soil conditions
• Able to form dense thickets
• Reproduces by seeds
• Hybridizes with other species
• Capable of self-pollination
• Annual to biennial (able to reproduce in one growing season)
• Seeds dispersed by wind, soil movement, water & human activities
• In rare instances, avian seed predators & mammals may internally disperse seeds
• Prolific seed production
• Seeds can remain viable in the soil for up to 3 years
• Herbicide resistance has developed in a number of locations

Low Risk Traits
• Impacts to the natural environment & ecological processes has not been documented & may not be as significant as impacts to crops
• Unarmed (no spines, thorns or burrs)
• Palatable to browsing & grazing animals
• Not reported to spread vegetatively
• Minimum tillage provides effective control